5551 Corporate Boulevard, Suite 200
Baton Rouge, Louisiana 70808
United States
www.GHD.com

Our Ref.: 11215702-Howard-8

July 26, 2021

Ms. Ashley Howard
Environmental Protection Agency Remedial Project Manager (SEDRA)
1201 Elm Street, Suite 500
Dallas, Texas 75270

SDI Sampling Plan Refinement Notice - 1
San Jacinto River Waste Pits Superfund Site
EPA Region 6, CERCLA Docket No. 06-02-18 for Remedial Design

Dear Ms. Howard:

GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents), has prepared a Work Plan Refinement Notice for the *Supplemental Design Investigation Sampling Plan - Revision 1* (Sampling Plan), approved by the United States Environmental Protection Agency (EPA) on June 4, 2021. As discussed during a weekly call with the EPA on Monday, July 19, 2021, the Respondents request to revise the approach to the collection of additional waste characterization samples due to short analytical hold times for Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics parameters.

As detailed in the Sampling Plan, during installation of analytical borings SJSB083 and SJSB101, duplicate samples would be collected from each planned 2-foot (ft) interval from 0 to 24 feet below ground surface (ft bgs) and archived for potential waste characterization, pending dioxins analytical results. Upon receipt of the dioxins analytical results, the two samples in each boring with the highest dioxins concentrations would be identified and the duplicate samples from those intervals would be analyzed for RCRA hazardous waste characteristics per EPA-required test methodology in 40 Code of Federal Regulations (CFR) Part 261.

Certain RCRA constituents must be analyzed within seven days of sample collection to be in accordance with the required test methodology in 40 CFR Part 261, which would not allow sufficient time to receive the results of the initial dioxins analyses. To avoid hold time issues, specific intervals from SJSB083 and SJSB101 have been pre-selected based on the highest dioxins concentrations reported in the collocated historic soil borings (SJSB046-C1 and SJSB071, respectively) completed during the Second Pre-Design Investigation (PDI-2). These selected intervals are:

- SBSB083:
  - 8 to 10 ft bgs (PDI-2 boring SJSB046-C1 dioxin concentration - 11,700 nanograms per kilogram [ng/kg])
  - 10 to 12 ft bgs (PDI-2 boring SJSB046-C1 dioxin concentration - 14,900 ng/kg)
- SBSB101:
  - 0 to 2 ft bgs (PDI-2 boring SJSB071 dioxin concentration - 34,700 ng/kg)
  - 2 to 4 ft bgs (PDI-2 boring SJSB071 dioxin concentration - 45,900 ng/kg)

Should you have any questions or require additional information regarding this submittal, please contact GHD at (225) 292-9007.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(832) 380-7655
Charles.Munce@GHD.com

CWM/jlf/8

cc: Lauren Poulos, EPA
Phil Slowiak, IPC
Brent Sasser, IPC
Judy Armour, MIMC

Approvals:

San Jacinto Project Coordinator: _____ Date: July 26, 2021
Charles W. Munce

EPA Remedial Project Manager: _____ Date: _____
Ashley Howard

Meeting Summary - April 2021 Technical Working Group (TWG) Meeting

Project:	San Jacinto River Waste Pits Site
Date/Time:	April 19, 2021; 12:00 PM - 3:40 PM CST
Place:	Via Teams
Attendees:	Ashley Howard (EPA), Lauren Poulos (EPA), John Meyer (EPA), Karl Gustavson (EPA), Chris Villareal (EPA), Paul Schroeder (USACE), Katie Delbecq (TCEQ), Xiaoxia Lu (TCEQ), Kristian Livingston (TCEQ), Phil Slowiak (IPC), Brent Sasser (IPC), Judy Armour (MIMC), Charles Munce (GHD), Janie Smith (GHD), Nick Groves (GHD), Satish Chilka (GHD), Stephen Saller (GHD), and Meagan Willis (GHD)

Representatives of the United States Environmental Protection Agency (EPA), the United States Army Corps of Engineers (USACE), the Texas Commission on Environmental Quality (TCEQ), International Paper Company (IPC), McGinnes Industrial Maintenance Corporation (MIMC), and GHD Services Inc. (GHD) held a Technical Working Group (TWG) meeting on April 19, 2021, via Microsoft Teams, to discuss the following items related to the Remedial Action (RA) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site located in Harris County, Texas (Site): the Respondents' draft response to EPA comments (RTCs) on the *Supplemental Design Investigation Sampling Plan* (Sampling Plan) that were provided to the EPA in advance of the meeting, the status of efforts to secure property access, the status of obtaining Coastal Water Authority (CWA) modeling outputs, and the status of upcoming Texas Department of Transportation (TxDOT) projects. Many items were discussed during the meeting, including those summarized below. This Meeting Summary is not intended, however, to provide a complete or exhaustive description of the matters addressed during the meeting.

- *Introductions:*
  - *GHD identified as the primary objective of the TWG meeting to be resolving issues regarding the Sampling Plan, in order to allow the Respondents to expeditiously proceed with the planned investigation activities.*
  - *Following introductions, GHD provided a brief recap of the key take-aways from the March 10, 2021, TWG meeting.*
  - *As a basis for discussing a draft of the Respondents' RTCs, GHD provided a summary of previous investigation activities at the Northern Impoundment, which included completion of 44 analytical borings and 42 geotechnical borings. GHD described the supplemental investigation which would include an additional 31 analytical borings and 10 geotechnical (CPT) borings.*
- *Supplemental Design Investigation RTCs:*

  Prior to the meeting, GHD provided the TWG participants with a draft RTC table which summarized the Respondents' proposed responses to the EPA comments received March 29, 2021. Below is a summary of the discussion about the RTC table.

- *Waste Characterization:*
    - *(General Comment #1) As described by GHD, two additional waste characterization samples would be collected from planned analytical borings (SJSB076 and SJSB083). The two intervals from each of these borings with the highest toxicity equivalent for mammals ($TEQ_{DF,M}$) concentrations will be analyzed for the RCRA hazardous waste parameters.*
        - *The EPA and TCEQ agreed with the proposed approach.*
        - *The TCEQ inquired if the samples would be analyzed for TCEQ Class 2 non-hazardous waste parameters.*
            - *GHD stated that the samples would not be analyzed for those parameters, and explained that this analysis would be conducted as part of the RA in connection with the selection of a disposal facility.*
- *Analytical Investigation:*
    - *(Analytical Comments #1 and #2) GHD provided an overview of the planned approach for analyzing the sample intervals and prioritizing sample locations collocated with historic samples locations in which an interval below the clean-up standard was not observed at the bottom of the boring (i.e., SJSB072, SJSB075, SJSB077, SJSB083, SJSB101).*
        - *As part of the overview of the planned approach, GHD explained the drilling challenges at the Northern Impoundment associated with weather, tidal conditions, etc. that could potentially affect the ability to prioritize sample locations.*
        - *After some discussion, the TWG participants aligned on analyzing all three deeper intervals simultaneously if the 16 to 18 feet below ground surface (ft bgs) interval had $TEQ_{DF,M}$ levels > 30 nanograms per kilogram (ng/kg) and prioritizing collocated samples to the extent practicable.*
    - *(Analytical Comment #3) The EPA inquired if the placement of analytical boring locations and spatial coverage relative to the conceptual best management practice (BMP) alignment would provide sufficient data to design a structurally robust BMP.*
        - *GHD indicated that the number and locations of the borings are based upon best engineering judgement and number and location of the proposed analytical borings are anticipated to provide the necessary data.*
        - *GHD added that the current conceptual alignment of the BMP has a 30-foot bench which will provide some flexibility for deeper localized excavations in smaller areas.*
    - *(Analytical Comments #4 and #5) The EPA expressed concern that there were not enough proposed boring locations in the northwest and southeast corners of the Northern Impoundment.*
        - *GHD indicated that two additional borings (SJSB100 and SJSB101) have been added to the northwestern corner and one additional boring (SJSB102) has been added to the southeastern corner. Additionally, the spatial coverage was adjusted to more evenly space several of the borings (Analytical Comment #7).*

ED_014247_00001093-00002

- *The TCEQ indicated they had hoped to see more borings added to the northwest corner and that the TCEQ would discuss further with the EPA.*

- *There was discussion about the potential need to use a crane with a bucket attachment affixed to an airboat to complete the borings in the northwest corner. The EPA expressed concerns that the community might perceive this activity as involving a disturbance to the cap.*
  - *After some discussion, the EPA and the USACE agreed that the bucket would likely remain on the depositional sediment above the armored cap, which would not impact the armored cap or expose any waste material below it.*
  - *The TCEQ requested that turbidity control measures be taken if a crane with a bucket attachment is utilized.*
  - *The EPA and TCEQ indicated that they would discuss this approach further internally.*
  - *There was discussion regarding what approaches might be utilized if it became necessary to collect samples at any location at depths deeper than those that can be accessed with the planned equipment.*
    - *GHD explained the challenges encountered during the Second Phase Pre-Design Investigation (PDI-2) in advancing soil borings.*
    - *Alternatives suggested by TWG participants to collect deeper samples included utilizing a larger airboat, accessing the northwest corner by anchoring equipment on land and water for stabilization, utilizing mats to build up work surfaces, moving the borings closer to the edge of the cap and positioning a spudded drill rig just outside the cap, adjusting footings on spuds to disperse weight, and utilizing spuds. GHD cautioned that some of these alternatives may be considered but that there still may be limitations on its ability to collect samples from deeper depths.*
    - *TWG participants discussed concerns that utilizing spuds has the potential to penetrate the cap and waste material.*
    - *The EPA and TCEQ indicated that they would discuss further internally how they would address a situation in which it becomes necessary to collect deeper samples.*

- *(Analytical Comment #6) GHD representatives indicated that GHD planned to collocate borings beside the five historic sample locations where $TEQ_{DF,M}$ levels < 30 ng/kg were not observed at the terminal depth.*

- *Geotechnical Investigation:*
  - *(Geotechnical Comment #1) GHD indicated that Figure 3 of the Sampling Plan had been updated, as requested, to include previously collected geotechnical samples.*
  - *(Geotechnical Comment #2) GHD provided an overview of how proposed cone penetrometer (CPT) Boring SJCPT-008 will be calibrated to historic boring SJGB050 so that the data obtained from the CPT investigation can be correlated back to existing SPT data (shear strength, consolidation test data, etc.) collected during previous geotechnical investigations.*

- *(Geotechnical Comment #3) GHD indicated that enough geotechnical information should be collected to calculate skin friction values and that these values could be provided to the Remedial Contractor during the RA.*
- *(Geotechnical Comment #4) The EPA requested that prior investigative work be reviewed to evaluate the potential of early CPT refusal and describe the approach for any potential adjustments in the field.*
  - *GHD explained that during PDI-2 borings were adjusted within a 25-foot radius if impediments were encountered. Any boring location adjusted beyond the 25-foot radius was discussed with the EPA before making the adjustment and documented in a refinement notice. GHD proposed this approach for the CPT and analytical borings for the supplemental investigation.*
  - *The EPA agreed on this approach relative to the CPT borings but expressed concerns about using this approach for adjusting the locations of analytical borings, especially collocated analytical borings.*
  - *The EPA representatives indicated that they would further discuss this approach internally.*

- *Piezometers:*
  - *(Piezometer Comment #1) The EPA requested that an additional deep piezometer be installed or if not, that additional information be added to the Sampling Plan to explain why it is not necessary.*
    - *GHD provided an overview of the three planned piezometers, their placement and screening depths, and their use in evaluating hydraulic conductivity and hydraulic heave. GHD also explained that the Northern Impoundment has a gradual potentiometric gradient within a thick uniform sand and there was not expected to be much variation across the Northern Impoundment.*
      - *The TCEQ and USACE indicated that they agreed but would like further explanation incorporated into the Sampling Plan.*
      - *The EPA indicated that another deep piezometer near the southeastern corner should be incorporated into the Sampling Plan or further justification incorporated into the Sampling Plan as to why another deep piezometer was not needed.*
  - *(Piezometer Comment #2) As requested by the EPA, standard operating procedures (SOPs) for Slug Testing and Pressuremeter Testing will be included in the Sampling Plan.*
    - *For purposes of expediency, the EPA asked that Respondents provide the SOPs for review prior to submittal of the Sampling Plan in final.*
  - *(Piezometer Comment #3) As requested by the EPA, GHD provided further detail on how slug tests would be conducted and how the data obtained would be utilized to measure lateral conductivity and estimate water volumes for management during the RA.*

ED_014247_00001093-00004

- *Access Update:*
  - *The Respondents have executed a temporary access agreement with Houston Fleeting Services, LLP to allow access during the Supplemental Design Investigation fieldwork.*
  - *GHD indicated that discussions are ongoing with several landowners for long-term lease or purchase of their property for use during the RA.*
- *CWA Update:*
  - *The CWA has indicated that its consultant completed the downstream modeling related to the Lake Houston flood control structure improvement project, submitted a Preliminary Design Report to CWA on March 12, 2021, and is moving forward with detailed design of the recommended alternative. The CWA also expressed concerns with sharing the model data with the EPA and GHD due to liability issues. The CWA also indicated it is consulting with the Federal Emergency Management Agency (which is funding the project) on the path forward.*
  - *GHD explained that the design team feels strongly that review of the model is necessary to verify assumptions in the basis of design for the top of BMP elevation.*
  - *The date that the modeling data will be available was unknown as of the date of the TWG meeting.*
- *TxDOT Update:*
  - *EPA, GHD, TxDOT, and the Respondents participated in a meeting on Monday, April 12, 2021. TxDOT reported on the Dolphin Fender Repair project and Interstate 10 (I-10) bridge replacement project.*
  - *TxDOT indicated that the Dolphin Fender Repair work is slated to begin at the end of May/early June with an anticipated duration of 382 days. A coordination meeting is scheduled with the TxDOT Area Office, contractor, EPA, GHD, and the Respondents on April 22, 2021.*
  - *TxDOT reported that the engineering contractor is scheduled to begin the preliminary design of the I-10 Bridge in May 2021 with construction not beginning until 2025 at the earliest.*
- *TWG Closing Discussion:*
  - *The EPA representatives indicated that they would have internal discussions on several outstanding questions related to the draft RTCs (i.e., boring locations around the northwest corner, alternatives to spudding, distance of field adjustment of analytical borings, and utilizing the crane bucket for positioning in the northwest corner) and provide further direction to the Respondents regarding those issues. The EPA does not anticipate another round of comments on the Sampling Plan.*

ED_014247_00001093-00005

5551 Corporate Boulevard, Suite 200
Baton Rouge, Louisiana 70808
United States
www.GHD.com

Our Ref.: 11215702-Howard-11

October 15, 2021

Ms. Ashley Howard
Environmental Protection Agency Remedial Project Manager (SEDRA)
1201 Elm Street, Suite 500
Dallas, Texas 75270

San Jacinto River Waste Pits Superfund Site
Monthly Progress Report No. 41 - September 2021
EPA Region 6, CERCLA Docket No. 06-02-18 for Remedial Design

Dear Ms. Howard:

On behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents), GHD Services Inc. (GHD) submits the September 2021 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Administrative Settlement Agreement and Order on Consent* (AOC), for the San Jacinto River Waste Pits Superfund Site (CERCLA Docket No. 06-02-18) located in Harris County, Texas (Site). This Monthly Progress Report No. 41 summarizes remedial design (RD) activities performed during the month of September 2021.

Consistent with the requirements of the AOC, this progress report was prepared on behalf of the Respondents and is organized into the following subject areas:

- Actions taken during previous period.
- Summary of sampling or testing results.
- AOC deliverables Respondents submitted to the EPA.
- Activities scheduled for the next month.
- Percentage of RD completion and potential schedule concerns.
- Modifications to approved work plans or schedules.
- Community Involvement Plan activities.
- Technical Working Group (TWG) activities.

1. Actions Taken During Previous Period

- Pursuant to Section VII, Paragraph 12.a.(3) of the RD AOC, conference calls were held on several occasions between the Respondent's Project Coordinator and the EPA.
- The Respondents concluded the majority of the Supplemental Design Investigation (SDI) fieldwork in accordance with the approved *SDI Sampling Plan - Revision 1* (Sampling Plan). The water-based cone penetration testing (CPT) investigation was completed on September 16, 2021. The only SDI activity remaining is the deployment of velocity monitors, which will be completed at the same time that ambient turbidity monitors are deployed. Deployment of the monitors will occur following EPA approval of a revised *Background Turbidity Measurements Plan* (Revised Turbidity Measurements Plan).

- The Respondents continued to receive, validate, and evaluate analytical and geotechnical data from the SDI.
- GHD continued work on the *Pre-Final 90% Remedial Design - Northern Impoundment* (Northern Impoundment 90% RD).
- The Respondents continued their efforts to obtain access rights related to performing the remedial action (RA), with support from the EPA.
- On September 24, 2021, the EPA provided comments on the July 14, 2021, *Background Turbidity Measurements Plan*. GHD is preparing a response to the EPA's comments and a Revised Turbidity Measurements Plan and anticipates submittal in early October.
- At the request of the EPA during a call on August 20, 2021, the Respondents prepared and submitted a *Turbidity Curtain Deployment during the Supplemental Design Investigation* letter on September 28, 2021.

2. Summary of Sampling and Testing Results

- The laboratory analyses and validation of the analytical data from the SDI fieldwork are currently on-going. The validated data from the SDI fieldwork received thus far is included in Tables 1, 2, and 3, attached to this report. Table 1 provides all validated SDI analytical data, and Table 2 provides results from waste characterization sampling. Table 3 provides a summary of the validated SDI dioxins and furans data, as requested by the EPA.

3. AOC Deliverables Respondents Submitted to the EPA

- No AOC Deliverables were submitted during this period.

4. Activities Scheduled for the Next Month

- GHD will continue to meet via video conference with the EPA and representatives of the relevant stakeholders (U.S. Army Corps of Engineers [USACE]-Galveston District, Port of Houston Authority [POHA], U.S. Coast Guard [USCG], Texas Department of Transportation [TxDOT], Texas Commission on Environmental Quality [TCEQ], Harris County, and others), as needed to obtain any necessary approvals and/or to coordinate on issues affecting their respective jurisdictions and authorities.
- The Respondents will submit a Revised Turbidity Measurements Plan to the EPA, responding to EPA comments received on September 24, 2021. Following EPA approval of the Revised Turbidity Measurements Plan, GHD will then deploy the ambient turbidity monitors, as soon as possible in an effort to obtain as much data, as possible to incorporate into Northern Impoundment 90% RD. For efficiency, the Respondents plan to deploy the velocity monitors at the same time as the turbidity monitors.
- The Respondents will remain in contact with TxDOT to obtain and track information regarding plans for the dolphin and fender repair project and Interstate-10 (I-10) bridge replacement project and to address permitting considerations related to implementation of the RA.
- With the support of the EPA, the Respondents will continue efforts to obtain access rights required in connection with implementing the Northern Impoundment RA.
- The Respondents will prepare material for the next TWG meeting, which is currently scheduled for October 19, 2021.

- GHD will participate in TWG follow-up meetings with POHA and Harris County following the October 19, 2021, TWG meeting.
- Due to significant modifications in fundamental design assumptions and alignment of the best management practice that will be required as a result of the SDI, the Respondents will submit a letter requesting an extension to the deadline for the Northern Impoundment 90% RD.
- The Respondents will continue to evaluate data from the SDI and work on the Northern Impoundment 90% RD.

5. Percentage of RD Completion and Potential Schedule Concerns

- Overall, the Northern Impoundment RD is approximately 67 percent complete, based on the current RD schedule. It should be noted that this reflects progress as it relates to the overall RD schedule for both the Northern Impoundment and the Southern Impoundment and not to the work completed in order to submit the Northern Impoundment 90% RD. The majority of work required to complete the Northern Impoundment 90% RD is contingent upon receipt of all of the validated SDI data.

6. Modifications to Approved Work Plans or Schedules

- No modifications to approved work plans or schedules occurred during this period.

7. Community Involvement Plan Activities

- The Respondents understand that the EPA is planning a Community Action Group (CAG) meeting for some time in October.

8. Technical Working Group Activities

- The next TWG Meeting is currently scheduled for October 19, 2021.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (225) 292-9007.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(832) 380-7655
Charles.Munce@GHD.com

CWM/jlf/11

Encl.: Table 1 - Supplemental Design Investigation - Soil Analytical Results Summary
Table 2 - Supplemental Design Investigation - Waste Characterization Results Summary
Table 3 - Supplemental Design Investigation - Dioxins/Furans Results Summary

cc: Lauren Poulos, EPA
Katie Delbecq, TCEQ
Phil Slowiak, IPC
Brent Sasser, IPC
Judy Armour, MIMC

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB072 11215702-072021-SS-SJSB072(8-10) 07/20/21 (8-10) ft bgs	SJSB072 11215702-072021-SS-SJSB072(10-12) 07/20/21 (10-12) ft bgs	SJSB072 11215702-072021-SS-SJSB072(12-14) 07/20/21 (12-14) ft bgs	SJSB072 11215702-072021-SS-SJSB072(14-16) 07/20/21 (14-16) ft bgs	SJSB072 11215702-072021-SS-SJSB072(16-18) 07/20/21 (16-18) ft bgs	SJSB072 11215702-072021-SS-SJSB072(18-20) 07/20/21 (18-20) ft bgs	SJSB072 11215702-072021-SS-SJSB072(20-22) 07/20/21 (20-22) ft bgs	SJSB072 11215702-072021-SS-SJSB072(22-24) 07/20/21 (22-24) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.49 U	5.3 U	0.046 U	0.49 U	2.3 U	0.88 U	1.3 U	0.68 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	72	190	42	38	89	190	120	43
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.32 J	10	0.050 U	0.11 U	1.7 J	0.35 U	2.7 J	0.032 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2.6 J	8.2	1.8 J	1.9 J	4.1 J	8.4	7.7	1.8 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.14 J	3.4 J	0.056 U	0.13 U	0.85 J	0.033 U	0.92 U	0.037 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.96 J	33	0.083 J	0.16 J	5.0 J	0.024 U	8.3	0.072 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.22 J	0.26 J	0.20 J	0.16 U	0.32 J	0.31 U	0.31 U	0.31 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.29 J	8.7	0.039 U	0.081 U	1.4 J	0.025 U	2.1 J	0.036 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.14 J	0.36 J	0.088 U	0.16 U	0.28 J	0.27 J	0.18 J	0.088 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.89 U	1.3 U	0.85 U	0.77 U	0.84 U	0.050 J	0.039 U	0.053 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.28 J	0.21 J	0.17 J	0.14 U	0.44 J	0.70 J	0.32 J	0.21 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.1 J	24	0.30 J	0.41 J	3.1 J	0.028 U	5.6 J	0.081 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 J	1.9 J	0.061 U	0.12 U	0.075 U	0.057 U	0.44 J	0.050 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 J	0.98 J	0.030 U	0.063 U	0.20 J	0.019 U	0.26 U	0.11 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.50 J	14	0.073 J	0.10 U	1.5 J	0.028 U	3.1 J	0.035 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	25	710	2.7	2.6	70	0.40 J	180	1.7
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.4	260	0.85 J	1.2	25	0.18 J	53	0.52 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.57 J	17 J	0.056 U	0.13 U	3.1 J	0.091 J	4.5 J	0.037 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11 J	28 J	8.0 J	6.5 J	15 J	38 J	21 J	7.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	51 J	0.94 J	0.94 J	8.2 J	0.050 J	12 J	0.19 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6 J	3.9 J	5.3 J	2.2 J	5.6 J	13 J	5.7 J	3.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.3 J	60 J	0.38 J	0.41 J	7.0 J	0.031 U	14 J	0.081 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.39 J	2.2 J	2.0 J	0.19 U	0.82 J	2.4 J	1.7 J	0.56 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	50 J	1400 J	5.4 J	4.9 J	140 J	0.66 J	320 J	2.4 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.4 J	280 J	4.1 J	1.2 J	28 J	1.8 J	59 J	0.96 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	12	340	1.2	1.5	33	0.46	74	0.75
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	12	340	1.3	1.7	34	0.52	74	0.81
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	84.5	81.7	80.4	79.2	82.4	80.9	81.8	84.2

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB073 11215702-072021-SS-SJSB073(0-2) 07/20/21 (0-2) ft bgs	SJSB073 11215702-072021-SS-SJSB073(2-4) 07/20/21 (2-4) ft bgs	SJSB073 11215702-072021-SS-SJSB073(4-6) 07/20/21 (4-6) ft bgs	SJSB073 11215702-072021-SS-SJSB073(6-8) 07/20/21 (6-8) ft bgs	SJSB073 11215702-072021-SS-SJSB073(8-10) 07/20/21 (8-10) ft bgs	SJSB073 11215702-072021-SS-SJSB073(10-12) 07/20/21 (10-12) ft bgs	SJSB073 11215702-072021-SS-SJSB073(12-14) 07/20/21 (12-14) ft bgs	SJSB073 11215702-072021-SS-SJSB073(14-16) 07/20/21 (14-16) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	20	440	350	780 J	1300 J	1.8 U	0.32 U	1.5 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	550	3500	2400	10000	19000	160 U	200 U	390
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	6.4 J	1000	770	1700	2800 J+	2.2 U	0.64 U	0.92 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	33	260	170	590 J	950 J	9.4	19	24
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.5 U	330	240	520 J	850 J	0.85 U	0.17 U	0.51 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	16	3300	2400	5600	8400	6.0	0.82 J	1.8 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.092 U	2.7 J	2.2 J	5.4 U	12 U	0.30 U	0.19 U	0.21 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.4 J	820	620	1500	2200	1.3 J	0.46 U	0.64 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	12	7.2 J	41 J	52 J	0.30 U	0.23 U	0.24 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	2.8 U	57	42	100 U	140 U	3.0 U	2.3 U	2.5 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.56 U	5.1 J	4.2 J	17 U	10 U	0.28 U	1.3 U	1.9 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.0	1900	1400	4500	5000	4.5 U	1.9 U	2.7 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.068 U	190	130	400 J	460 J	0.24 U	0.25 U	0.15 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.44 J	83	66	170 J	210 J	0.37 U	0.16 U	0.11 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.98 J	1200	820	2700	2900	2.2 J	0.14 U	0.99 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	13	77000	91000	160000	200000	90	3.4	28
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.9	22000	16000	50000	60000	30	4.1	11
Total heptachlorodibenzofuran (HpCDF)	pg/g	19 J	1600 J	1200 J	2800 J	4600 J	3.0 J	1.1 J	2.4 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	88 J	550 J	350 J	1300 J	2100 J	60 J	77 J	82 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	29 J	4700 J	3500 J	8500 J	12000 J	10 J	3.6 J	4.9 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.7 J	68 J	49 J	160 J	210 J	19 J	20 J	23 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	13 J	4700 J	3300 J	11000 J	13000 J	7.9 J	1.9 J	3.7 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.52 J	220 J	150 J	400 J	460 J	0.45 U	0.25 U	0.15 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	30 J	120000 J	78000 J	290000 J	350000 J	210 J	24 J	63 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.9 J	24000 J	17000 J	55000 J	66000 J	36 J	5.1 J	11 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	9.4	31000	26000	68000	83000	41	4.7	15
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	9.6	31000	26000	68000	83000	41	5.2	15
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	79.9	61.1	60.3	47.4	39.0	76.9	72.1	71.1

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

ED_014247_00001095-00006

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB073 11215702-072021-SS-SJSB073(16-18) 07/20/21 (16-18) ft bgs	SJSB074 11215702-072221-SS-SJSB074(0-2) 07/22/21 (0-2) ft bgs	SJSB074 11215702-072221-DUP-5 07/22/21 (2-4) ft bgs Duplicate	SJSB074 11215702-072221-SS-SJSB074(2-4) 07/22/21 (2-4) ft bgs	SJSB074 11215702-072221-SS-SJSB074(4-6) 07/22/21 (4-6) ft bgs	SJSB074 11215702-072221-SS-SJSB074(6-8) 07/22/21 (6-8) ft bgs	SJSB074 11215702-072221-SS-SJSB074(8-10) 07/22/21 (8-10) ft bgs	SJSB074 11215702-072221-SS-SJSB074(10-12) 07/22/21 (10-12) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.15 U	140	950	1600	600	7.1 J	0.38 U	0.32 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	220	2200	21000 J	41000 J	17000 J	1200	82	58
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.11 U	280	1900	4200 J	1200	4.3 J	0.22 U	0.16 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11	110	1800	4000 J	1700	34	2.9 J	1.8 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.13 U	85	610	1100	420	0.87 J	0.063 U	0.059 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.97 J	910	5900 J	9900 J	5100 J	7.8	0.44 J	0.28 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.17 U	1.3 J	6.5 J	8.7 J	4.0 J	0.55 U	0.20 U	0.19 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.38 U	240	1600	2700	1400	2.3 J	0.12 U	0.13 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.20 U	3.6 J	45	80	32	0.98 J	0.082 U	0.074 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	2.3 U	13	86	130	110	0.085 U	0.036 U	0.11 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.17 U	2.7 J	16	25	8.6 J	1.4 J	0.19 U	0.061 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.6 U	680	3900 J	5300 J	3600 J	5.6 J	0.33 J	0.17 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 U	49	390	480	190	0.64 J	0.065 U	0.043 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.093 U	28	160	250	160	0.32 J	0.035 U	0.024 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.13 U	370	2600	3300	1500	3.6 J	0.20 J	0.12 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	5.9	19000 J	160000 J	180000 J	63000 J	200	12	6.2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.5	5600 J	41000 J	49000 J	22000 J	63	3.7	2.3
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.13 U	440 J	3200 J	6300 J	2000 J	7.3 J	0.35 J	0.16 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	48 J	230 J	3200 J	6600 J	2700 J	110 J	13 J	7.1 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	3.6 J	1300 J	8800 J	15000 J	7800 J	14 J	0.56 J	0.47 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	14 J	32 J	250 J	450 J	350 J	21 J	2.7 J	1.4 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1.6 J	1600 J	10000 J	13000 J	7600 J	17 J	0.69 J	0.36 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 U	52 J	480 J	600 J	240 J	4.1 J	0.17 J	0.18 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	24 J	34000 J	160000 J	210000 J	110000 J	370 J	22 J	10 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.5 J	6100 J	46000 J	54000 J	24000 J	69 J	4.0 J	2.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	5.4	7800	59000	70000	30000	87	5.1	3.0
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	5.6	7800	59000	70000	30000	87	5.1	3.1
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	78.7	74.3	58.1	51.5	57.6	80.3	83.7	83.8

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB074 11215702-072221-SS-SJSB074(12-14) 07/22/21 (12-14) ft bgs	SJSB074 11215702-072221-SS-SJSB074(14-16) 07/22/21 (14-16) ft bgs	SJSB074 11215702-072221-SS-SJSB074(16-18) 07/22/21 (16-18) ft bgs	SJSB075 11215702-072021-SS-DUP-1 07/20/21 (4-6) ft bgs	SJSB075 11215702-072021-SS-SJSB075(10-12) 07/20/21 (10-12) ft bgs	SJSB075 11215702-072021-SS-SJSB075(12-14) 07/20/21 (12-14) ft bgs	SJSB075 11215702-072021-SS-SJSB075(14-16) 07/20/21 (14-16) ft bgs	SJSB075 11215702-072021-SS-SJSB075(16-18) 07/20/21 (16-18) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.32 U	0.34 U	0.14 U	970 U	3.0 U	0.11 U	1.1 U	0.10 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	55	51	200	11000 U	130 U	52 U	240 U	190 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.13 U	0.42 U	0.14 U	2300	5.4 J	0.096 U	0.48 U	0.48 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2.2 J	2.2 J	9.6	660	7.0 U	1.9 U	15 U	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.099 U	0.12 U	0.027 U	710	2.5 J	0.10 U	0.19 U	0.30 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 U	0.38 J	0.067 J	8400	25	0.33 J	0.41 J	0.90 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.11 U	0.25 U	0.26 U	6.3 U	0.30 U	0.25 U	0.28 U	0.37 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.054 U	0.20 U	0.019 U	2100	6.3	0.32 U	0.14 U	0.34 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.11 U	0.19 J	0.27 J	34 J	0.39 J	0.10 U	0.62 J	0.43 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 U	0.19 U	0.22 U	110 U	2.1 U	2.9 U	1.9 U	1.9 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.22 U	0.24 U	0.67 J	9.6 U	0.43 U	0.36 U	1.1 U	0.72 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.033 U	0.30 J	0.18 J	5500	22	1.7 U	1.4 U	1.4 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.11 J	0.054 U	0.12 J	330 J	1.8 J	0.069 U	0.23 U	0.066 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.056 J	0.10 J	0.016 U	230 J	1.0 J	0.065 U	0.11 U	0.12 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.032 U	0.16 J	0.056 J	2800	12	0.065 U	0.19 U	0.33 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.76 U	5.7	0.66 U	130000	690	1.3 U	5.9 U	13
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.26 U	1.8	0.38 J	40000	190	0.98 U	1.8 U	5.0
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.34 J	0.74 J	0.096 J	3800 J	10 J	0.10 U	0.28 J	0.56 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	9.6 J	7.6 J	37 J	1500 J	18 J	11 J	43 J	36 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.35 J	0.88 J	0.28 J	12000 J	40 J	4.2 J	2.3 J	3.5 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.9 J	6.8 J	11 J	170 J	5.1 J	4.8 J	15 J	13 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.033 U	0.55 J	0.29 J	13000 J	55 J	2.2 J	1.4 J	2.6 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.9 J	1.8 J	2.4 J	350 J	1.8 J	0.71 J	3.1 J	2.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.1 J	7.7 J	1.3 J	230000 J	1300 J	5.0 J	10 J	29 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	7.9 J	4.6 J	2.0 J	44000 J	220 J	3.7 J	3.2 J	6.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.15	2.5	0.78	55000	270	0.033	0.10	6.6
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.37	2.6	0.84	55000	270	0.88	1.8	6.7
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	83.1	82.9	79.5	47.1	80.9	80.4	81.6	79.3

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB076 11215702-072221-SS-SJSB076(0-2) 07/22/21 (0-2) ft bgs	SJSB076 11215702-072221-SS-SJSB076(2-4) 07/22/21 (2-4) ft bgs	SJSB076 11215702-072221-SS-SJSB076(4-6) 07/22/21 (4-6) ft bgs	SJSB076 11215702-072221-SS-SJSB076(6-8) 07/22/21 (6-8) ft bgs	SJSB076 11215702-072221-SS-SJSB076(8-10) 07/22/21 (8-10) ft bgs	SJSB076 11215702-072221-SS-SJSB076(10-12) 07/22/21 (10-12) ft bgs	SJSB076 11215702-072221-SS-SJSB076(12-14) 07/22/21 (12-14) ft bgs	SJSB076 11215702-072221-SS-SJSB076(14-16) 07/22/21 (14-16) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	72	910	1400	3.6 J	0.35 J	2.7 J	0.58 J	0.81 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1200	4500	16000 J	150	84	200	350	130
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	150	2300	2900	6.6 J	0.43 J	5.2 J	1.0 J	0.70 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	51 J	350	1200	6.4 J	3.4 J	8.9	19	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	46	780	1000	2.5 J	0.16 J	1.8 J	0.42 J	0.084 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	500	8400 J	11000 J	24	1.1 J	19	3.0 J	1.1 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.96 J	3.6 J	7.0 J	0.051 U	0.28 J	0.071 U	0.61 J	0.31 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	130	2300	3000	6.8	0.30 J	4.4 J	0.87 J	0.31 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	18	35	0.054 U	0.19 J	0.082 U	0.85 J	0.34 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	8.1	140	210	0.14 U	0.13 J	0.35 J	0.046 U	0.065 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.0 J	9.1 J	13	0.24 J	0.28 J	0.29 J	1.5 J	0.56 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	310	6000 J	6400 J	17	0.96 J	14	2.1 J	0.72 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	20	270	420	1.5 J	0.19 J	0.98 J	0.21 U	0.15 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	16	260	360	0.15 U	0.073 U	0.59 J	0.044 U	0.029 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	160	2600	3200	9.7	0.54 J	7.5	0.95 J	0.31 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	7600 J	110000 J	150000 J	540	28	360	43	9.8
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2100 J	36000 J	45000 J	150	7.9	110	15	3.5
Total heptachlorodibenzofuran (HpCDF)	pg/g	230 J	3600 J	4600 J	11 J	0.72 J	8.5 J	1.7 J	0.90 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	690 J	2200 J	19 J	12 J	24 J	69 J	26 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	740 J	13000 J	16000 J	31 J	1.5 J	27 J	3.8 J	1.7 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	22 J	110 J	260 J	3.6 J	3.9 J	3.4 J	17 J	7.5 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	720 J	13000 J	16000 J	38 J	2.1 J	32 J	4.0 J	1.5 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	22 J	300 J	420 J	1.5 J	0.40 J	0.98 J	0.68 J	0.66 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	13000 J	160000 J	230000 J	930 J	51 J	640 J	78 J	19 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2300 J	40000 J	50000 J	160 J	8.8 J	120 J	17 J	4.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3000	49000	63000	210	11	150	21	5.2
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3000	49000	63000	210	11	150	21	5.2
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	76.0	50.8	43.6	76.7	81.4	81.7	67.0	74.8

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB076	SJSB077	SJSB077	SJSB077	SJSB077	SJSB077	SJSB077	SJSB077
Sample Identification:		11215702-072221-SS-SJSB076(16-18)	11215702-072121-SS-SJSB077(0-2)	11215702-072121-DUP-3	11215702-072121-SS-SJSB077(6-8)	11215702-072121-SS-SJSB077(8-10)	11215702-072121-SS-SJSB077(10-12)	11215702-072121-SS-SJSB077(12-14)	11215702-072121-SS-SJSB077(14-16)
Sample Date:	Units	07/22/21	07/21/21	07/21/21	07/21/21	07/21/21	07/21/21	07/21/21	07/21/21
Sample Depth:		(16-18) ft bgs	(0-2) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs
Sample Type:				Duplicate					
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.24 U	--	1400	1300	1700	1.4 J	0.95 J	8.3 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	400	--	9700	8900	10000	100	73	480
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.21 U	--	2500	2400	3900	2.1 J	0.84 J	14
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	18	--	610	550	720	4.4 J	2.7 J	21
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.027 U	--	760	770	1000	0.67 J	0.33 J	4.5 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.39 J	--	8700	7100	9800	6.9	2.2 J	41
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.45 U	--	4.6 J	7.4 J	5.2 J	0.32 J	0.17 U	0.24 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 J	--	2300	1800	2500	1.8 J	0.74 J	11
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.53 J	--	48 J	41 J	37 J	0.13 U	0.18 U	0.27 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.23 U	--	140	120	160	0.075 U	0.050 U	0.25 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	--	13 J	18 J	12 J	0.11 U	0.16 U	0.24 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.41 J	--	5400	4600	5900	5.1 J	1.6 J	27
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.22 J	--	460	400	530	0.091 U	0.077 U	2.4 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.019 U	--	280	220	280	0.077 U	0.050 U	1.4 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.16 J	--	3200	2800	3500	2.5 J	1.1 J	16
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	6.5	--	140000 J	170000 J	200000 J	100	48	730 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.2	--	44000 J	44000 J	54000 J	38	18	260
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.32 J	--	4000 J	3900 J	5900 J	3.3 J	1.2 J	23 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	77 J	--	1300 J	1100 J	1500 J	17 J	9.9 J	74 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.76 J	--	13000 J	10000 J	14000 J	8.7 J	3.0 J	58 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	21 J	--	200 J	190 J	190 J	8.4 J	3.3 J	23 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.81 J	--	13000 J	11000 J	14000 J	7.6 J	2.7 J	62 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.2 J	--	460 J	400 J	530 J	0.14 U	0.077 U	6.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	11 J	--	250000 J	240000 J	300000 J	200 J	100 J	1400 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.7 J	--	48000 J	48000 J	59000 J	43 J	20 J	290 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3.7	--	61000	63000	77000	50	24	350
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.7	--	61000	63000	77000	50	24	350
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	72.5	71.3	41.3	46.3	40.5	81.3	81.2	61.5

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB077 11215702-072121-SS-SJSB077(16-18) 07/21/21 (16-18) ft bgs	SJSB078 11215702-072121-SS-SJSB078(0-2) 07/21/21 (0-2) ft bgs	SJSB078 11215702-072121-SS-SJSB078(2-4) 07/21/21 (2-4) ft bgs	SJSB078 11215702-072121-SS-SJSB078(4-6) 07/21/21 (4-6) ft bgs	SJSB078 11215702-072121-SS-SJSB078(6-8) 07/21/21 (6-8) ft bgs	SJSB078 11215702-072121-SS-SJSB078(8-10) 07/21/21 (8-10) ft bgs	SJSB078 11215702-072121-SS-SJSB078(10-12) 07/21/21 (10-12) ft bgs	SJSB078 11215702-072121-SS-SJSB078(12-14) 07/21/21 (12-14) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.83 J	560 J	1100 J	1200	0.74 J	1.7 J	3.1 J	0.073 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	89	5600	15000	12000	91	92	320	89
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.32 J	1300	2300	2300	0.33 J	1.6 J	2.5 J	0.69 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3.9 J	440 J	1100	710	3.1 J	4.4 J	9.1	2.7 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 J	480 J	730 J	730	0.050 U	0.64 J	0.94 J	0.21 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.033 U	4700	7100	8200	1.6 J	5.1 J	9.9	1.7 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.077 U	38 J	5.8 U	6.2 J	0.093 U	0.056 U	0.17 U	0.090 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.032 U	1200	1800	2100	0.50 J	1.5 J	2.3 J	0.52 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.088 U	4.5 U	6.4 U	45 J	0.11 U	0.065 U	0.20 U	0.11 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.031 U	22 U	37 U	160	0.033 U	0.063 U	0.092 U	0.033 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.076 U	4.0 U	5.7 U	14 J	0.093 U	0.056 U	0.17 U	0.090 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.038 U	3100	3300	5300	1.8 J	4.4 J	7.1	1.3 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.069 U	170 J	260 J	440	0.071 U	0.51 J	0.076 U	0.068 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.031 U	170 J	170 J	270	0.029 U	0.061 U	0.082 U	0.031 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.040 U	1700	1800	3300	1.0 J	2.6 J	3.7 J	0.071 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.0 U	80000	190000 J	250000	66	150	200	32
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.058 U	24000	26000	58000	25	47	68	12
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.65 J	2100 J	3700 J	4000 J	0.64 J	2.8 J	4.5 J	1.1 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	16 J	820 J	2300 J	1600 J	13 J	13 J	34 J	15 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.033 U	6500 J	9500 J	12000 J	2.1 J	6.6 J	13 J	2.2 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.2 J	93 J	150 J	220 J	3.0 J	3.5 J	5.8 J	2.0 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.072 U	7600 J	7800 J	13000 J	4.4 J	9.3 J	15 J	1.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.34 U	170 J	260 J	440 J	0.51 U	0.51 J	0.58 U	0.34 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.0 J	160000 J	160000 J	320000 J	130 J	300 J	380 J	64 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.74 U	27000 J	28000 J	63000 J	25 J	47 J	68 J	12 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.071	33000	47000	86000	32	64	91	16
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.21	33000	47000	86000	32	64	91	16
General Chemistry									
Percent solids	%	83.0	--	--	--	--	--	--	--
Percent solids, vol.	%	--	57.9	48.3	43.0	75.9	81.9	74.1	84.1

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB078	SJSB078	SJSB078	SJSB078	SJSB078	SJSB078	SJSB079	SJSB079
Sample Identification:		11215702-072121-DUP-2	11215702-072121-SS-SJSB078(14-16)	11215702-072121-SS-SJSB078(16-18)	11215702-072121-SS-SJSB078(18-20)	11215702-072121-SS-SJSB078(20-22)	11215702-072121-SS-SJSB078(22-24)	11215702-072521-SS-SJSB079(0-2)	11215702-072521-SS-SJSB079(2-4)
Sample Date:	Units	07/21/21	07/21/21	07/21/21	07/21/21	07/21/21	07/21/21	07/25/21	07/25/21
Sample Depth:		(14-16) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(18-20) ft bgs	(20-22) ft bgs	(22-24) ft bgs	(0-2) ft bgs	(2-4) ft bgs
Sample Type:		Duplicate							
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.33 U	0.069 U	4.4 J	0.88 U	4.5 J	0.88 U	620	1500
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	130	100	240	130	240	63	5100	12000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.19 U	0.21 J	4.5 J	0.35 U	7.3	0.35 U	1200	2800
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	6.3	4.9 J	10	6.3	12	2.6 U	410	880
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 U	0.047 U	1.1 J	0.034 U	2.3 J	0.036 U	420	1000
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.89 J	0.58 J	13	0.22 J	22	0.070 J	4800	10000
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.28 U	0.081 U	0.10 U	0.31 U	0.31 U	0.045 U	2.0 U	6.4 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.030 U	3.4 J	0.028 U	5.6 J	0.030 U	1200	2500
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.29 U	0.088 U	0.11 U	0.25 J	0.37 J	0.049 U	13 J	27 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 U	0.029 U	0.38 J	0.043 J	0.46 J	0.057 J	84 J	130
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.26 U	0.078 U	0.098 U	0.51 J	0.41 J	0.27 J	7.9 J	15 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.17 U	0.48 J	8.1	0.19 J	16	0.034 U	3600	5200
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.41 UJ	0.089 U	1.1 J	0.10 J	1.6 J	0.050 U	210	340
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 U	0.028 U	0.32 J	0.11 U	0.73 J	0.024 U	170	260
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.17 U	0.032 U	4.8 J	0.096 J	9.5	0.033 U	2000	2600
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	22	15	230	5.0	570 J	0.57 J	77000 J	120000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.6	5.6	92	1.8	190	0.25 J	23000 J	37000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.19 U	0.21 J	7.7 J	0.14 J	13 J	0.10 J	1900 J	4500 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	27 J	19 J	31 J	25 J	32 J	12 J	750 J	1600 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.89 J	0.58 J	20 J	0.28 J	33 J	0.13 J	7100 J	15000 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	11 J	8.8 J	7.3 J	8.8 J	7.4 J	5.0 J	80 J	160 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.29 U	0.48 J	20 J	0.37 J	41 J	0.034 U	8900 J	12000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.60 U	2.3 J	2.1 J	1.6 J	3.3 J	1.2 J	210 J	340 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	38 J	26 J	460 J	8.2 J	1100 J	0.92 J	130000 J	220000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.6 J	8.0 J	100 J	2.9 J	210 J	1.4 J	25000 J	41000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	12	7.3	120	2.6	260	0.37	32000	52000
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	12	7.3	120	2.7	260	0.42	32000	52000
General Chemistry									
Percent solids	%	--	--	77.5	--	--	--	57.4	52.9
Percent solids, vol.	%	80.4	79.1	--	82.8	81.6	81.6	--	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB079 11215702-072521-SS-SJSB079(4-6) 07/25/21 (4-6) ft bgs	SJSB079 11215702-072521-SS-SJSB079(6-8) 07/25/21 (6-8) ft bgs	SJSB079 11215702-072521-DUP-7 07/25/21 (8-10) ft bgs Duplicate	SJSB079 11215702-072521-SS-SJSB079(8-10) 07/25/21 (8-10) ft bgs	SJSB079 11215702-072521-SS-SJSB079(10-12) 07/25/21 (10-12) ft bgs	SJSB079 11215702-072521-SS-SJSB079(12-14) 07/25/21 (12-14) ft bgs	SJSB079 11215702-072521-SS-SJSB079(14-16) 07/25/21 (14-16) ft bgs	SJSB079 11215702-072521-SS-SJSB079(16-18) 07/25/21 (16-18) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	950	1200	1700	1200	4.5 J	0.10 U	0.88 J	0.15 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	5600	6500	11000	9000	100	100	460	240
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1900	2000	2800	2100	6.9	0.24 J	0.68 J	0.068 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	340	470	850	570	5.2 J	4.1 J	21	14
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	620	650	1300	640	2.3 J	0.11 J	0.35 J	0.060 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6500	6500	20000	7000	23	1.4 J	2.0 J	0.049 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.2 U	7.0 J	3.8 J	4.9 J	0.070 U	0.11 U	0.19 U	0.18 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1700	1700	4400	1900	6.8	0.36 J	0.65 J	0.045 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	15 J	31 J	39 J	32 J	0.075 U	0.12 U	0.23 U	0.21 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	87 J	100	300	97 J	0.61 U	0.038 U	0.11 U	0.042 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.1 U	9.0 J	12 J	9.9 J	0.067 U	0.11 U	1.4 J	0.18 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	4100	4200	26000 J	4500 J	14	1.8 J	1.7 J	0.16 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	200	330	320 J	290	1.4 J	0.11 U	0.16 U	0.37 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	210	190	780 J	230 J	0.58 J	0.042 U	0.10 U	0.044 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1800	2400	11000 J	2400 J	8.1	0.70 J	1.1 J	0.16 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	70000 J	130000 J	120000 J	120000 J	380	6.4	30	1.1 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	19000 J	35000 J	31000 J	31000 J	140	1.9	12	0.14 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	3000 J	3300 J	5300 J	3400 J	12 J	0.35 J	1.0 J	0.27 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	720 J	1000 J	1800 J	1200 J	13 J	19 J	80 J	54 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	9400 J	9700 J	30000 J	10000 J	35 J	1.7 J	2.6 J	0.19 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	80 J	140 J	170 J	140 J	3.6 J	12 J	27 J	15 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	9200 J	10000 J	60000 J	11000 J	33 J	3.8 J	2.8 J	0.56 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	200 J	330 J	320 J	290 J	1.8 J	0.11 U	3.5 U	2.4 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	140000 J	240000 J	240000 J	210000 J	730 J	9.7 J	53 J	1.1 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	21000 J	38000 J	34000 J	33000 J	150 J	4.5 J	12 J	1.0 U
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	28000	50000	50000	45000	190	3.1	16	0.32
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	28000	50000	50000	45000	190	3.1	16	0.64
General Chemistry									
Percent solids	%	45.6	46.8	42.3	43.7	83.9	81.9	71.1	77.0
Percent solids, vol.	%	--	--	--	--	--	--	--	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB080 11215702-072221-SS-SJSB080(0-2) 07/22/21 (0-2) ft bgs	SJSB080 11215702-072221-SS-SJSB080(2-4) 07/22/21 (2-4) ft bgs	SJSB080 11215702-072221-SS-SJSB080(4-6) 07/22/21 (4-6) ft bgs	SJSB080 11215702-072221-SS-SJSB080(6-8) 07/22/21 (6-8) ft bgs	SJSB080 11215702-072221-SS-SJSB080(8-10) 07/22/21 (8-10) ft bgs	SJSB080 11215702-072221-SS-SJSB080(10-12) 07/22/21 (10-12) ft bgs	SJSB080 11215702-072221-SS-SJSB080(12-14) 07/22/21 (12-14) ft bgs	SJSB080 11215702-072221-SS-SJSB080(14-16) 07/22/21 (14-16) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	370	370	220	68	25	0.37 U	0.32 U	0.32 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	7000 J	3900	3100	1500	750	57	58	120
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	990	710	660	150	57	0.58 U	0.16 U	0.13 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	530	280	210	120	57	1.9 J	2.9 J	6.4
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	300	210	170	50	16	0.13 U	0.061 U	0.055 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3100	2100	1700	610	160	1.5 J	0.23 U	0.096 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.0 J	2.0 J	1.3 J	0.79 J	0.49 U	0.20 U	0.17 U	0.12 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	840	590	460	150	44	0.42 J	0.092 U	0.035 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	14	8.0 J	5.7 J	3.3 J	1.4 J	0.070 U	0.073 U	0.12 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	45	32	21	10	2.4 J	0.11 U	0.028 U	0.11 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	6.3 J	4.3 J	3.3 J	0.24 U	0.81 J	0.062 U	0.22 U	0.46 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1900	1300	810	360	110	0.98 J	0.13 J	0.038 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	140	94	58	23	9.0	0.055 U	0.055 U	0.073 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	92	66	38	19	4.7 J	0.038 U	0.027 U	0.028 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1000	690	420	180	59	0.46 J	0.042 U	0.038 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	47000 J	28000 J	19000 J	7500 J	3300 J	26	2.7	1.1 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	17000 J	11000 J	6900 J	2300 J	1100 J	9.0	1.1 J	0.34 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	1500 J	1100 J	930 J	240 J	90 J	0.89 J	0.16 J	0.095 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1000 J	540 J	420 J	230 J	140 J	8.9 J	11 J	24 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	4600 J	3200 J	2500 J	900 J	240 J	2.2 J	0.32 J	0.17 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	99 J	58 J	44 J	25 J	19 J	6.0 J	5.8 J	8.7 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	4500 J	3000 J	1900 J	830 J	260 J	2.2 J	0.13 J	0.038 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	170 J	110 J	67 J	27 J	12 J	1.6 J	1.3 J	2.1 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	71000 J	51000 J	33000 J	13000 J	6200 J	48 J	4.5 J	1.9 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	19000 J	12000 J	7600 J	2500 J	1300 J	14 J	2.2 J	2.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	23000	14000	9200	3200	1500	12	1.4	0.15
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	23000	14000	9200	3200	1500	12	1.5	0.44
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	61.5	62.1	66.9	69.3	78.5	82.1	81.5	81.6

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB080	SJSB080	SJSB081	SJSB081	SJSB081	SJSB081	SJSB081	SJSB081	SJSB081
Sample Identification:		11215702-072221-DUP-4	11215702-072221-SS-SJSB080(16-18)	11215702-080521-BN-SJSB081(0-2)	11215702-080521-BN-SJSB081(2-4)	11215702-080521-BN-SJSB081(4-6)	11215702-080521-BN-DUP-13	11215702-080521-BN-SJSB081(6-8)	11215702-080521-BN-SJSB081(8-10)	11215702-080521-BN-SJSB081(10-12)
Sample Date:	Units	07/22/21	07/22/21	08/05/21	08/05/21	08/05/21	08/05/21	08/05/21	08/05/21	08/05/21
Sample Depth:		(16-18) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Sample Type:		Duplicate					Duplicate			
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.32 U	0.89 U	110 J	730 J+	460	0.72 U	0.85 U	510	3.4 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	72	72	2700	2500	2600	320	340	2400	240
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 U	0.55 U	66 J	1600	830	0.30 U	0.35 J	1000	7.4
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3.5 J	3.5 J	110	230	180	14	15	130	12
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.051 U	0.22 J	19 J	530 J+	310	0.063 U	0.10 U	400	2.8 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.35 J	1.3 J	220	4700	3100 J	0.29 J	0.60 J	3500	41
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.22 U	0.28 U	0.99 U	4.9 J	1.8 U	0.33 U	0.38 J	1.2 U	0.27 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 U	0.42 J	67 J	1500	850	0.086 J	0.20 J	920	10
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.077 U	0.18 J	1.1 U	14 J	13 J	0.41 U	0.46 J	1.3 U	0.54 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.023 U	0.31 U	1.4 U	84 J	42	0.11 U	0.16 J	56 J	0.87 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.27 U	0.27 U	0.97 U	7.1 J	9.3 J	0.80 U	0.86 J	4.5 J	1.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.27 J	1.1 J	180	4200	2200	0.27 J	0.52 J	2300	38
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.055 U	0.20 J	14 J	290	260	0.085 U	0.12 U	110	1.5 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.022 U	0.059 J	8.1 J	180 J	94	0.040 U	0.089 J	96 J	1.2 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.10 J	0.66 J	110	2200	1400	0.056 U	0.28 J	1000	14
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	6.3 J	27 J	5600	93000 J	92000 J	3.2	8.0	45000 J	530 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.1 J	9.1 J	1700	36000 J	37000 J	1.4	3.8	13000 J	210
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.29 J	1.0 J	110 J	2500 J	1300 J	0.73 J	0.35 J	1700 J	12 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	13 J	12 J	360 J	470 J	380 J	58 J	52 J	310 J	48 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.45 J	2.3 J	350 J	7400 J	4700 J	0.45 J	1.1 J	5200 J	61 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.5 J	3.6 J	59 J	99 J	79 J	16 J	14 J	57 J	16 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.49 J	2.4 J	430 J	10000 J	5700 J	0.33 J	0.88 J	5100 J	72 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.93 J	0.81 J	14 J	290 J	260 J	2.7 J	0.68 J	110 J	1.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	11 J	50 J	12000 J	170000 J	150000 J	5.4 J	13 J	70000 J	1100 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.6 J	10 J	1900 J	40000 J	41000 J	3.5 J	3.8 J	14000 J	230 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.9	13	2300	47000	47000	2.0	5.2	19000	280
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.0	13	2300	47000	47000	2.1	5.3	19000	280
General Chemistry										
Percent solids	%	--	--	--	--	--	--	--	--	--
Percent solids, vol.	%	80.9	75.3	63.3	51.0	62.0	80.2	78.8	55.2	80.0

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB081 11215702-080521-BN-SJSB081(12-14) 08/05/21 (12-14) ft bgs	SJSB081 11215702-080521-BN-SJSB081(14-16) 08/05/21 (14-16) ft bgs	SJSB081 11215702-080521-BN-SJSB081(16-18) 08/05/21 (16-18) ft bgs	SJSB082 11215702-080921-BN-SJSB082(0-2) 08/09/21 (0-2) ft bgs	SJSB082 11215702-080921-BN-SJSB082(2-4) 08/09/21 (2-4) ft bgs	SJSB082 11215702-080921-BN-SJSB082(4-6) 08/09/21 (4-6) ft bgs	SJSB082 11215702-080921-BN-SJSB082(6-8) 08/09/21 (6-8) ft bgs	SJSB082 11215702-080921-DUP-16 08/09/21 (6-8) ft bgs Duplicate
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.45 U	0.52 U	0.45 U	220 J	8.3 J	17	0.30 U	0.29 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	620	690	210	3100	230	350	300	210
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.20 U	0.30 U	0.18 U	300	19	43	0.33 U	0.28 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	31	35	11	160	7.0	15	16	8.6
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.062 U	0.068 U	0.071 U	84 J	7.9	16	0.15 U	0.15 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.25 J	0.16 J	0.12 J	960	69 J	170	0.70 J	0.58 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.64 U	0.61 U	0.29 U	3.0 U	0.33 U	0.44 U	0.40 U	0.33 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.17 J	0.10 J	0.052 U	260	17	43	0.24 J	0.20 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.82 J	0.71 J	0.26 U	7.1 J	0.40 J	0.74 J	0.43 J	0.27 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	0.18 U	0.11 U	15 J	1.4 J	3.0 J	0.15 U	0.083 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	3.1 J	1.1 J	5.0 U	0.50 U	0.60 U	0.87 J	0.50 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.22 J	0.068 U	0.17 J	1100	47	130	0.53 J	0.39 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.31 J	0.15 U	0.096 U	93 J	3.1 J	9.3	0.22 J	0.15 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.052 U	0.040 U	0.036 U	34 J	2.0 J	4.8 J	0.096 J	0.077 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.068 U	0.069 U	0.052 U	1200	22	71	0.31 J	0.24 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	4.3	0.85 J	0.87 J	44000 J	1300 J	3900 J	14	9.7
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.1 J	0.47 J	0.39 J	10000	520 J	1500 J	5.5	3.9
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.20 J	0.30 J	0.14 J	450 J	31 J	70 J	0.54 J	0.49 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	140 J	150 J	56 J	390 J	35 J	51 J	49 J	33 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.61 J	0.44 J	0.20 J	1500 J	100 J	250 J	1.2 J	0.94 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	40 J	48 J	20 J	70 J	14 J	16 J	12 J	8.9 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.22 J	0.069 U	0.17 J	3500 J	110 J	320 J	1.2 J	0.63 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.4 J	8.7 J	3.7 J	110 J	6.0 J	14 J	2.0 J	1.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	4.6 J	1.8 J	1.6 J	90000 J	2600 J	8200 J	26 J	18 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	7.1 J	8.2 J	3.1 J	11000 J	570 J	1700 J	7.3 J	5.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.7	1.5	0.78	15000	670	2000	7.7	5.4
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.8	1.7	0.87	15000	670	2000	7.7	5.4
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	71.1	72.4	82.8	63.1	79.0	72.0	77.1	81.2

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB082	SJSB082	SJSB082	SJSB082	SJSB082	SJSB083	SJSB083	SJSB083
Sample Identification:	Units	11215702-080921-BN-SJSB082(8-10)	11215702-080921-BN-SJSB082(10-12)	11215702-080921-BN-SJSB082(12-14)	11215702-080921-BN-SJSB082(14-16)	11215702-080921-BN-SJSB082(16-18)	11215702-072221-BN-SJSB083(0-2)	11215702-072221-BN-SJSB083(2-4)	11215702-072221-BN-SJSB083(4-6)
Sample Date:		08/09/21	08/09/21	08/09/21	08/09/21	08/09/21	07/22/21	07/22/21	07/22/21
Sample Depth:		(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.8 J	0.26 U	0.55 U	0.32 U	0.28 J	510	35	3.3 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	940	980	600	1000	190	2400	1700	1700
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2.8 J	0.22 U	0.43 U	0.28 U	0.27 J	750	69	0.44 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	30	36	23	42	6.8	160	71	77
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.86 U	0.033 U	0.058 U	0.15 U	0.16 J	250	23	0.051 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	8.5	0.30 J	0.24 U	0.29 U	0.40 J	2800	280	1.0 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.48 U	0.53 U	0.49 U	0.69 U	0.29 J	3.2 J	0.31 U	0.93 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	0.13 J	0.047 U	0.12 J	0.13 J	760	75	0.36 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.76 J	0.74 J	0.57 J	0.87 J	0.20 J	11 J	0.39 U	1.9 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.25 U	0.086 U	0.092 U	0.12 U	0.073 J	49 J	5.0 J	0.024 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.7 J	2.0 J	1.7 J	2.2 J	0.67 J	5.5 J	3.2 J	4.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.9	0.23 J	0.051 U	0.20 J	0.12 J	2100	200	0.62 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.95 J	0.25 J	0.21 J	0.30 J	0.054 U	210	12	0.15 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.31 J	0.033 J	0.032 U	0.061 J	0.018 U	87 J	9.0	0.024 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	4.6 J	0.15 J	0.053 U	0.16 J	0.034 U	1300	98	0.34 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	320	6.0	0.50 U	5.4	1.5	220000	4400	16
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	84	2.2	0.26 U	1.7 J	0.50 J	23000	1700	5.9
Total heptachlorodibenzofuran (HpCDF)	pg/g	4.7 J	0.18 J	0.43 J	0.50 J	0.49 J	1200 J	110 J	0.44 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	100 J	130 J	91 J	180 J	31 J	380 J	190 J	220 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	13 J	0.55 J	0.33 J	0.65 J	0.60 J	4200 J	420 J	1.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	23 J	28 J	24 J	50 J	12 J	72 J	28 J	67 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	19 J	0.55 J	0.054 U	0.51 J	0.12 J	5200 J	460 J	0.96 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.4 J	5.4 J	4.2 J	8.7 J	2.7 J	210 J	14 J	11 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	610 J	12 J	0.87 J	10 J	2.7 J	160000 J	8200 J	29 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	94 J	6.1 J	2.8 J	7.4 J	2.5 J	25000 J	1800 J	7.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	120	4.1	0.85	3.6	0.96	46000	2200	9.8
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	120	4.1	1.1	3.7	0.99	46000	2200	9.8
General Chemistry									
Percent solids	%	--	--	--	--	--	50.8	69.5	64.4
Percent solids, vol.	%	79.0	73.3	72.8	62.7	82.6	--	--	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB083	SJSB083	SJSB083	SJSB083	SJSB083	SJSB083	SJSB083	SJSB083-Waste
Sample Identification:	Units	11215702-072221-BN-SJSB083(6-8)	11215702-072221-BN-SJSB083(8-10)	11215702-072221-BN-SJSB083(10-12)	11215702-072221-BN-SJSB083(12-14)	11215702-072221-BN-SJSB083(14-16)	11215702-072221-BN-SJSB083(16-18)	11215702-072221-BN-SJSB083(18-20)	11215702-072221-BN-SJSB083(8-10)-WC
Sample Date:		07/22/21	07/22/21	07/22/21	07/22/21	07/22/21	07/22/21	07/22/21	07/22/21
Sample Depth:		(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(18-20) ft bgs	(8-10) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.078 U	530	6.5 J	2.3 J	0.080 U	7.3 J	0.34 U	370
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1000	3800	1600	1300	980	360	19 J	4100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.23 J	450	12	1.6 J	0.40 J	0.30 J	0.29 U	140
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	51	160	62	51	40	19	1.1 U	180
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.059 U	160	5.2 J	0.32 J	0.049 U	0.036 U	0.11 U	46
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.64 J	1700	44	3.1 J	0.88 J	0.029 U	0.75 J	500
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.78 J	0.70 U	0.89 J	0.54 J	0.42 J	0.35 J	0.073 U	2.1 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.041 U	410	12	0.76 J	0.27 J	0.029 U	0.23 U	140
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	8.0 J	1.1 J	1.1 J	0.93 J	0.099 U	0.12 U	7.2 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.038 U	28 J	0.29 U	0.053 U	0.034 U	0.028 U	0.16 U	9.8 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.2 J	5.7 J	3.2 J	2.7 J	2.4 J	1.3 J	0.13 U	8.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.74 J	980	16	1.9 J	0.53 J	0.039 U	0.49 J	330
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.15 U	91	1.2 J	0.14 U	0.16 U	0.11 U	0.14 U	31
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.042 U	44	0.30 U	0.053 U	0.034 U	0.028 U	0.082 U	16
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.079 U	560	8.1	0.97 J	0.37 J	0.043 U	0.38 J	190
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	29	38000	430	50	16	1.2 J	12	11000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.7	11000	140	17	6.0	0.11 U	3.3	3100
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.23 J	740 J	20 J	2.3 J	0.40 J	0.82 J	0.51 J	240 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	460 J	180 J	170 J	130 J	54 J	3.3 J	490 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.64 J	2400 J	59 J	3.8 J	1.1 J	0.029 U	1.4 J	740 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	37 J	71 J	42 J	39 J	38 J	12 J	1.5 J	92 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.74 J	2400 J	34 J	2.9 J	0.90 J	0.043 U	1.4 J	770 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.5 J	91 J	7.6 J	6.2 J	7.6 J	1.6 J	0.56 J	37 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	57 J	67000 J	820 J	99 J	31 J	1.3 J	24 J	21000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.7 J	12000 J	160 J	17 J	8.5 J	0.32 U	3.8 J	3400 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	14	15000	200	24	8.9	0.59	4.7	4400
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	14	15000	200	24	9.0	0.72	4.8	4400
General Chemistry									
Percent solids	%	63.5	60.2	76.9	70.0	73.8	77.9	--	48.8
Percent solids, vol.	%	--	--	--	--	--	--	82.4	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB083-Waste 11215702-072221-BN-SJSB083(10-12)-WC 07/22/21 (10-12) ft bgs	SJSB084 11215702-072021-BN-SJSB084(0-2) 07/20/21 (0-2) ft bgs	SJSB084 11215702-072021-BN-SJSB084(2-4) 07/20/21 (2-4) ft bgs	SJSB084 11215702-072021-BN-SJSB084(4-6) 07/20/21 (4-6) ft bgs	SJSB084 11215702-072021-BN-SJSB084(6-8) 07/20/21 (6-8) ft bgs	SJSB084 11215702-072021-BN-SJSB084(8-10) 07/20/21 (8-10) ft bgs	SJSB084 11215702-072021-BN-SJSB084(10-12) 07/20/21 (10-12) ft bgs	SJSB084 11215702-072021-BN-SJSB084(12-14) 07/20/21 (12-14) ft bgs
Dioxins/Furans			Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.14 U	570	100	6.7 U	1.0 U	6.9 U	1.4 U	0.84 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1100	7000	2500	2300	1600	1900	1400	1700
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.6 J	320	65	1.2 J	0.45 J	0.27 J	0.23 J	0.11 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	39	270	77	84	63	71	52	62
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.68 J	110	19	0.46 J	0.076 U	0.080 U	0.062 U	0.12 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.5 J	1100	200	2.8 J	1.4 J	0.25 J	0.24 J	0.40 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.26 U	4.3 J	1.2 J	0.85 J	0.92 J	0.78 J	0.88 J	0.98 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.3 J	300	52	0.85 J	0.57 J	0.15 J	0.055 U	0.21 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.30 U	11	2.4 J	2.0 J	1.6 J	1.7 J	1.1 J	1.5 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.29 J	20	4.6 U	1.2 U	1.1 U	1.0 U	1.1 U	1.4 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.2 J	8.6 J	2.9 J	4.2 J	3.1 J	3.6 J	2.8 J	3.5 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3.4 J	860	220	2.4 J	1.6 J	0.63 J	0.64 J	0.73 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.58 J	82	21	0.52 J	0.14 U	0.34 J	0.40 J	0.54 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.079 U	35 J	6.7 J	0.092 J	0.098 J	0.049 U	0.042 U	0.078 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.0 J	530	200	1.6 J	0.89 J	0.21 J	0.21 J	0.23 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	95	18000	8100	120	52	8.4	18	8.1
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	34	9600	2300	29	15	2.8	4.0	2.8
Total heptachlorodibenzofuran (HpCDF)	pg/g	2.3 J	530 J	110 J	2.5 J	0.67 J	1.0 J	0.44 J	0.12 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	770 J	270 J	240 J	200 J	210 J	190 J	220 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	7.1 J	1600 J	300 J	5.8 J	3.4 J	1.4 J	1.4 J	2.0 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	30 J	130 J	48 J	63 J	47 J	53 J	50 J	58 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	6.6 J	2200 J	630 J	6.2 J	3.1 J	1.1 J	1.1 J	1.2 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.0 J	100 J	29 J	11 J	8.4 J	11 J	8.9 J	10 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	180 J	62000 J	22000 J	230 J	100 J	17 J	33 J	16 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	38 J	11000 J	2600 J	38 J	22 J	9.0 J	10 J	12 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	47	12000	3200	45	22	6.0	7.7	6.0
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	47	12000	3200	45	23	6.1	7.8	6.1
General Chemistry									
Percent solids	%	67.4	--	--	--	--	--	--	--
Percent solids, vol.	%	--	44.2	69.4	60.9	61.9	65.2	64.8	60.7

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB084	SJSB084	SJSB085	SJSB085	SJSB085	SJSB085	SJSB085	SJSB085
Sample Identification:		11215702-072021-BN-SJSB084(14-16)	11215702-072021-BN-SJSB084(16-18)	11215702-072321-BN-SJSB085(0-2)	11215702-072321-BN-SJSB085(2-4)	11215702-072321-BN-SJSB085(4-6)	11215702-072321-BN-SJSB085(6-8)	11215702-072321-BN-SJSB085(8-10)	11215702-072321-BN-SJSB085(10-12)
Sample Date:	Units	07/20/21	07/20/21	07/23/21	07/23/21	07/23/21	07/23/21	07/23/21	07/23/21
Sample Depth:		(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.7 U	2.8 U	770	13 J	0.88 U	2.5 J	1.1 U	0.66 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1300	1800	5300	1600	1000	2500	750	2100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.24 J	0.72 J	1200	16	0.64 U	1.3 J	1.0 J	0.24 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	56	72	300	59	34	72	24	82
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.087 U	0.10 U	380	5.4 J	0.20 U	0.40 U	0.26 U	0.048 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.19 J	0.44 J	3600	54	2.0 J	3.5 J	2.5 J	0.28 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.0 J	0.66 J	4.5 J	0.82 U	0.44 U	0.68 U	0.42 U	1.1 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 J	0.25 J	960	14	0.59 J	1.0 J	0.77 J	0.11 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.2 J	1.4 J	16	1.7 J	0.68 J	1.5 J	0.53 J	1.7 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.2 U	1.2 U	49	1.1 J	0.12 U	0.044 U	0.12 U	0.20 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.4 J	3.9 J	9.4 J	2.8 J	1.5 J	3.1 J	0.98 J	3.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.55 J	0.62 J	2400	45	1.5 J	2.5 J	1.7 J	0.17 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	0.14 U	240	4.4 J	0.21 J	0.49 J	0.27 J	0.35 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.052 U	0.050 U	100	1.8 J	0.092 J	0.12 J	0.090 J	0.033 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.11 J	0.15 J	1600	26	0.97 J	1.6 J	0.95 J	0.083 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	4.7	3.9	98000 J	1700 J	65	97	55	3.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.5 J	1.4 J	31000 J	530	19	31	18	1.5 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.52 J	1.1 J	1900 J	27 J	1.0 J	2.2 J	1.5 J	0.24 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	200 J	230 J	710 J	150 J	110 J	200 J	79 J	240 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.7 J	1.9 J	5300 J	82 J	3.1 J	5.2 J	3.9 J	0.59 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	58 J	60 J	130 J	27 J	28 J	45 J	19 J	57 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.79 J	1.1 J	6200 J	110 J	3.7 J	6.4 J	4.1 J	0.35 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	11 J	13 J	260 J	9.1 J	6.0 J	8.7 J	4.1 J	11 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	9.8 J	7.9 J	170000 J	2900 J	120 J	180 J	100 J	5.4 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	12 J	11 J	34000 J	580 J	24 J	38 J	23 J	7.0 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3.6	3.8	42000	720	27	44	25	4.2
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.7	3.9	42000	720	27	44	25	4.3
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	60.6	61.6	40.9	61.3	79.8	70.1	75.7	58.4

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB085	SJSB085	SJSB085	SJSB086	SJSB086	SJSB086	SJSB086	SJSB086
Sample Identification:	Units	11215702-072321-BN-SJSB085(12-14)	11215702-072321-BN-SJSB085(14-16)	11215702-072321-BN-SJSB085(16-18)	11215702-080421-BN-SJSB086(0-2)	11215702-080421-BN-SJSB086(2-4)	11215702-080421-BN-SJSB086(4-6)	11215702-080421-BN-DUP-12	11215702-080421-BN-SJSB086(6-8)
Sample Date:		07/23/21	07/23/21	07/23/21	08/04/21	08/04/21	08/04/21	08/04/21	08/04/21
Sample Depth:		(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs
Sample Type:								Duplicate	
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.64 U	1.8 U	0.52 U	0.45 U	1.9 U	0.48 U	0.45 U	0.45 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1700	1600	1300	580	1300	700	490	880
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.20 U	0.85 U	0.28 U	0.31 U	1.0 U	0.18 U	0.27 U	0.18 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	73	66	51	25	69	38	17	30
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.10 U	0.20 U	0.071 U	0.075 U	0.43 J	0.058 U	0.053 U	0.069 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.37 J	0.86 J	0.67 J	0.32 J	0.52 J	0.054 J	0.18 J	0.040 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.87 U	0.73 U	0.82 U	0.60 U	0.61 U	0.55 U	0.37 U	0.45 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.26 U	0.27 J	0.17 J	0.38 J	0.084 J	0.084 J	0.040 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.9 J	1.6 J	1.2 J	0.94 J	1.4 J	0.97 J	0.48 U	0.67 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.16 U	0.13 U	0.20 U	0.25 U	0.13 U	0.12 U	0.13 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.6 J	3.6 J	2.8 J	1.9 J	2.9 J	2.0 J	0.89 J	1.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.30 J	0.70 J	0.58 J	0.47 J	0.51 J	0.042 U	0.36 J	0.069 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.29 J	0.37 J	0.39 J	0.27 J	0.27 J	0.19 J	0.14 J	0.17 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.026 U	0.10 J	0.048 U	0.089 U	0.10 U	0.069 U	0.069 U	0.069 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.14 J	0.33 J	0.31 J	0.21 J	0.18 J	0.042 U	0.11 J	0.051 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	12	21	16	11	0.89 J	0.35 U	1.0 J	0.40 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.6	6.3	5.2	2.7	0.24 J	0.13 J	0.29 J	0.21 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.27 J	1.1 J	0.28 J	0.31 J	2.0 J	0.17 J	0.27 J	0.14 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	200 J	190 J	170 J	64 J	140 J	83 J	61 J	89 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.62 J	1.4 J	1.1 J	0.78 J	1.5 J	0.32 J	0.45 J	0.19 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	47 J	46 J	43 J	17 J	24 J	17 J	14 J	18 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.69 J	1.5 J	1.4 J	1.1 J	1.5 J	0.14 J	0.46 J	0.069 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.7 J	9.3 J	10 J	2.8 J	2.8 J	2.2 J	1.8 J	2.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	21 J	38 J	29 J	19 J	3.1 J	1.0 J	1.6 J	0.88 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.8 J	13 J	12 J	6.1 J	3.5 J	2.4 J	2.3 J	2.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	7.0	11	8.7	4.9	2.3	1.2	1.0	1.1
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	7.0	11	7.8	5.0	2.3	1.3	1.1	1.2
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	64.8	60.8	61.2	67.3	63.6	77.0	78.8	74.9

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB086	SJSB086	SJSB086	SJSB086	SJSB086	SJSB087	SJSB087	SJSB087
Sample Identification:	Units	11215702-080421-BN-SJSB086(8-10)	11215702-080421-BN-SJSB086(10-12)	11215702-080421-BN-SJSB086(12-14)	11215702-080421-BN-SJSB086(14-16)	11215702-080421-BN-SJSB086(16-18)	11215702-081021-BN-SJSB087(0-2)	11215702-081021-BN-SJSB087(2-4)	11215702-081021-BN-SJSB087(4-6)
Sample Date:		08/04/21	08/04/21	08/04/21	08/04/21	08/04/21	08/10/21	08/10/21	08/10/21
Sample Depth:		(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.45 U	0.45 U	0.45 U	0.45 U	0.58 U	90	330	48
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1700	1400	760	1800	1100	2000	4300	2600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 U	0.25 U	0.27 U	0.18 U	0.18 U	150	810	89
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	70	66	35	72	45	89	220	82
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.063 U	0.062 U	0.057 U	0.045 U	0.042 U	54	270 J+	30
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 U	0.065 U	0.43 J	0.23 J	0.064 J	1100	2800	370
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.92 U	1.0 U	0.42 U	0.99 U	0.83 U	1.2 U	2.3 U	1.0 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.080 J	0.067 U	0.21 J	0.11 J	0.034 U	260	710	95
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	1.8 J	0.78 J	1.7 J	0.97 J	3.0 J	11 J	2.3 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 U	0.16 U	0.11 U	0.13 U	0.11 U	19	46 J	6.2 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.9 J	4.2 J	1.7 J	3.6 J	2.4 J	2.9 J	6.5 J	3.2 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.052 U	0.070 U	0.30 J	0.14 J	0.065 J	1200	1800	250
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.14 U	0.32 J	0.21 J	0.32 J	0.23 J	23	130	11
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.035 U	0.076 U	0.045 U	0.031 U	0.025 U	37	71 J	12
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.050 U	0.072 U	0.18 J	0.053 U	0.045 U	440	930	100
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.30 U	0.23 U	6.5	1.7	0.17 U	12000 J	48000 J	4200 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.24 J	0.25 J	1.4 J	0.54 J	0.17 J	3100 J	19000 J	1800 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.15 J	0.25 J	0.27 J	0.11 J	0.28 J	250 J	1300 J	140 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	230 J	210 J	83 J	200 J	160 J	250 J	490 J	210 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.26 J	0.23 J	0.72 J	0.48 J	0.15 J	1600 J	4000 J	550 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	54 J	58 J	17 J	48 J	46 J	44 J	83 J	39 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.052 U	0.073 U	0.48 J	0.14 J	0.065 J	2600 J	4100 J	530 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.3 J	9.6 J	2.6 J	7.5 J	8.1 J	31 J	140 J	18 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.0 J	0.73 J	13 J	3.8 J	0.51 J	21000 J	91000 J	7900 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.7 J	7.9 J	3.5 J	7.4 J	6.9 J	3400 J	21000 J	1900 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.0	2.3	3.2	2.9	1.5	4600	25000	2300
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.2	2.3	3.2	2.9	1.6	4600	25000	2300
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	58.4	62.8	73.3	67.7	67.8	70.2	56.7	60.6

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB087	SJSB087	SJSB087	SJSB087	SJSB087	SJSB087	SJSB087	SJSB088
Sample Identification:		11215702-081021-BN-DUP-17	11215702-081021-BN-SJSB087(6-8)	11215702-081021-BN-SJSB087(8-10)	11215702-081021-BN-SJSB087(10-12)	11215702-081021-BN-SJSB087(12-14)	11215702-081021-BN-SJSB087(14-16)	11215702-081021-BN-SJSB087(16-18)	11215702-080621-BN-SJSB088(0-2)
Sample Date:	Units	08/10/21	08/10/21	08/10/21	08/10/21	08/10/21	08/10/21	08/10/21	08/06/21
Sample Depth:		(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs
Sample Type:		Duplicate							
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.88 U	3.3 U	14	0.88 U	1.9 U	9.9 U	2.6 U	400
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	520	830	990	1100	300	930	210	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.35 U	0.92 U	24	0.35 U	3.0 J	20	0.68 U	890
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	21	29	45	40	11	36	10	120 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.036 U	0.30 U	8.2	0.061 U	0.98 U	9.2	0.26 U	310
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.17 J	0.98 J	66	0.30 J	9.5	74	0.50 J	2900
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.42 U	0.49 U	0.63 U	0.60 U	0.31 U	0.59 U	0.35 U	5.5 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.068 J	0.33 J	17	0.11 J	2.8 J	18	0.24 U	770
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.56 J	0.76 J	1.2 J	1.1 J	0.29 J	0.95 J	0.38 U	12 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.065 J	0.081 J	1.1 J	0.16 J	0.20 J	1.3 J	0.17 U	38 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	1.5 J	2.3 J	2.8 J	0.57 J	2.6 J	0.90 J	2.0 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.13 J	0.58 J	40	0.18 J	7.4	42	0.31 U	2100
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 J	0.086 U	3.1 J	0.15 U	0.64 J	3.1 J	0.43 U	300
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.024 U	0.046 U	1.8 J	0.045 U	0.39 U	1.9 J	0.17 U	81 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.030 U	0.35 J	20	0.084 U	4.3 J	21	0.32 U	1700
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3.3 J	22 J	1200 J	5.0	280	1100 J	5.8	130000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.3 J	6.8 J	430	1.7 J	80	440	1.8 J	25000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.12 J	1.5 J	37 J	0.14 J	4.7 J	35 J	0.56 J	1400 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	74 J	88 J	130 J	150 J	33 J	150 J	44 J	250 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.30 J	1.4 J	96 J	0.57 J	15 J	110 J	0.50 J	4300 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	18 J	21 J	27 J	40 J	8.1 J	39 J	15 J	59 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.22 J	1.7 J	90 J	0.18 J	17 J	96 J	0.35 U	6000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.7 J	3.8 J	7.7 J	4.3 J	1.7 J	9.2 J	2.1 J	300 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	6.5 J	35 J	2300 J	8.6 J	540 J	2100 J	7.8 J	160000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.6 J	9.7 J	470 J	4.8 J	88 J	480 J	3.1 J	28000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.4	10	570	3.4	110	570	2.7	39000
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.4	10	570	3.5	110	570	3.0	39000
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	74.3	71.3	75.8	67.9	77.7	62.2	84.4	57.0

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB088 11215702-080621-BN-SJSB088(2-4) 08/06/21 (2-4) ft bgs	SJSB088 11215702-080621-BN-SJSB088(4-6) 08/06/21 (4-6) ft bgs	SJSB088 11215702-080621-BN-DUP-14 08/06/21 (6-8) ft bgs Duplicate	SJSB088 11215702-080621-BN-SJSB088(6-8) 08/06/21 (6-8) ft bgs	SJSB088 11215702-080621-BN-SJSB088(8-10) 08/06/21 (8-10) ft bgs	SJSB088 11215702-080621-BN-SJSB088(10-12) 08/06/21 (10-12) ft bgs	SJSB088 11215702-080621-BN-SJSB088(12-14) 08/06/21 (12-14) ft bgs	SJSB088 11215702-080621-BN-SJSB088(14-16) 08/06/21 (14-16) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	420	970	1200	960	1200	0.54 U	0.071 U	0.39 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1400 J-	3900	6000	4600	6300	170	150	390
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	940	2100	2700	2200	2400	0.33 J	0.051 U	0.13 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	300	420	340	420	9.5	7.0	20
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	300 J+	820	970	700	770	0.060 U	0.062 U	0.061 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2900	7700	9800	7300	7700	0.75 J	0.047 U	0.14 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.6 U	7.0 J	5.5 J	2.9 U	5.4 J	0.11 U	0.34 J	0.36 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	800	2100	2500	1900	2000	0.18 J	0.048 U	0.049 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.7 J	20 J	28 J	30 J	29 J	0.12 U	0.28 J	0.44 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	32 J	110 J	150 J	98 J	91 J	0.022 U	0.10 U	0.094 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 U	8.2 J	12 U	2.6 U	12 J	0.10 U	0.57 U	2.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2300	4900	7000	4500	5200	0.45 J	0.071 U	0.054 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	300 J+	330	290	320	300	0.13 U	0.093 U	0.098 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	95 J	210 J	290	210 J	200 J	0.023 U	0.034 U	0.035 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1800	2400	2900	2300	2400	0.18 J	0.075 U	0.056 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	170000 J	130000 J	110000 J	120000 J	130000 J	10	0.79 J	1.2 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	25000 J	35000 J	49000 J	40000 J	36000 J	3.9	0.32 J	0.51 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1400 J	3400 J	4400 J	3400 J	3700 J	0.49 J	0.062 U	0.11 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	250 J	640 J	910 J	700 J	850 J	35 J	33 J	96 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	4300 J	11000 J	14000 J	10000 J	11000 J	0.93 J	0.10 J	0.24 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	31 J	110 J	150 J	140 J	140 J	11 J	11 J	35 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	6400 J	92000 J	15000 J	11000 J	12000 J	0.78 J	0.075 U	0.060 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	300 J	330 J	320 J	320 J	300 J	0.13 U	2.3 J	6.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	200000 J	190000 J	200000 J	180000 J	190000 J	17 J	1.2 J	2.1 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	27000 J	39000 J	53000 J	45000 J	39000 J	3.9 J	2.0 J	4.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	43000	50000	63000	54000	51000	5.2	0.58	1.2
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	43000	50000	63000	54000	51000	5.3	0.68	1.3
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	55.7	46.9	43.3	42.5	45.9	82.7	82.7	73.8

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB088	SJSB088	SJSB088	SJSB088	SJSB089	SJSB089	SJSB089	SJSB089
Sample Identification:		11215702-080621-BN-SJSB088(16-18)	11215702-080621-BN-SJSB088(18-20)	11215702-080621-BN-SJSB088(20-22)	11215702-080621-BN-SJSB088(22-24)	11215702-080721-BN-SJSB089(0-2)	11215702-080721-BN-SJSB089(2-4)	11215702-080721-BN-SJSB089(4-6)	11215702-080721-BN-DUP-19
Sample Date:	Units	08/06/21	08/06/21	08/06/21	08/06/21	08/07/21	08/07/21	08/07/21	08/07/21
Sample Depth:		(16-18) ft bgs	(18-20) ft bgs	(20-22) ft bgs	(22-24) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs
Sample Type:									Duplicate
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	9.2 U	0.40 U	0.17 U	0.20 U	28	1.3 U	0.39 U	0.39 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	150	220	290	210	1900	480	910	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	17 J	0.26 U	0.26 U	0.21 U	41	2.1 J	0.35 U	0.14 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	8.4 J	11	16	11	55	17	41	72
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	6.6 J	0.14 U	0.077 U	0.0030 U	13	0.74 J	0.16 J	0.081 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	64	0.64 J	0.28 J	0.23 U	100	7.6	0.99 J	0.18 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.43 U	0.040 U	0.70 J	0.34 J	0.85 J	0.43 J	0.58 J	0.84 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	16 J	0.18 U	0.0075 U	0.21 U	27	2.0 J	0.28 J	0.11 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.44 U	0.38 J	0.66 J	0.035 U	1.5 J	0.52 J	0.85 J	1.8 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 U	0.14 U	0.14 U	0.0030 U	1.8 J	0.17 U	0.11 U	0.11 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.40 U	0.042 U	0.84 J	0.52 J	2.3 J	1.1 J	2.4 J	3.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	40	0.90 J	0.28 U	0.32 U	62	4.3 J	0.96 J	0.072 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.9 J	0.14 J	0.11 J	0.33 J	4.6 J	0.45 J	0.23 J	0.31 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.8 J	0.083 U	0.086 U	0.0025 U	3.0 J	0.22 U	0.064 U	0.042 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	19 J	0.66 J	0.22 U	0.25 U	32	2.0 J	0.64 J	0.075 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	930	2.6	3.5	0.77 J	1600 J	110	37	2.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	410	1.6	1.2 J	0.36 J	630 J	39	13	1.1 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	28 J	0.55 J	0.42 J	0.32 J	63 J	3.4 J	0.66 J	0.14 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	29 J	49 J	81 J	54 J	170 J	68 J	120 J	220 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	90 J	1.2 J	0.65 J	0.60 J	160 J	11 J	1.6 J	0.41 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	9.5 J	20 J	30 J	19 J	37 J	21 J	33 J	47 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	94 J	2.6 J	0.79 J	0.66 J	160 J	9.8 J	2.3 J	0.079 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.8 J	2.8 J	8.7 J	6.3 J	10 J	5.0 J	7.4 J	7.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2000 J	13 J	7.9 J	1.4 J	3600 J	210 J	70 J	4.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	440 J	3.1 J	4.4 J	5.2 J	690 J	45 J	18 J	5.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	520	2.5	2.2	1.0	820	53	18	3.5
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	520	2.5	2.2	1.1	820	53	18	3.5
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	80.3	80.5	77.0	82.8	64.3	70.5	70.7	64.1

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB089	SJSB089	SJSB089	SJSB089	SJSB089	SJSB089	SJSB090	SJSB090
Sample Identification:	Units	11215702-080721-BN-SJSB089(6-8)	11215702-080721-BN-SJSB089(8-10)	11215702-080721-BN-SJSB089(10-12)	11215702-080721-BN-SJSB089(12-14)	11215702-080721-BN-SJSB089(14-16)	11215702-080721-BN-SJSB089(16-18)	11215702-080221-BN-SJSB090(0-2)	11215702-080221-BN-SJSB090(2-4)
Sample Date:		08/07/21	08/07/21	08/07/21	08/07/21	08/07/21	08/07/21	08/02/21	08/02/21
Sample Depth:		(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.39 U	0.92 U	1.2 U	0.067 U	0.11 U	0.39 U	820	170 J-
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1100	770	390	66	940	25	5100	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.16 U	1.6 J	1.9 J	0.13 U	0.069 U	0.041 U	2000	390 J-
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	48	27	14	2.5 J	40	0.94 U	360	83
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.072 U	0.51 J	0.64 J	0.056 U	0.085 U	0.053 U	650	130 J-
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.087 U	5.5 J	5.1 J	0.25 U	0.066 U	0.056 U	6800	1000
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.74 J	0.38 J	0.26 J	0.24 J	0.61 J	0.24 J	4.8 J	0.84 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 J	1.5 J	1.4 J	0.050 J	0.065 U	0.054 U	1800	240 J-
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	0.65 J	0.35 J	0.098 J	1.2 J	0.060 U	25	4.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.18 U	0.17 U	0.14 U	0.032 U	0.13 U	0.039 U	110 J	9.6
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.0 J	1.5 J	0.81 J	0.21 U	4.4 J	0.12 U	9.5 J	2.4 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.063 U	4.9 J	2.6 J	0.15 J	0.076 U	0.055 U	5000	410 J-
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.36 J	0.34 J	0.34 J	0.069 U	0.29 J	0.075 U	320	35
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.037 U	0.22 U	0.14 U	0.033 U	0.048 U	0.040 U	200	18
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.065 U	2.1 J	1.3 J	0.050 U	0.079 U	0.057 U	2600	230 J-
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.0 J	100	70	3.7	1.1 J	0.60 J	110000 J	12000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.71 J	39	25	1.5	0.60 J	0.24 J	49000 J	5100 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.16 J	2.6 J	3.1 J	0.13 J	0.085 U	0.053 U	3100 J	610 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	90 J	49 J	8.9 J	160 J	3.0 J	740 J	190 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.38 J	8.3 J	7.6 J	0.30 J	0.13 J	0.056 U	9800 J	1400 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	39 J	21 J	13 J	3.1 J	47 J	1.5 J	180 J	40 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.066 U	11 J	5.9 J	0.15 J	0.090 U	0.060 U	12000 J	1000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.1 J	4.1 J	1.9 J	0.64 J	9.1 J	0.25 U	330 J	39 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2.2 J	200 J	140 J	7.2 J	2.0 J	0.89 J	220000 J	25000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.0 J	45 J	29 J	2.1 J	7.4 J	0.60 J	56000 J	5800 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.5	52	34	1.0	2.3	0.33	62000	6600
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.5	52	34	2.0	2.3	0.40	62000	6600
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	69.9	74.8	79.5	85.6	59.3	86.4	49.6	76.1

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB090	SJSB090	SJSB090	SJSB090	SJSB090	SJSB090	SJSB090	SJSB090
Sample Identification:		11215702-080221-BN-SJSB090(4-6)	11215702-080221-BN-DUP-11	11215702-080221-BN-SJSB090(6-8)	11215702-080221-BN-SJSB090(8-10)	11215702-080221-BN-SJSB090(10-12)	11215702-080221-BN-SJSB090(12-14)	11215702-080221-BN-SJSB090(14-16)	11215702-080221-BN-SJSB090(16-18)
Sample Date:	Units	08/02/21	08/02/21	08/02/21	08/02/21	08/02/21	08/02/21	08/02/21	08/02/21
Sample Depth:		(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs
Sample Type:			Duplicate						
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	11 J	0.67 U	0.67 U	3.3 U	0.67 U	1.8 U	0.67 U	0.88 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	850	280	250	630	1400	890	780	780
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	20	0.057 U	0.22 U	7.8	0.23 J	1.9 J	0.45 J	0.12 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	54	12	11	28	59	36	31	31
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	7.4	0.062 U	0.25 U	2.8 J	0.049 U	0.83 J	0.050 U	0.14 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	73	0.25 J	0.88 J	31	0.54 J	4.8 J	0.61 J	0.13 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.68 J	0.33 J	0.55 J	0.49 J	0.76 J	0.55 J	0.57 J	0.84 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	18	0.11 J	0.21 U	8.2	0.14 J	1.1 J	0.19 J	0.14 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	0.44 J	0.39 J	0.75 J	1.3 J	0.81 J	0.72 J	0.89 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.4 J	0.11 J	0.14 U	0.66 J	0.14 J	0.17 J	0.10 J	0.10 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6 J	0.75 J	0.27 U	1.5 J	3.2 J	1.8 J	1.8 J	2.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	57	0.19 J	0.71 J	29	0.51 J	0.86 J	0.28 J	0.17 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.3 J	0.089 U	0.38 U	1.7 J	0.31 J	0.22 J	0.075 U	0.23 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.1 J	0.048 U	0.15 U	1.0 J	0.033 U	0.092 J	0.027 U	0.096 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	34	0.16 J	0.27 U	15	0.19 J	0.39 J	0.18 J	0.17 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2000 J	4.9	12	620 J	7.5	16	7.4	2.9
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	700 J	1.9	4.5	190	2.5	5.5	2.3	0.87 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	36 J	0.062 U	0.25 U	13 J	0.23 J	3.3 J	0.45 J	0.14 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	47 J	36 J	73 J	190 J	110 J	120 J	120 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	100 J	0.47 J	0.88 J	45 J	0.83 J	6.5 J	0.90 J	0.11 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	26 J	13 J	7.1 J	16 J	48 J	26 J	28 J	35 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	140 J	0.35 J	0.71 J	70 J	0.92 J	2.0 J	0.79 J	0.19 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.5 J	1.3 J	0.38 U	3.7 J	7.3 J	4.1 J	3.0 J	4.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	3600 J	8.0 J	23 J	1100 J	14 J	29 J	14 J	4.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	780 J	2.8 J	4.5 J	210 J	8.6 J	8.9 J	5.5 J	4.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	930	2.9	6.1	260	5.3	9.1	4.1	2.2
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	930	2.9	6.4	260	5.3	9.1	4.1	2.3
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	70.2	77.2	69.1	77.6	62.9	73.5	68.3	62.5

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB091 11215702-080321-BN-SJSB091(0-2) 08/03/21 (0-2) ft bgs	SJSB091 11215702-080321-BN-SJSB091(2-4) 08/03/21 (2-4) ft bgs	SJSB091 11215702-080321-BN-SJSB091(4-6) 08/03/21 (4-6) ft bgs	SJSB091 11215702-080321-BN-DUP-18 08/03/21 (6-8) ft bgs Duplicate	SJSB091 11215702-080321-BN-SJSB091(6-8) 08/03/21 (6-8) ft bgs	SJSB091 11215702-080321-BN-SJSB091(8-10) 08/03/21 (8-10) ft bgs	SJSB091 11215702-080321-BN-SJSB091(10-12) 08/03/21 (10-12) ft bgs	SJSB091 11215702-080321-BN-SJSB091(12-14) 08/03/21 (12-14) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.3 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	4400	770	340	1700	930	1400	1500	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.50 J	0.21 J	0.21 J	0.12 J	0.057 U	0.038 U	0.20 J	0.049 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130	32	10	63	39	55	62	47
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.14 U	0.045 U	0.044 U	0.062 U	0.065 U	0.043 U	0.068 U	0.055 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.1 J	0.51 J	0.35 J	0.15 J	0.096 J	0.076 J	0.071 U	0.048 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	0.58 J	0.33 J	0.77 J	0.66 J	0.71 J	1.0 J	0.75 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.39 J	0.19 J	0.12 J	0.047 U	0.068 J	0.033 U	0.071 U	0.050 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.0 J	0.91 J	0.28 J	1.4 J	1.1 J	1.3 J	1.7 J	1.3 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.19 J	0.080 J	0.080 J	0.20 J	0.15 J	0.14 J	0.14 J	0.086 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.6 J	2.1 J	0.57 J	3.3 J	2.7 J	3.1 J	2.4 J	2.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.1 J	0.56 J	0.31 J	0.16 J	0.11 J	0.099 J	0.058 U	0.057 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.26 U	0.31 J	0.11 J	0.30 J	0.29 J	0.082 U	0.27 J	0.30 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.076 U	0.040 J	0.065 J	0.035 U	0.043 J	0.023 U	0.054 U	0.036 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.50 J	0.23 J	0.23 J	0.059 U	0.057 U	0.048 J	0.062 U	0.057 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	31	11	14	1.3 U	3.1	1.4 U	0.91 U	1.3 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.6	4.2	3.2	0.56 J	0.72 J	0.50 J	0.51 J	0.74 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.50 J	0.21 J	0.21 J	0.27 J	0.065 U	0.043 U	0.20 J	0.055 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	300 J	83 J	38 J	210 J	130 J	190 J	190 J	130 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.7 J	0.82 J	0.62 J	0.34 J	0.35 J	0.24 J	0.14 J	0.086 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	51 J	21 J	11 J	54 J	40 J	51 J	50 J	36 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.8 J	2.1 J	0.75 J	0.16 J	0.11 J	0.15 J	0.089 J	0.080 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.0 J	4.5 J	1.9 J	10 J	7.3 J	8.5 J	9.5 J	9.2 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	58 J	25 J	32 J	2.5 J	4.3 J	2.6 J	1.6 J	2.9 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	12 J	9.5 J	5.4 J	7.4 J	6.4 J	6.2 J	9.0 J	7.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	16	6.7	5.2	2.6	2.5	2.0	2.4	2.3
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	16	6.7	5.2	2.7	2.5	2.1	2.4	2.4
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	44.4	61.9	78.3	61.2	61.1	61.3	57.8	63.2

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB091	SJSB091	SJSB092	SJSB092	SJSB092	SJSB092	SJSB092	SJSB092
Sample Identification:		11215702-080321-BN-SJSB091(14-16)	11215702-080321-BN-SJSB091(16-18)	11215702-072521-BN-SJSB092(0-2)	11215702-072521-BN-SJSB092(2-4)	11215702-072521-BN-SJSB092(4-6)	11215702-072521-BN-SJSB092(6-8)	11215702-072521-BN-SJSB092(8-10)	11215702-072521-BN-SJSB092(10-12)
Sample Date:	Units	08/03/21	08/03/21	07/25/21	07/25/21	07/25/21	07/25/21	07/25/21	07/25/21
Sample Depth:		(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.67 U	0.67 U	450	250	1.6 U	0.075 U	4.9 J	0.11 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1200	1900	1800	1200	640	1100	870	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.063 J	0.042 U	910	540	1.9 J	0.050 U	0.66 U	0.87 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	59	82	110	72 J	28	43	46	52
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.046 U	0.046 U	330	170	1.0 J	0.048 U	0.66 J	0.046 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.048 U	0.040 U	3300	1800	11	0.036 U	1.4 J	2.0 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.81 J	0.84 J	1.9 U	1.1 U	0.15 U	0.31 U	0.20 U	0.16 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 U	0.039 U	880	500	2.8 J	0.039 U	0.47 J	0.51 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	2.2 J	9.4 J	7.0 J	0.16 U	0.35 U	0.23 U	0.17 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.087 J	0.14 J	46 J	28 J	0.11 U	0.037 U	0.053 U	0.38 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.2 J	4.5 J	6.3 U	1.1 U	0.14 U	0.30 U	2.7 J	2.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.051 U	0.048 U	2200	1400 J	9.9	0.058 U	1.9 J	1.4 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.12 U	0.12 U	290	200	0.19 U	0.17 U	0.20 U	0.22 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.037 U	0.030 U	82 J	57 J	0.12 U	0.036 U	0.055 U	0.084 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.054 U	0.049 U	1500	1100	6.6 J	0.066 U	0.92 J	0.97 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.93 U	0.51 U	210000	110000	340	7.4	70	71
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.53 J	0.39 J	21000 J	16000 J	93	3.1	18	17 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.063 J	0.046 U	1500 J	820 J	3.6 J	0.083 U	1.3 J	0.87 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	210 J	260 J	170 J	94 J	160 J	150 J	150 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.087 J	0.14 J	4800 J	2700 J	14 J	0.077 U	1.9 J	2.9 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	45 J	58 J	37 J	35 J	24 J	38 J	42 J	39 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.063 J	0.049 U	5700 J	3800 J	24 J	0.066 U	3.6 J	2.4 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	11 J	13 J	290 J	200 J	1.9 U	2.9 U	4.1 U	3.3 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.9 J	1.3 J	160000 J	130000 J	670 J	13 J	130 J	150 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.6 J	9.2 J	23000 J	17000 J	93 J	3.1 J	18 J	17 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.0	2.6	43000	28000	130	4.6	27	26
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.2	2.7	43000	28000	130	4.8	27	26
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	59.8	63.1	53.3	61.6	71.0	71.0	63.2	63.7

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB092 11215702-072521-BN-SJSB092(12-14) 07/25/21 (12-14) ft bgs	SJSB092 11215702-072521-BN-SJSB092(14-16) 07/25/21 (14-16) ft bgs	SJSB092 11215702-072521-BN-SJSB092(16-18) 07/25/21 (16-18) ft bgs	SJSB094 11215702-072621-BN-SJSB094(0-2) 07/26/21 (0-2) ft bgs	SJSB094 11215702-072621-BN-SJSB094(2-4) 07/26/21 (2-4) ft bgs	SJSB094 11215702-072621-BN-SJSB094(4-6) 07/26/21 (4-6) ft bgs	SJSB094 11215702-072621-BN-DUP-8 07/26/21 (6-8) ft bgs Duplicate	SJSB094 11215702-072621-BN-SJSB094(6-8) 07/26/21 (6-8) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	110	0.55 U	0.067 U	460 J	530	570	12 J	180 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1300	340	450	720 J	750	1700	1200	680 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	200	0.40 U	0.44 U	1100	1100	1300	19 J	290 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	55	12	20	68 J	70 J	140	48	42 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	69	0.20 U	0.047 U	280	360	360	5.9 J	110
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	660	0.78 J	0.66 J	3200	3600	4400	62 J	1300 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.86 U	0.35 U	0.33 U	3.6 J	0.97 U	1.5 UJ	1.0 J	1.2 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	180	0.29 J	0.029 U	740	960	1100	16 J	330 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.98 U	0.32 J	0.61 J	7.0 J	0.93 U	9.1 J	1.2 J	1.2 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	11 J	0.18 U	0.41 U	42 J	57 J	45 J	0.99 J	16 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.85 U	0.77 J	1.6 J	5.6 J	0.88 U	7.0 J	2.7 J	1.1 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	550	0.54 J	0.063 U	2200	2700	2900	51 J	920 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	82	0.24 J	0.11 U	290	370	340	7.1	100 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	22 J	0.12 J	0.028 U	100	130	140	2.6 J	32 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	420	0.42 J	0.065 U	1600	2000	2000	47 J	700 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	33000	27	20	110000 J	140000 J	130000 J	2300 J	47000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6800 J	7.2	4.5	24000 J	23000 J	26000 J	570 J	10000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	310 J	0.68 J	0.44 J	1500 J	1700 J	1900 J	30 J	480 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	38 J	64 J	130 J	140 J	320 J	160 J	89 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	990 J	1.4 J	1.1 J	4600 J	5400 J	6500 J	92 J	1900 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	26 J	8.6 J	16 J	48 J	17 J	37 J	42 J	9.9 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1500 J	1.3 J	0.24 U	6200 J	7500 J	7800 J	150 J	2600 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	82 J	1.3 J	1.7 U	290 J	370 J	340 J	12 J	100 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	50000 J	47 J	33 J	210000 J	210000 J	220000 J	4400 J	87000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	7400 J	8.3 J	4.5 J	26000 J	26000 J	28000 J	620 J	11000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	10000	11	7.1	36000	39000	41000	830	15000
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	10000	11	7.2	36000	39000	41000	830	15000
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	63.0	81.6	83.1	53.7	54.6	51.2	69.9	64.7

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB094	SJSB094	SJSB094	SJSB094	SJSB094	SJSB095	SJSB095	SJSB095
Sample Identification:	Units	11215702-072621-BN-SJSB094(8-10)	11215702-072621-BN-SJSB094(10-12)	11215702-072621-BN-SJSB094(12-14)	11215702-072621-BN-SJSB094(14-16)	11215702-072621-BN-SJSB094(16-18)	11215702-072821-BN-SJSB095(0-2)	11215702-072821-BN-SJSB095(2-4)	11215702-072821-BN-SJSB095(4-6)
Sample Date:		07/26/21	07/26/21	07/26/21	07/26/21	07/26/21	07/28/21	07/28/21	07/28/21
Sample Depth:		(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	56 J	0.17 U	0.15 U	0.11 U	0.11 U	340 J	18 J	0.17 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	620	840	1400	1300	45	1400	1700	240
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	110	1.1 U	0.086 U	0.079 U	0.33 U	790	4.4 J	0.26 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	32 J	36	65	60	2.6 J	88 J	60	12
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	39	0.091 U	0.080 U	0.077 U	0.058 U	250	2.0 J	0.068 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	430	2.7 J	0.047 U	0.046 U	0.029 U	2800	7.0	0.045 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.45 U	0.27 U	0.37 U	0.91 J	0.097 U	1.2 U	0.33 U	0.13 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	130	0.62 J	0.047 U	0.045 U	0.030 U	740	1.6 J	0.044 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.52 U	0.31 U	0.41 U	1.6 J	0.11 U	1.3 U	0.40 U	0.15 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	5.5 J	0.12 U	0.047 U	0.046 U	0.029 U	40 J	0.36 U	0.045 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.45 U	2.4 J	4.8 J	4.4 J	0.096 U	4.8 J	0.33 U	0.74 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	320	1.7 J	0.066 U	0.063 U	0.047 U	2100	0.54 U	0.078 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	41	0.32 U	0.24 U	0.23 U	0.11 U	290	0.50 U	0.17 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	13 J	0.11 U	0.048 U	0.046 U	0.028 U	88 J	0.36 U	0.041 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	240	1.3 J	0.068 U	0.069 U	0.047 U	1700	0.57 U	0.085 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	16000 J	83	4.3 U	2.4 U	6.4 U	110000 J	140	11 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3700 J	22	0.13 U	1.3 J	1.4 J	23000 J	42	0.16 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	180 J	1.1 J	0.086 U	0.23 U	0.33 J	1200 J	8.3 J	0.26 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	87 J	130 J	190 J	190 J	8.1 J	200 J	150 J	45 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	650 J	3.3 J	0.074 U	0.11 U	0.036 U	4100 J	8.6 J	0.078 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	16 J	32 J	52 J	50 J	2.0 J	32 J	18 J	9.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	860 J	4.0 J	0.068 U	0.069 U	0.14 U	6200 J	2.6 J	0.27 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	41 J	5.2 J	8.8 J	8.4 J	0.26 U	290 J	1.3 U	1.2 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	26000 J	160 J	8.1 J	3.0 J	9.8 J	200000 J	240 J	19 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4100 J	22 J	1.1 J	4.1 J	1.4 J	25000 J	42 J	0.45 U
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	5500	32	1.6	3.0	1.4	35000	58	0.27
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	5500	32	2.0	3.2	1.9	35000	59	1.0
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	68.6	62.9	64.7	64.6	79.5	56.8	72.7	75.8

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB095	SJSB095	SJSB095	SJSB095	SJSB095	SJSB095	SJSB095	SJSB096
Sample Identification:		11215702-072821-BN-DUP-10	11215702-072821-BN-SJSB095(6-8)	11215702-072821-BN-SJSB095(8-10)	11215702-072821-BN-SJSB095(10-12)	11215702-072821-BN-SJSB095(12-14)	11215702-072821-BN-SJSB095(14-16)	11215702-072821-BN-SJSB095(16-18)	11215702-072721-BN-SJSB096(0-2)
Sample Date:	Units	07/28/21	07/28/21	07/28/21	07/28/21	07/28/21	07/28/21	07/28/21	07/27/21
Sample Depth:		(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs
Sample Type:		Duplicate							
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.61 J	0.12 U	25	0.10 U	0.12 U	0.70 J	0.12 U	700
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	240	190	1300	200	130	170	260	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.34 U	0.060 U	33	0.62 U	0.29 U	0.66 U	0.28 U	1500
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11	10 J	38	11	6.5	7.7	15	130
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.054 U	0.057 U	10	0.35 J	0.043 U	0.28 J	0.061 U	450
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.2 J	0.029 U	100	3.8 J	0.032 U	2.1 J	0.019 U	4400
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.14 U	0.080 U	0.71 J	0.097 U	0.057 U	0.33 J	0.28 U	5.9 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.42 J	0.027 U	28	0.91 J	0.032 U	0.64 J	0.018 U	1200
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.15 U	0.091 U	1.3 J	0.11 U	0.060 U	0.20 J	0.29 U	13
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.040 U	0.026 U	1.3 J	0.17 J	0.030 U	0.17 J	0.018 U	89
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.0 J	0.50 J	1.7 J	1.1 J	0.054 U	0.78 J	0.26 U	10
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.55 J	0.044 U	74	2.9 J	0.071 U	2.7 J	0.052 U	3500
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 U	0.099 U	9.3	0.14 U	0.10 U	0.43 J	0.15 U	550
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.038 U	0.027 U	3.6 J	0.14 J	0.029 U	0.13 J	0.017 U	150
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.48 J	0.051 U	55	2.1 J	0.078 U	2.7 J	0.056 U	3200
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	27 J	5.5 UJ	3500 J	150	17	170	3.6 U	250000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.3 J	1.7 J	810 J	40	4.1	35	0.13 U	60000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.34 J	0.060 U	50 J	1.1 J	0.29 J	1.1 J	0.28 J	2200 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	44 J	38 J	100 J	44 J	25 J	32 J	66 J	230 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.6 J	0.036 U	160 J	5.0 J	0.075 U	3.3 J	0.052 U	6200 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	11 J	8.9 J	20 J	13 J	6.2 J	9.3 J	17 J	99 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1.0 J	0.094 U	190 J	7.0 J	0.078 U	7.6 J	0.056 U	9300 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.90 J	0.48 U	10 J	0.42 U	0.69 U	1.5 J	5.9 J	590 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	49 J	8.9 J	6400 J	300 J	25 J	300 J	6.1 J	390000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.3 J	1.7 J	880 J	40 J	4.1 J	40 J	1.2 J	70000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	9.6	1.9	1200	57	5.9	54	0.23	87000
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	9.7	2.3	1200	57	6.0	54	0.60	87000
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	81.7	81.0	76.6	76.5	76.8	75.7	69.3	49.0

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB096	SJSB096	SJSB096	SJSB096	SJSB096	SJSB096	SJSB096	SJSB096
Sample Identification:	Units	11215702-072721-BN-SJSB096(2-4)	11215702-072721-BN-SJSB096(4-6)	11215702-072721-BN-DUP-9	11215702-072721-BN-SJSB096(6-8)	11215702-072721-BN-SJSB096(8-10)	11215702-072721-BN-SJSB096(10-12)	11215702-072721-BN-SJSB096(12-14)	11215702-072721-BN-SJSB096(14-16)
Sample Date:		07/27/21	07/27/21	07/27/21	07/27/21	07/27/21	07/27/21	07/27/21	07/27/21
Sample Depth:		(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs
Sample Type:				Duplicate					
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	290	3.8 J	0.13 U	0.51 J	37	0.74 J	0.095 U	0.74 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	610	950	820	980	1000	1200	460	360
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	650	7.6	0.071 U	0.18 J	68	1.4 J	0.050 U	0.039 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	43 J	36	34	39	41	51	24	18
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	200	2.6 J	0.072 U	0.041 U	22	0.39 J	0.048 U	0.036 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2000	25	0.29 J	0.74 J	200	4.9 J	0.038 U	0.024 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.1 J	0.26 U	0.23 U	0.59 J	0.79 J	0.49 J	0.19 U	0.29 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	500	6.4 J	0.033 U	0.25 J	51	1.2 J	0.038 U	0.025 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.0 J	0.27 U	0.82 J	0.81 J	1.3 J	1.3 J	0.21 U	0.54 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	23 J	0.26 U	0.034 U	0.12 J	3.3 J	0.25 J	0.037 U	0.024 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6 J	2.1 J	0.23 U	2.9 J	2.7 J	3.3 J	2.3 J	1.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1300	18	0.042 U	0.86 J	150	3.6 J	0.26 J	0.037 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	130	2.6 J	0.15 U	0.29 J	24	0.16 U	0.10 U	0.11 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	47 J	0.73 J	0.032 U	0.043 J	6.5 J	0.066 U	0.038 U	0.024 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	930	13	0.041 U	0.35 J	120	2.6 J	0.16 J	0.040 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	61000 J	910 J	8.6	8.8	8000 J	190	11	3.9
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	15000 J	210	2.5	2.4	1900 J	45	3.3	0.95 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	980 J	12 J	0.072 U	0.18 J	100 J	1.8 J	0.050 U	0.039 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	88 J	120 J	130 J	150 J	140 J	160 J	100 J	71 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2900 J	32 J	0.29 J	1.3 J	290 J	6.4 J	0.038 U	0.027 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	27 J	25 J	30 J	38 J	36 J	41 J	28 J	24 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	3400 J	48 J	0.057 U	1.9 J	400 J	8.5 J	0.43 J	0.040 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	150 J	5.7 J	5.0 J	5.9 J	24 J	7.7 J	3.9 J	4.8 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	110000 J	1500 J	14 J	15 J	14000 J	360 J	17 J	5.6 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	16000 J	230 J	4.1 J	7.9 J	2100 J	45 J	3.3 J	2.2 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	22000	310	4.1	4.9	2800	67	5.1	1.9
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	22000	310	4.2	4.9	2800	67	5.2	1.9
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	62.0	69.9	65.1	68.2	66.8	65.9	73.4	72.3

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB096	SJSB097	SJSB097	SJSB097	SJSB097	SJSB097	SJSB097	SJSB097
Sample Identification:		11215702-072721-BN-SJSB096(16-18)	11215702-082221-BN-SJSB097(0-2)	11215702-082221-BN-SJSB097(2-4)	11215702-082221-BN-SJSB097(4-6)	11215702-082221-BN-DUP-20	11215702-082221-BN-SJSB097(6-8)	11215702-082221-BN-SJSB097(8-10)	11215702-082221-BN-SJSB097(10-12)
Sample Date:	Units	07/27/21	08/22/21	08/22/21	08/22/21	08/22/21	08/22/21	08/22/21	08/22/21
Sample Depth:		(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Sample Type:						Duplicate			
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.60 J	58 J	0.71 U	0.76 U	1.3 J	0.98 U	1.0 U	0.089 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	600	2500	350	430	420	320	66 J	22
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.40 J	9.0 J	0.021 U	0.57 U	1.5 J	0.31 U	0.62 U	0.082 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	27	73 J	23 J	25 J	24 J	17 J	3.6 U	1.1 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.059 U	0.84 U	0.025 U	0.039 U	0.082 U	0.27 U	0.29 U	0.079 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.91 J	2.3 U	0.024 U	0.42 U	0.86 U	0.31 U	0.69 U	0.064 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.29 U	1.7 U	0.52 U	0.59 U	0.17 U	0.48 U	0.76 U	0.055 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.036 U	1.0 U	0.24 U	0.44 U	0.84 U	0.23 U	0.92 U	0.056 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.33 U	2.0 J	0.048 U	0.093 U	0.18 U	1.0 J	0.74 J	0.098 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.036 U	0.79 U	0.21 U	0.53 U	0.52 J	0.69 U	0.94 U	0.016 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.5 J	2.7 U	1.2 U	1.6 J	0.52 U	1.6 J	0.96 J	0.21 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.53 J	1.5 J	0.51 J	0.17 U	1.2 J	0.65 J	1.2 J	0.10 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.15 U	0.095 U	0.15 U	0.12 U	0.14 U	0.10 U	0.15 U	0.15 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.034 U	0.86 U	0.20 U	0.57 U	0.63 U	0.32 U	0.44 U	0.014 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.12 U	1.6 U	0.52 U	0.58 U	1.2 J	0.038 U	0.68 U	0.096 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	32	26	0.067 U	3.8 J	1.4 J	2.3 J	9.3 J	1.2 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.7	0.062 U	0.54 J	1.1 U	0.095 U	0.95 U	2.1 U	0.44 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.40 J	20 J	0.42 J	1.3 J	3.0 J	0.71 J	1.1 J	0.22 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130 J	230 J	94 J	110 J	93 J	66 J	11 J	3.9 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.91 J	9.7 J	0.65 J	2.2 J	3.3 J	1.6 J	3.2 J	0.12 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	42 J	47 J	28 J	31 J	25 J	22 J	7.3 J	1.9 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.53 J	9.1 J	1.5 J	1.1 J	2.8 J	1.3 J	3.0 J	0.24 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.2 J	7.4 J	6.1 J	11 J	3.0 J	4.0 J	2.4 J	0.41 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	60 J	52 J	0.94 J	4.3 J	2.4 J	2.9 J	14 J	1.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.7 J	3.5 J	3.5 J	1.1 J	1.4 J	2.3 J	3.7 J	0.81 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	13	4.4	0.89	0.92	0.97	0.78	1.2	0.73
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	13	5.2	1.2	1.8	1.3	1.4	2.6	0.77
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	73.2	56.4	79.0	82.0	73.7	86.3	89.3	74.3

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB097	SJSB097	SJSB098	SJSB098	SJSB098	SJSB098	SJSB098	SJSB098
Sample Identification:		11215702-082221-BN-SJSB097(12-14)	11215702-082221-BN-SJSB097(14-16)	11215702-082021-BN-SJSB098(0-2)	11215702-082021-BN-SJSB098(2-4)	11215702-082021-BN-SJSB098(4-6)	11215702-082021-BN-SJSB098(6-8)	11215702-082021-BN-SJSB098(8-10)	11215702-082021-BN-SJSB098(10-12)
Sample Date:	Units	08/22/21	08/22/21	08/20/21	08/20/21	08/20/21	08/20/21	08/20/21	08/20/21
Sample Depth:		(12-14) ft bgs	(14-16) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.089 U	0.089 U	39 J	73 J	120 J	57 J	130 J	82
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	26	26	1800	1800	3000	1900	1700	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.064 U	0.064 U	8.3 J	31 J	38 J	13 J	250	150
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1.6 J	1.7 J	58 J	71 J	120	77	95	71
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.047 U	0.0030 U	1.3 U	9.9 J	12 J	3.0 J	80	48
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.067 U	0.063 U	8.5 J	120	130	24 J	790	450
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.10 J	0.069 J	0.76 U	1.6 J	0.18 U	2.2 U	2.0 U	0.94 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.050 U	0.047 U	2.3 J	29 J	31 J	6.5 J	200	110
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.16 J	0.12 U	2.5 J	6.3 J	3.7 J	2.7 J	7.8 J	4.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.083 U	0.083 U	1.5 U	15 J	13 J	0.10 U	0.62 U	39
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.25 U	0.17 U	2.7 U	3.8 J	5.0 J	1.6 J	3.7 J	1.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.14 U	0.074 U	4.7 J	120	130	16 J	620	340
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 J	0.16 J	2.1 J	14 J	16 J	2.8 J	76	48
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.085 U	0.085 U	1.1 U	9.2 J	8.6 U	1.5 U	40 J	23
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.096 U	0.096 U	4.5 J	100	110	12 J	530	280
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.1	0.11 U	180	5500	4500	360	21000	10000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.0 J	0.050 J	47	1300	1300	110	7100 J	2700 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.086 J	0.12 J	18 J	59 J	72 J	28 J	430 J	260 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	6.5 J	5.4 J	190 J	240 J	370 J	77 J	230 J	190 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.20 J	0.23 J	20 J	200 J	210 J	42 J	1100 J	690 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.0 J	2.1 J	34 J	81 J	93 J	50 J	50 J	38 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.23 J	0.36 J	19 J	350 J	370 J	50 J	1800 J	1200 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.34 J	0.86 J	9.7 J	21 J	46 J	13 J	96 J	56 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	8.0 J	0.11 J	360 J	10000 J	10000 J	480 J	46000 J	34000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.1 J	0.32 J	51 J	1400 J	1500 J	130 J	7900 J	7300 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.3	0.24	71	1900	1800	160	9600	3900
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.4	0.29	71	1900	1800	160	9600	3900
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	83.8	84.8	80.2	49.9	46.7	65.5	71.8	79.6

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB098 11215702-082021-BN-SJSB098(12-14) 08/20/21 (12-14) ft bgs	SJSB098 11215702-082021-BN-SJSB098(14-16) 08/20/21 (14-16) ft bgs	SJSB098 11215702-082021-BN-SJSB098(16-18) 08/20/21 (16-18) ft bgs	SJSB099 11215702-072421-SS-SJSB099(0-2) 07/24/21 (0-2) ft bgs	SJSB099 11215702-072421-SS-SJSB099(2-4) 07/24/21 (2-4) ft bgs	SJSB099 11215702-072421-SS-SJSB099(4-6) 07/24/21 (4-6) ft bgs	SJSB099 11215702-072421-SS-SJSB099(6-8) 07/24/21 (6-8) ft bgs	SJSB099 11215702-072421-SS-SJSB099(8-10) 07/24/21 (8-10) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	9.8 J	0.39 U	0.22 U	1700	1300 J+	2.9 J	0.53 J	0.063 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	610	610	19	11000	11000	160	110	120
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	19	0.38 U	0.14 U	2800	2100	3.1 J	0.45 J	0.61 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	36	37	1.2 J	670	640	6.3	3.4 J	4.8 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	6.5 J	0.20 U	0.057 U	790	620	1.0 J	0.055 U	0.20 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	61	1.3 J	0.051 U	6600	6000	11	1.2 J	1.6 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.83 J	0.60 J	0.044 U	6.3 J	8.2 J	0.30 J	0.32 J	0.058 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	15	0.43 J	0.064 U	1500	1700	2.9 J	0.31 J	0.43 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.1 J	0.088 U	49 J	41 J	0.41 J	0.069 U	0.068 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.051 U	0.15 U	0.082 U	84 J	100 J	0.071 U	0.028 U	0.049 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.3 J	2.2 J	0.099 U	12 J	8.3 J	0.067 U	0.23 J	0.058 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	48	0.93 J	0.11 U	4000	4300	9.4	1.0 J	1.2 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.4 J	0.47 J	0.015 U	390	430	1.0 J	0.068 U	0.064 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.1 J	0.16 U	0.064 U	170	220	0.27 J	0.028 U	0.046 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	40	0.53 U	0.073 U	2500	2700	5.5 J	0.51 J	0.71 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1600	20	0.44 J	160000 J	120000 J	290	27	34
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	490	6.8	0.10 U	35000 J	40000 J	94	10	11
Total heptachlorodibenzofuran (HpCDF)	pg/g	31 J	0.93 J	0.29 J	4500 J	3600 J	5.4 J	0.74 J	1.0 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	160 J	4.0 J	1500 J	1400 J	22 J	13 J	19 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	87 J	2.2 J	0.31 J	9400 J	9100 J	16 J	1.5 J	2.0 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	54 J	48 J	1.6 J	190 J	180 J	4.5 J	2.9 J	3.9 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	130 J	2.5 J	0.40 J	10000 J	11000 J	23 J	2.0 J	2.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	19 J	7.0 J	0.86 J	390 J	430 J	1.0 J	0.068 U	0.064 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	3300 J	52 J	0.99 J	250000 J	280000 J	590 J	59 J	70 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	540 J	14 J	0.20 J	38000 J	43000 J	100 J	10 J	11 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	680	10	0.062	53000	54000	130	13	15
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	680	11	0.16	53000	54000	130	13	15
General Chemistry									
Percent solids	%	--	--	--	44.1	39.8	81.5	83.9	77.5
Percent solids, vol.	%	64.6	69.9	88.9	--	--	--	--	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB099 11215702-072421-SS-SJSB099(10-12) 07/24/21 (10-12) ft bgs	SJSB099 11215702-072421-SS-SJSB099(12-14) 07/24/21 (12-14) ft bgs	SJSB099 11215702-072421-SS-SJSB099(14-16) 07/24/21 (14-16) ft bgs	SJSB099 11215702-072421-DUP-6 07/24/21 (16-18) ft bgs Duplicate	SJSB099 11215702-072421-SS-SJSB099(16-18) 07/24/21 (16-18) ft bgs	SJSB101 11215702-072521-SS-SJSB101(0-2) 07/25/21 (0-2) ft bgs	SJSB101 11215702-072521-SS-SJSB101(2-4) 07/25/21 (2-4) ft bgs	SJSB101 11215702-072521-SS-SJSB101(4-6) 07/25/21 (4-6) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	5.4 J	0.094 U	1.0 J	1.1 J	0.59 J	1700	1400	640
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	440	220	350	360	280	10000	9700	4500
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	6.5 J	0.057 U	0.90 J	0.90 J	0.50 J	3100	2300	1100
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	28	12	17	17	13	540	610	280
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	2.5 J	0.055 U	0.24 J	0.058 U	0.15 J	1000	700	370
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	21	0.021 U	2.5 J	1.4 J	0.76 J	10000	7300	3400
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.52 J	0.31 J	0.11 U	0.48 J	0.14 U	6.1 J	7.5 J	2.4 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.8 J	0.022 U	0.55 J	0.54 J	0.30 J	2800	1800	1000
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	0.51 J	0.12 U	0.50 J	0.15 U	36 J	44 J	18 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.52 J	0.30 J	0.050 U	0.045 U	0.032 U	180	110 J	65 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	0.82 J	1.3 J	1.3 J	0.72 J	18 J	11 J	6.9 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	13	0.26 J	1.8 J	1.1 J	0.47 J	7000	4700	2200
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	0.092 U	0.11 U	0.11 U	0.089 U	400 J	380	160
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.81 J	0.021 U	0.050 U	0.044 U	0.035 U	340	220	120
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	8.0	0.037 U	1.2 J	0.67 J	0.36 J	3400	2700	1300
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	390	2.8 U	55	27	14	160000 J	150000 J	62000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	130	1.3 J	19	10	5.0	44000 J	42000 J	18000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	11 J	0.057 U	1.1 J	1.3 J	0.65 J	4900 J	3800 J	1900 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	94 J	41 J	64 J	66 J	55 J	1100 J	1300 J	590 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	32 J	0.30 J	3.1 J	1.9 J	1.1 J	15000 J	11000 J	5200 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	28 J	13 J	18 J	21 J	16 J	190 J	190 J	82 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	34 J	0.26 J	4.1 J	1.7 J	0.84 J	16000 J	12000 J	5300 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	0.86 J	1.4 J	1.5 J	1.5 J	400 J	380 J	160 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	830 J	4.8 J	100 J	48 J	23 J	260000 J	250000 J	100000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	140 J	1.3 J	19 J	10 J	5.0 J	48000 J	46000 J	19000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	180	1.7	26	14	6.9	63000	59000	25000
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	180	1.9	26	14	7.0	63000	59000	25000
General Chemistry									
Percent solids	%	74.3	76.7	79.3	78.2	81.0	42.2	41.0	65.8
Percent solids, vol.	%	--	--	--	--	--	--	--	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB101 11215702-072521-SS-SJSB101(6-8) 07/25/21 (6-8) ft bgs	SJSB101 11215702-072521-SS-SJSB101(8-10) 07/25/21 (8-10) ft bgs	SJSB101 11215702-072521-SS-SJSB101(10-12) 07/25/21 (10-12) ft bgs	SJSB101 11215702-072521-SS-SJSB101(12-14) 07/25/21 (12-14) ft bgs	SJSB101 11215702-072521-SS-SJSB101(14-16) 07/25/21 (14-16) ft bgs	SJSB101 11215702-072521-SS-SJSB101(16-18) 07/25/21 (16-18) ft bgs	SJSB101 11215702-072521-SS-SJSB101(18-20) 07/25/21 (18-20) ft bgs	SJSB101-Waste 11215702-072521-SS-SJSB101(0-2)-WC 07/25/21 (0-2) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.61 J	0.095 U	5.0 J	1.7 J	0.66 J	19	0.38 U	1400
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	110	88	170	180	95	180	150	10000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.72 J	0.20 J	7.5	0.94 J	0.24 J	1.2 J	0.15 U	2500
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3.9 J	3.2 J	7.0	11	5.1 J	9.3	7.3	670
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.26 J	0.034 U	2.5 J	0.060 U	0.044 U	0.088 U	0.074 U	890
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	0.56 J	26	0.72 J	0.029 U	1.3 J	0.38 J	8500
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.24 J	0.20 J	0.073 U	0.13 U	0.085 U	0.097 U	0.26 J	4.5 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.57 J	0.14 J	6.7	0.038 U	0.030 U	0.052 U	0.18 U	2200
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.19 J	0.23 J	0.076 U	0.14 U	0.095 U	0.11 U	0.21 U	40 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.36 U	0.025 U	0.74 U	0.28 U	0.25 U	0.29 U	0.092 U	120
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.26 J	0.059 U	0.37 J	1.1 J	0.083 U	0.096 U	0.34 J	16 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.7 J	0.31 J	18	0.045 U	0.035 U	1.0 J	0.33 J	5500
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.079 U	0.080 U	1.6 J	0.11 U	0.083 U	0.16 U	0.19 U	370
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.046 U	0.028 U	0.52 J	0.035 U	0.029 U	0.049 U	0.074 U	250
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.83 J	0.051 U	11	0.045 U	0.038 U	0.077 U	0.25 U	2900
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	42	6.9	540 J	1.1 J	0.71 J	24	6.6	140000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	13	1.8	170	0.11 U	0.077 U	8.5	2.1	35000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.3 J	0.20 J	13 J	0.94 J	0.24 J	3.0 J	0.38 J	4300 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	12 J	13 J	20 J	35 J	18 J	34 J	29 J	1400 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	3.2 J	0.70 J	39 J	1.0 J	0.25 J	1.6 J	0.74 J	13000 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.2 J	3.1 J	5.5 J	12 J	5.5 J	9.6 J	13 J	190 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	3.7 J	0.31 J	40 J	0.17 U	0.038 U	1.0 J	19 J	14000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.079 U	0.080 U	1.6 J	1.2 J	0.083 U	0.16 U	4.2 J	370 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	72 J	9.6 J	1100 J	1.6 J	0.71 J	42 J	13 J	230000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	13 J	1.8 J	190 J	1.0 J	0.15 U	8.5 J	4.9 J	38000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	18	2.7	230	0.47	0.15	11	3.0	52000
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	18	2.7	230	0.62	0.27	11	3.2	52000
General Chemistry									
Percent solids	%	83.0	83.3	80.1	79.3	83.7	79.4	--	42.5 Dup 43.4
Percent solids, vol.	%	--	--	--	--	--	--	82.9	--

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB101-Waste 11215702-072521-SS-SJSB101(2-4)-WC 07/25/21 (2-4) ft bgs	SJSB102 11215702-081921-BN-SJSB102(0-2) 08/19/21 (0-2) ft bgs	SJSB102 11215702-081921-BN-SJSB102(2-4) 08/19/21 (2-4) ft bgs	SJSB102 11215702-081921-BN-SJSB102(4-6) 08/19/21 (4-6) ft bgs	SJSB102 11215702-081921-BN-SJSB102(6-8) 08/19/21 (6-8) ft bgs	SJSB102 11215702-081921-BN-SJSB102(8-10) 08/19/21 (8-10) ft bgs	SJSB102 11215702-081921-BN-SJSB102(10-12) 08/19/21 (10-12) ft bgs	SJSB102 11215702-081921-BN-SJSB102(12-14) 08/19/21 (12-14) ft bgs
Dioxins/Furans			Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1200	150 J	12 U	13 J	1.4 U	1.1 U	0.26 U	1.9 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	5800	2900	160	710	580	590	890	590
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2800	120 J	3.0 U	12 J	0.63 U	0.34 U	0.13 U	1.0 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	470	180 J	14 J	34 J	49 J	27 J	39	25
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	860	15 J	1.1 U	3.9 J	0.044 U	0.22 U	0.0079 U	0.34 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	10000	120 J	1.1 U	28 J	3.1 U	2.0 U	0.24 U	3.3 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.1 J	7.0 J	0.099 U	1.4 U	0.90 U	0.091 U	0.58 J	0.43 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2600	37 J	0.23 U	8.1 J	0.87 U	0.041 U	0.21 U	0.88 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	30 J	13 J	1.3 U	2.8 J	0.14 U	0.63 J	1.2 J	0.63 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	140 J	1.0 U	1.2 U	0.13 U	0.31 U	0.35 U	0.0084 U	0.0093 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	15 J	11 J	1.1 U	1.4 J	3.7 J	1.9 J	1.2 J	1.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5500	98 J	1.6 U	23 J	1.5 J	3.4 J	0.35 U	2.9 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	280	20 J	1.0 U	3.8 J	1.4 J	0.31 U	0.50 J	0.43 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	260	13 J	0.80 U	2.2 U	0.038 U	0.037 U	0.22 U	0.24 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2400	95 J	1.2 U	23 J	1.8 U	1.9 U	0.0070 U	2.3 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	100000 J	3900	17	960	54	41	3.1	87
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	34000 J	960	3.0 J	230	16	0.16 U	0.71 J	23
Total heptachlorodibenzofuran (HpCDF)	pg/g	4300 J	220 J	10 J	20 J	0.63 J	0.56 J	0.20 J	1.9 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	970 J	450 J	25 J	91 J	100 J	82 J	120 J	84 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	15000 J	250 J	5.0 J	41 J	4.6 J	2.4 J	0.67 J	5.0 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	150 J	120 J	7.6 J	33 J	22 J	31 J	43 J	26 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	12000 J	380 J	4.5 J	66 J	3.9 J	5.8 J	0.72 J	7.8 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	280 J	30 J	2.1 J	11 J	4.7 J	4.0 J	8.3 J	5.1 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	170000 J	8900 J	20 J	2400 J	110 J	57 J	4.6 J	190 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	37000 J	1100 J	3.8 J	270 J	17 J	0.16 U	6.9 J	27 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	47000	1400	4.9	340	24	4.9	2.5	34
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	47000	1400	5.9	340	24	5.6	2.5	34
General Chemistry									
Percent solids	%	51.4 Dup 40.0	--	--	--	--	--	--	--
Percent solids, vol.	%	--	71.3	75.0	67.7	78.7	78.1	69.4	78.4

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB102	SJSB102	SJSB102	SJSB102	SJSB102	SJSB103	SJSB103	SJSB103
Sample Identification:		11215702-081921-BN-SJSB102(14-16)	11215702-081921-BN-SJSB102(16-18)	11215702-081921-BN-SJSB102(18-20)	11215702-081921-BN-SJSB102(20-22)	11215702-081921-BN-SJSB102(22-24)	11215702-082121-BN-SJSB103(0-2)	11215702-082121-BN-SJSB103(2-4)	11215702-082121-BN-SJSB103(4-6)
Sample Date:	Units	08/19/21	08/19/21	08/19/21	08/19/21	08/19/21	08/21/21	08/21/21	08/21/21
Sample Depth:		(14-16) ft bgs	(16-18) ft bgs	(18-20) ft bgs	(20-22) ft bgs	(22-24) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.0043 U	7.6 U	2.0 U	1.4 U	0.69 U	1.6 U	0.10 U	2.5 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	800	900	810	790	730	35 U	35 U	220
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.11 U	3.5 U	1.4 U	0.51 U	0.93 U	0.67 U	1.3 U	1.1 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	35	40 J	52 J	40 J	40 J	2.6 U	0.14 U	11 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.0058 U	1.7 U	1.3 U	0.57 U	0.69 U	0.057 U	0.39 U	0.60 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.093 U	10 J	2.9 U	1.2 U	0.87 U	0.29 U	0.81 U	1.7 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.44 J	1.1 U	2.6 U	3.3 U	1.5 U	0.062 U	0.46 U	0.40 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.0039 U	3.0 U	1.4 U	0.68 U	0.48 U	0.38 U	0.83 U	0.91 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.94 J	1.7 U	4.1 U	3.9 U	2.7 U	0.27 U	0.14 U	1.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 U	1.6 U	2.6 U	1.2 U	0.57 U	0.47 U	0.13 U	0.62 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	2.6 J	5.1 U	2.7 U	3.2 U	0.55 U	0.14 U	1.0 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.20 U	7.9 J	1.6 U	1.9 U	1.4 U	0.36 J	0.18 U	1.2 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.15 J	2.3 U	4.1 U	3.6 U	3.9 U	1.4 J	1.0 U	0.46 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.0037 U	0.91 U	1.5 U	0.64 U	0.59 U	0.48 U	0.41 U	0.39 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.096 U	7.7 J	3.2 U	1.3 U	0.48 U	0.11 U	0.53 U	1.3 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3.5	290	16	1.4 U	0.50 U	5.6 J	2.1 J	13
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.014 U	72	6.0 U	0.98 U	1.7 U	0.12 U	0.34 U	11
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.18 J	7.7 J	2.6 J	1.1 J	1.6 J	1.6 J	2.7 J	2.3 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	110 J	120 J	130 J	95 J	100 J	5.5 J	4.3 J	42 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.25 J	19 J	8.8 J	4.0 J	2.8 J	3.7 J	2.7 J	4.1 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	33 J	33 J	55 J	40 J	40 J	1.9 J	1.3 J	12 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.47 J	26 J	6.5 J	7.8 J	4.5 J	4.0 J	6.0 J	2.8 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.9 J	9.6 J	15 J	10 J	15 J	1.4 J	4.1 J	5.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	9.8 J	600 J	28 J	2.6 J	1.7 J	11 J	5.3 J	64 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.1 J	84 J	7.6 J	6.2 J	4.1 J	0.12 U	0.34 U	11 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.4	110	2.4	0.64	0.62	1.0	0.21	13
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.4	110	8.9	3.9	4.0	2.2	1.1	14
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	79.4	71.5	62.1	62.7	63.1	84.7	83.6	86.5

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB103 11215702-082121-BN-SJSB103(6-8) 08/21/21 (6-8) ft bgs	SJSB103 11215702-082121-BN-SJSB103(8-10) 08/21/21 (8-10) ft bgs	SJSB103 11215702-082121-BN-SJSB103(10-12) 08/21/21 (10-12) ft bgs	SJSB103 11215702-082121-BN-SJSB103(12-14) 08/21/21 (12-14) ft bgs	SJSB104 11215702-072421-BN-SJSB104(0-2) 07/24/21 (0-2) ft bgs	SJSB104 11215702-072421-BN-SJSB104(2-4) 07/24/21 (2-4) ft bgs	SJSB104 11215702-072421-BN-SJSB104(4-6) 07/24/21 (4-6) ft bgs	SJSB104 11215702-072421-BN-SJSB104(6-8) 07/24/21 (6-8) ft bgs
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.4 U	0.76 U	0.089 U	0.099 U	1.5 U	0.25 U	0.54 U	0.86 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	14 J	8.4 U	28	49	1300	1100	710	1300
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.88 U	0.55 U	0.064 U	0.064 U	0.48 U	0.14 U	0.33 U	0.14 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2.1 U	1.9 U	1.0 J	3.0 J	41	46	29	48
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.62 U	0.53 U	0.047 U	0.047 U	0.10 J	0.028 U	0.089 J	0.040 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.3 U	1.3 U	0.063 U	0.063 U	0.90 J	0.12 J	0.76 J	0.10 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.82 U	1.0 U	0.043 J	0.13 J	0.56 U	0.66 U	0.45 U	0.58 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 U	1.2 U	0.051 U	0.041 U	0.30 J	0.080 J	0.25 J	0.049 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.62 J	1.4 J	0.055 U	0.21 J	0.84 J	0.87 J	0.66 J	0.81 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.72 U	1.3 U	0.083 U	0.083 U	0.22 U	0.35 U	0.27 U	0.29 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.86 J	1.7 J	0.12 U	0.24 U	1.7 J	2.4 J	1.4 J	2.2 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.8 J	2.6 J	0.074 U	0.088 U	0.91 J	0.30 J	0.75 J	0.26 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.0 J	1.8 J	0.043 J	0.25 J	0.31 J	0.23 J	0.22 J	0.20 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.88 U	0.85 U	0.085 U	0.085 U	0.047 J	0.032 J	0.055 J	0.017 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.1 U	1.6 U	0.096 U	0.096 U	0.54 J	0.12 J	0.43 J	0.095 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	7.4 J	5.2 J	0.96 J	0.28 U	38	3.2	24	2.6
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.4 U	1.2 U	0.29 J	0.075 J	9.9	1.0 J	7.0	0.91 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	2.1 J	1.4 J	0.12 J	0.11 J	0.78 J	0.11 J	0.57 J	0.12 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	4.3 J	4.0 J	4.0 J	8.5 J	140 J	160 J	110 J	160 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	4.6 J	4.8 J	0.21 J	0.28 J	1.5 J	0.59 J	1.3 J	0.44 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.4 J	5.8 J	1.7 J	2.7 J	28 J	43 J	26 J	40 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	5.5 J	5.0 J	0.26 J	0.36 J	2.1 J	0.54 J	1.7 J	0.47 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.4 J	3.9 J	0.61 J	0.39 J	5.2 J	9.8 J	5.4 J	8.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	8.7 J	6.8 J	2.7 J	0.43 J	68 J	5.9 J	43 J	5.1 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.4 J	1.2 J	0.56 J	0.39 J	14 J	7.2 J	10 J	5.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3.0	2.7	0.45	0.40	15	2.7	11	2.6
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	4.8	3.9	0.49	0.46	15	2.8	11	2.6
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	87.6	88.3	90.4	84.9	67.0	66.5	72.4	67.1

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

ED_014247_00001095-00041

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB104	SJSB104	SJSB104	SJSB104	SJSB104	SJSB105	SJSB105	SJSB105
Sample Identification:	Units	11215702-072421-BN-SJSB104(8-10)	11215702-072421-BN-SJSB104(10-12)	11215702-072421-BN-SJSB104(12-14)	11215702-072421-BN-SJSB104(14-16)	11215702-072421-BN-SJSB104(16-18)	11215702-072321-BN-SJSB105(0-2)	11215702-072321-BN-SJSB105(2-4)	11215702-072321-BN-SJSB105(4-6)
Sample Date:		07/24/21	07/24/21	07/24/21	07/24/21	07/24/21	07/23/21	07/23/21	07/23/21
Sample Depth:		(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.7 U	0.075 U	1.7 U	0.042 U	0.092 U	470	480	3.9 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	770	1400	430	80	130	3200	1600	1500
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.59 U	0.043 U	0.021 U	0.030 U	0.038 U	800	1200	5.0 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	32	56	17	2.4 J	3.6 J	180	110	49
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.068 J	0.041 U	0.021 U	0.029 U	0.036 U	240	440	1.6 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.33 J	0.049 U	0.024 U	0.019 U	0.042 U	2500	4200	17
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.59 U	0.33 U	0.11 U	0.060 U	0.058 U	3.0 J	3.4 J	0.54 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.087 J	0.051 U	0.026 U	0.021 U	0.046 U	710	1100	5.2 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.73 J	0.37 U	0.12 U	0.076 U	0.065 U	11	8.4 J	0.90 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.28 U	0.36 U	0.026 U	0.27 U	0.35 U	40	54 J	0.38 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.1 J	3.6 J	0.11 U	0.062 U	0.056 U	6.7 J	5.1 J	2.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.24 J	0.074 U	0.046 U	0.046 U	0.056 U	2000	2600	12
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.21 J	0.21 U	0.082 U	0.068 U	0.083 U	240	300	1.9 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.019 U	0.049 U	0.025 U	0.020 U	0.045 U	80	110	0.53 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.034 U	0.074 U	0.049 U	0.046 U	0.055 U	1400	1900	9.2
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.2 J	2.2	1.3	0.91 J	0.063 U	83000 J	130000 J	610 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.38 J	0.11 U	0.051 U	0.081 U	0.071 U	27000 J	33000 J	170
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.77 J	0.13 U	0.20 U	0.030 U	0.038 U	1200 J	1900 J	8.0 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	100 J	160 J	46 J	8.5 J	12 J	420 J	230 J	170 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.78 J	0.36 J	0.051 U	0.27 J	0.35 J	3700 J	6000 J	24 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	30 J	47 J	8.7 J	3.2 J	1.1 J	110 J	59 J	33 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.36 J	0.11 U	0.13 U	0.083 U	0.056 U	5400 J	6800 J	34 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.9 J	4.5 U	1.1 U	0.92 U	0.35 U	260 J	320 J	7.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2.6 J	2.4 J	1.7 J	0.91 J	0.18 U	160000 J	210000 J	1100 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.1 J	1.3 U	0.60 U	2.1 J	0.22 U	30000 J	37000 J	190 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.6	1.7	0.43	0.14	0.075	36000	48000	240
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.7	1.8	0.53	0.25	0.20	36000	48000	240
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	66.1	61.9	78.3	84.1	78.3	50.2	52.0	69.4

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB105	SJSB105	SJSB105	SJSB105	SJSB105	SJSB105	SJSB106	SJSB106
Sample Identification:		11215702-072321-BN-SJSB105(6-8)	11215702-072321-BN-SJSB105(8-10)	11215702-072321-BN-SJSB105(10-12)	11215702-072321-BN-SJSB105(12-14)	11215702-072321-BN-SJSB105(14-16)	11215702-072321-BN-SJSB105(16-18)	11215702-080821-BN-SJSB106(0-2)	11215702-080821-BN-SJSB106(2-4)
Sample Date:	Units	07/23/21	07/23/21	07/23/21	07/23/21	07/23/21	07/23/21	08/08/21	08/08/21
Sample Depth:		(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs
Sample Type:									
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.47 U	0.49 U	0.39 U	4.3 J	2.9 J	0.32 U	31	0.69 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1800	1600	1100	1600	1400	1400	4400	950 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.52 U	0.15 U	0.32 U	7.0 J	1.3 J	0.20 U	4.7 U	0.39 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	68	64	37	64	57	57	130	36
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 U	0.080 U	0.062 U	2.1 J	0.68 U	0.049 U	0.78 J	0.12 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.8 J	0.55 J	1.0 J	24	3.3 J	0.38 J	2.2 J	0.42 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.50 U	0.92 U	0.63 U	0.58 U	0.62 U	0.76 U	2.5 J	0.79 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.53 J	0.22 U	0.29 J	6.8 J	1.0 J	0.14 U	1.1 J	0.069 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.9 J	1.4 J	0.89 J	1.2 J	1.2 J	1.3 J	3.0 J	1.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.053 U	0.046 U	0.040 U	0.41 U	0.21 U	0.11 U	0.18 U	0.27 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.2 J	3.1 J	1.8 J	2.8 J	2.6 J	3.6 J	6.4 J	2.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.2 J	0.44 J	0.86 J	18	2.9 J	0.39 J	2.0 J	0.69 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.15 U	0.16 U	0.27 J	2.6 J	0.59 J	0.32 J	0.58 U	0.29 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.051 U	0.044 U	0.039 U	0.79 J	0.12 J	0.029 U	0.18 U	0.18 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.0 J	0.39 J	0.54 J	13	2.1 J	0.18 J	1.1 J	0.17 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	71	33	39	900 J	160	14	71	4.5
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	20	8.1	11	250	41	4.3	27	1.8
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.70 J	0.15 J	0.32 J	11 J	2.2 J	0.20 J	8.9 J	0.39 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	190 J	200 J	110 J	200 J	180 J	200 J	310 J	100 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	0.78 J	1.3 J	36 J	5.3 J	0.62 J	6.6 J	0.87 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	40 J	51 J	26 J	45 J	42 J	51 J	65 J	24 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	3.4 J	0.83 J	1.7 J	48 J	7.9 J	0.72 J	6.1 J	3.8 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.3 J	13 J	6.0 J	12 J	8.6 J	11 J	0.58 U	0.29 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	120 J	57 J	70 J	1600 J	290 J	27 J	110 J	6.4 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	26 J	16 J	18 J	270 J	50 J	11 J	27 J	4.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	29	13	17	350	60	7.6	39	3.4
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	29	13	17	350	60	7.7	39	3.6
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	69.7	60.1	60.8	66.6	65.6	67.3	37.8	61.6

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

Table 1

Supplemental Design Investigation – Soil Analytical Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB106	SJSB106	SJSB106	SJSB106	SJSB106	SJSB106	SJSB106	SJSB106
Sample Identification:		11215702-080821-BN-SJSB106(4-6)	11215702-080821-BN-DUP-15	11215702-080821-BN-SJSB106(6-8)	11215702-080821-BN-SJSB106(8-10)	11215702-080821-BN-SJSB106(10-12)	11215702-080821-BN-SJSB106(12-14)	11215702-080821-BN-SJSB106(14-16)	11215702-080821-BN-SJSB106(16-18)
Sample Date:	Units	08/08/21	08/08/21	08/08/21	08/08/21	08/08/21	08/08/21	08/08/21	08/08/21
Sample Depth:		(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs
Sample Type:			Duplicate						
Dioxins/Furans		Final	Final	Final	Final	Final	Final	Final	Final
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.1 J	0.078 U	0.65 J	0.65 J	0.77 J	0.61 J	0.80 J	0.80 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2700	810	1400	1000	1900	1300	990	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.0 U	0.084 U	0.37 U	0.47 U	0.45 U	0.37 U	0.51 U	0.37 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	73	35	58	47	85	61	46	53
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.26 J	0.076 U	0.076 U	0.092 U	0.13 U	0.097 U	0.11 U	0.095 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.92 J	0.030 U	0.037 U	0.065 U	0.046 U	0.058 U	0.078 U	0.057 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.77 J	0.25 U	0.94 J	0.68 J	0.75 J	1.0 J	0.38 U	0.87 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.46 J	0.029 U	0.037 U	0.063 U	0.047 U	0.054 U	0.078 U	0.057 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	0.27 U	1.3 J	1.4 J	2.1 J	1.9 J	0.44 U	1.4 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.21 J	0.024 U	0.036 U	0.056 U	0.044 U	0.055 U	0.071 U	0.15 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.1 J	2.8 J	3.3 J	3.3 J	5.2 J	3.8 J	3.9 J	3.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.13 U	0.053 U	0.072 U	0.37 J	0.076 U	0.076 U	0.10 U	0.093 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.32 U	0.23 U	0.25 U	0.38 U	0.35 U	0.30 U	0.24 U	0.28 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.073 U	0.026 U	0.037 U	0.058 U	0.045 U	0.054 U	0.076 U	0.053 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.13 U	0.062 U	0.075 U	0.080 U	0.076 U	0.078 U	0.11 U	0.11 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	17	0.79 U	2.7	3.5	0.77 U	0.99 U	2.3 U	3.2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.3	0.098 U	0.90 J	1.5 J	0.19 U	0.69 J	0.18 U	1.4 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.3 J	0.084 U	0.57 J	0.47 J	0.45 J	0.27 J	0.51 J	0.28 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	190 J	110 J	190 J	130 J	240 J	180 J	140 J	160 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.6 J	0.030 U	0.037 U	0.065 U	0.047 U	0.058 U	0.14 U	0.15 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	35 J	38 J	55 J	38 J	64 J	54 J	43 J	48 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.51 U	0.062 U	0.075 U	0.75 J	0.076 U	0.078 U	0.11 U	0.14 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.32 U	0.23 U	0.25 U	0.38 U	0.35 U	0.30 U	0.24 U	0.28 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	27 J	0.79 J	2.4 J	5.7 J	0.77 J	0.99 J	1.6 J	2.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.3 J	2.4 J	5.6 J	4.4 J	1.8 J	4.9 J	2.3 J	1.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	9.2	0.87	2.7	3.2	2.2	2.4	1.2	3.2
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	9.4	1.1	2.9	3.4	2.6	2.6	1.6	3.4
General Chemistry									
Percent solids	%	--	--	--	--	--	--	--	--
Percent solids, vol.	%	59.3	72.0	67.7	61.3	63.1	63.6	61.1	64.0

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high

ED_014247_00001095-00044

Table 2

Supplemental Design Investigation – Waste Characterization Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB101-Waste 11215702-072521-SS-SJSB101(0-2)-WC 07/25/21 (0-2) ft bgs	SJSB101-Waste 11215702-072521-SS-SJSB101(2-4)-WC 07/25/21 (2-4) ft bgs	SJSB102-Waste 11215702-081921-BN-SJSB102(8-10)-WC 08/19/21 (8-10) ft bgs	SJSB102-Waste 11215702-081921-BN-SJSB102(10-12)-WC 08/19/21 (10-12) ft bgs	SJSB083-Waste 11215702-072221-BN-SJSB083(8-10)-WC 07/22/21 (8-10) ft bgs	SJSB083-Waste 11215702-072221-BN-SJSB083(10-12)-WC 07/22/21 (10-12) ft bgs
TCLP-Herbicides							
2,4,5-TP (Silvex)	mg/L	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
TCLP-Metals							
Arsenic	mg/L	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U
Barium	mg/L	1.4 J	0.98 J	0.22 J	0.28 J	0.86 J	0.39 J
Cadmium	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chromium	mg/L	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
Lead	mg/L	0.033 J	0.029 U	0.029 U	0.029 U	0.029 U	0.029 U
Mercury	mg/L	0.00013 U	0.00016 J	0.00013 U	0.00013 U	0.00013 U	0.00013 U
Selenium	mg/L	0.036 U	0.036 U	0.036 U	0.036 U	0.50 U	0.036 U
Silver	mg/L	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U
PCBs							
Aroclor-1016 (PCB-1016)	ug/kg	13 U	10 U	7.2 U	8.5 U	11 U	8.0 U
Aroclor-1221 (PCB-1221)	ug/kg	14 U	11 U	7.9 U	9.2 U	12 U	8.7 U
Aroclor-1232 (PCB-1232)	ug/kg	9.5 U	7.7 U	5.4 U	6.4 U	8.2 U	6.0 U
Aroclor-1242 (PCB-1242)	ug/kg	5.7 U	4.6 U	3.3 U	3.8 U	4.9 U	3.6 U
Aroclor-1248 (PCB-1248)	ug/kg	9.3 U	7.6 U	5.3 U	6.3 U	8.1 U	5.9 U
Aroclor-1254 (PCB-1254)	ug/kg	12 U	9.5 U	6.7 U	7.8 U	10 U	7.4 U
Aroclor-1260 (PCB-1260)	ug/kg	1500	1900	6.3 U	7.4 U	670	7.0 U
TCLP-Pesticides							
Chlordane, technical	mg/L	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U
Endrin	mg/L	0.000091 U	0.000091 U	0.000091 U	0.000091 U	0.000091 U	0.000091 U
gamma-BHC (lindane)	mg/L	0.00012 U	0.00012 U	0.00012 U	0.00012 U	0.00012 U	0.00012 U
Heptachlor	mg/L	0.00018 U	0.00018 U	0.00018 U	0.00018 U	0.00018 U	0.00018 U
Heptachlor epoxide	mg/L	0.00014 U	0.00014 U	0.00014 U	0.00014 U	0.00014 U	0.00014 U
Methoxychlor	mg/L	0.00031 U	0.00031 U	0.00031 U	0.00031 U	0.00031 U	0.00031 U
Toxaphene	mg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
TCLP-Semi-Volatile Organic Compounds (SVOCs)							
1,4-Dichlorobenzene	mg/L	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U
2,4,5-Trichlorophenol	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
2,4,6-Trichlorophenol	mg/L	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U
2,4-Dinitrotoluene	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
2-Methylphenol	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
3&4-Methylphenol	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
Hexachlorobenzene	mg/L	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
Hexachlorobutadiene	mg/L	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U
Hexachloroethane	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
Methylphenol (cresol)	mg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Nitrobenzene	mg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	mg/L	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U
Pyridine	mg/L	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U
TCLP-Volatile Organic Compounds (VOCs)							
1,1-Dichloroethene	mg/L	0.057 U	0.057 U	0.11 U	0.11 U	0.057 U	0.057 U
1,2-Dichloroethane	mg/L	0.029 U	0.029 U	0.058 U	0.058 U	0.029 U	0.029 U
1,4-Dichlorobenzene	mg/L	0.020 U	0.020 U	0.041 U	0.041 U	0.020 U	0.020 U
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	0.058 U	0.058 U	0.12 U	0.12 U	0.058 U	0.058 U
Benzene	mg/L	0.039 U	0.039 U	0.079 U	0.079 U	0.039 U	0.039 U
Carbon tetrachloride	mg/L	0.066 U	0.066 U	0.13 U	0.13 U	0.066 U	0.066 U
Chlorobenzene	mg/L	0.032 U	0.032 U	0.063 U	0.063 U	0.032 U	0.032 U
Chloroform (Trichloromethane)	mg/L	0.042 U	0.042 U	0.085 U	0.085 U	0.042 U	0.042 U
Tetrachloroethene	mg/L	0.040 U	0.040 U	0.080 U	0.080 U	0.040 U	0.040 U
Trichloroethene	mg/L	0.030 U	0.030 U	0.060 U	0.060 U	0.030 U	0.030 U
Vinyl chloride	mg/L	0.073 U	0.073 U	0.15 U	0.15 U	0.073 U	0.073 U
General Chemistry							
Cyanide (total)	mg/kg	0.51 U	0.50 U	0.29 U	0.36 U	0.48 U	0.37 U
Free liquid	none	0.10 CNF	0.10 CNF	0.10 CNF	0.10 CNF	0.10 CNF	0.10 CFL
Ignitability	Deg F	140	140	140	140	140	140
pH, lab	s.u.	9.5 J-	8.0 J-	8.8 J-	8.4 J-	8.6 J-	8.9 J-
Reactive cyanide	mg/kg	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
Reactive sulfide	mg/kg	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	25
Sulfide	mg/kg	15 U	17 U	8.2 U	9.1 U	13 U	11 U

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
J- - Estimated concentration, result may be biased low
CNL - Contains Free Liquid.
CNF - Contains No Free Liquid.
TCLP - Toxicity Characteristic Leaching Procedure

Table 3

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

	SJSB072	SJSB073	SJSB074	DUP-5 (74 2-4)	SJSB075	DUP-1 (75 4-6)	SJSB076	SJSB077	DUP-3 (77 6-8)	SJSB078	DUP-2 (78 14-16)	SJSB079	DUP-7 (79 8-10)	SJSB080	DUP-4 (80 16-18)	SJSB081	DUP-13 (81 6-8)	SJSB082	DUP-16 (82 6-8)
ELEVATION																			
+5																			
+4			7,800																
+3					NA		3,000												
+2	NA	9.6	70,000	59,000	NA		49,000	NA		33,000		32,000		23,000					
+1	NA	31,000	30,000		NA	55,000	63,000	NA		47,000		52,000		14,000				15,000	
0	NA	26,000	87		NA		210	NA		86,000		28,000		9,200		2,300		670	
-1	NA	68,000	5.1		NA		11	63,000	61,000	32		50,000		3,200		47,000		2,000	
-2	12	83,000	3.1		270		150	77,000		64		45,000	50,000	1,500		47,000		7.7	5.4
-3	340	41	0.37		0.88		21	50		91		190		12		5.3	2.1	120	
-4	1.3	5.2	2.6		1.8		5.2	24		16		3.1		1.5		19,000		4.1	
-5	1.7	15	0.84		6.7		3.7	350		7.3	12	16		0.44		280		1.1	
-6	34	5.6						0.21		120		0.64		13	3	2.8		3.7	
-7	0.52									2.7						1.7		0.99	
-8	74									260						0.87			
-9	0.81									0.42									
-10																			
-11																			
-12																			
-13																			
-14																			
-15																			
-16																			
-17																			
-18																			
-19																			
-20																			
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			
-33																			
-34																			
-35																			
-36																			
-37																			
-38																			
-39																			
-40																			

Table 3

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB083	SJSB083 WC	SJSB084	SJSB085	SJSB086	DUP-12 (86 6-8)	SJSB087	DUP-17 (87 6-8)	SJSB088	DUP-14 (88 6-8)	SJSB089	DUP-19 (89 6-8)	SJSB090	DUP-11 (90 6-8)	SJSB091	DUP-18 (91 6-8)	SJSB092	SJSB094	DUP-8 (94 6-8)
+5																			
+4																			
+3																			
+2																			
+1																			
0																			
-1													62,000						
-2	46,000				5				39,000		820		6,600		16				
-3	2,200		12,000		2.3		4,600		43,000		53		930		6.7		43,000	36,000	
-4	9.8		3,200	42,000	1.3		25,000		50,000		18		6.4	2.9	5.2		28,000	39,000	
-5	14		45	720	1.2	1.1	2,300		54,000	63,000	2.5	3.5	260		2.5	2.7	130	41,000	
-6	15,000	4,400	23	27	2.2		10	2.4	51,000		52		5.3		2.1		4.8	15,000	830
-7	200	47	6.1	44	2.3		570		5.3		34		9.1		2.4		27	5,500	
-8	24		7.8	25	3.2		3.5		0.68		2		4.1		2.4		26	32	
-9	9		6.1	4.3	2.9		110		1.3		2.3		2.3		2.2		10,000	2	
-10	0.72		3.7	7	1.6		570		520		0.4				2.7		11	3.2	
-11	4.8		3.9	11			3		2.5								7.2	1.9	
-12				7.8					2.2										
-13																			
-14									1.1										
-15																			
-16																			
-17																			
-18																			
-19																			
-20																			
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			
-33																			
-34																			
-35																			
-36																			
-37																			
-38																			
-39																			
-40																			

Table 3

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB095	DUP-10 (95 6-8)	SJSB096	DUP-9 (96 6-8)	SJSB097	DUP-20 (97 6-8)	SJSB098	SJSB099	DUP-6 (99 16-18)	SJSB101	SJSB101 WC	SJSB102	SJSB103	SJSB104	SJSB105	SJSB0106	DUP-15 (106 6-8)
+5																	
+4																	
+3																	
+2																	
+1																	
0								53,000		63,000	52,000						
-1																	
-2	35,000							54,000		59,000	47,000	1,400					
-3																39	
-4	59							130		25,000		5.9			36,000		
-5														15		3.6	
-6	1		87,000					13		18		340			48,000		
-7														2.8		9.4	
-8	2.3	9.7	22,000					15		2.7		24			240		
-9														11		2.9	1.1
-10	1,200		310					180		230		5.6			29		
-11														2.6		3.4	
-12	57		4.9	4.2				1.9		0.62		2.5			13		
-13														1.7		2.6	
-14	6		2,800				71	26		0.27		34			17		
-15					5.2								2.2	1.8		2.6	
-16	54		67				1,900	7	14	11		1.4			350		
-17					1.2								1.1	0.53		1.6	
-18	0.6		5.2				1,800			3.2		110			60		
-19					1.8								14	0.25		3.4	
-20			1.9				160					8.9			7.7		
-21					1.4	1.3							4.8	0.2			
-22			13				9,600					3.9					
-23					2.6								3.9				
-24							3,900					4					
-25					0.77								0.49				
-26							680										
-27					1.4								0.46				
-28							11										
-29					0.29												
-30							0.16										
-31																	
-32																	
-33																	
-34																	
-35																	
-36																	
-37																	
-38																	
-39																	
-40																	

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 29, 2021

Ms. Lauren Poulos
US Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

Via email

Re: Remedial Action Work Plan for the Southern Impoundment, San Jacinto River Waste Pits Federal Superfund Site, Highlands, Harris County, Texas

Dear Ms. Poulos:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the draft Remedial Action Work Plan for the Southern Impoundment of the San Jacinto River Waste Pits Federal Superfund Site and has the following comments.

Remedial Action Work Plan Comments:

Section 2.3.4: Please specify what type of air emissions that the 5 tons per year or 1 pound per hour limit applies to.

Section 2.4.2.2: Please specify the numbers of samples for additional waste characterization and non-hazardous waste classification analyses.

Section 2.4.5.1: This section states that if the refined water management volumes are less than previously estimated, alternate treatment methods may be evaluated; please be more specific and define the volume that will warrant the alternate treatments evaluation.

Appendix A, Pre-Construction Field Sampling Plan Comments:

Section 5: Waste Characterization Sampling, p. 6: The plan proposes to collect samples for waste characterization for the four RCRA hazardous-waste characteristics from six sample locations known to have high concentrations of dioxins/furans but proposes to collect composite samples for non-hazardous waste classification analyses required by TAC 335.505-506 from the IDW generated in each of the four excavation areas. The TCEQ recommends that the samples from the six high-concentration target intervals also be submitted for the Class 2 Disposal Parameters identified in Table 7.

Section 6.1: Pre-Construction Field Program: Please provide additional information about the construction details of the piezometers. Will they be screened across the entire thickness (0-10 ft bgs) or some subset of that interval? The TCEQ suggests screening to capture pore water within waste if the groundwater samples from the piezometers will be used to confirm parameters requiring water treatment.

Table 1 NE Sidewall Confirmation Samples: For polygon SJSB012-N2, the composite sample NE-S-3 should contain discrete samples from core NE-B3, not NE-B1 (which is located in the interior of the polygon).

Table 2 NC Bottom confirmation samples: TCEQ suggests separating the composite sample NC-B-1 into two samples for the polygons for SJSB008 and SJSB008-S1 and separate the sample NC-B-5 into two samples for SJSB061-C1 and SJSB060/SJSB060-C1 as the existing data suggests that these polygons have different dioxins/furans concentrations in the 8-10 ft interval.

Table 4 SW Side Overburden Confirmation Samples: Please verify if the composite sample SW-O-5 should also include discrete sample SW-H4a.

Table 4 SW Side Wall Confirmation Samples: Please verify whether sample SW-S-2 should be in polygon SJSB065-C1 not in SJSB065.

Table 4 SW Side Wall Confirmation Samples: In polygons SJSB066, SJSB067 and SJSB023-S2, only the top 8 ft of soil was sampled and composited as the confirmation samples (likely due to the shallow contamination in these cells). Since the cleanup level is based on DWA of the top 10 ft of soil, the TCEQ suggests that soil from the 8-10 ft intervals also be collected and added to the composite confirmation samples for each cell.

Table 4 SW Bottom Confirmation Samples: Sample SW-4b in composite sample SW-B-5 should be SW-4d.

Please let me know if you have any questions or would like to discuss these comments.

Sincerely,

Katie Delbecq

Katie Delbecq, P.G., Project Manager
Superfund Section
Remediation Division
Texas Commission on Environmental Quality

KD/cw

San Jacinto River Waste Pits Superfund Site

TWG Update Meeting
Harris County

October 28, 2021

Discussion Topics

- Supplemental Design Investigation Update
  - Data Review
  - Waste Characterization
  - Monitor Deployment
- Remedial Design Update
  - BMP Alignment
  - Hydraulic Heave
  - Hydrogeological Data Evaluation
- Other Updates
  - TxDOT Projects
  - Extension Request (Currently Under Review)
  - Southern Impoundment Update

June 2021: Summary of Northern Impoundment Technical Challenges and Uncertainties

- Excavation Strategy
  - Excavation depth
  - BMP (Wall) Design
  - Water infiltration and risk of hydraulic heave
  - Confirmation Sampling
- TxDOT I-10 Bridge Replacement
- Expansion of Lake Houston Control Structures
  - Data currently being incorporated into design.

ED_014247_00001106-00003

Supplemental Design Investigation Update

Supplemental Design Investigation Updates

- Validated Data
  - Waste Characterization results validated. (Sample locations 101 and 83)
  - Summary table with depth of contamination shown by elevation.
- Data Evaluation
  - Soil boring data increased from 7 locations from RI (used for ROD) to a total of 74 locations across the northern impoundment.
  - Vertical Delineation – Deeper
  - Horizontal Delineation
    - Excavation area expanded in east. (Locations 92 and 105 above 30 ng/kg)
    - Two samples below cleanup value in NW corner (Locations 103 and 97 under 30 ng/kg)
    - Expect realignment of BMP

ED_014247_00001106-00005

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

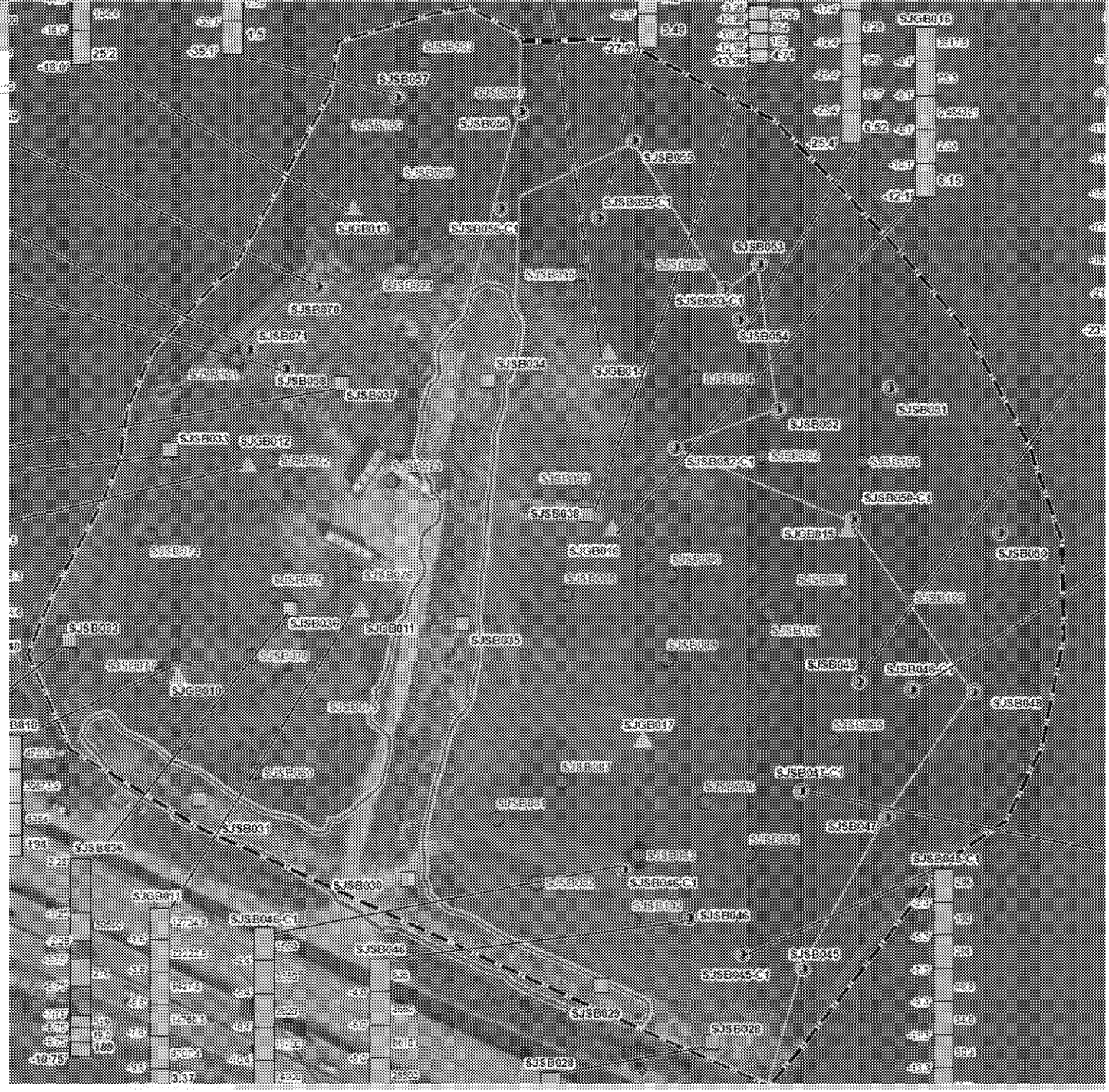
ELEVATION	SJSB072	SJSB073	SJSB074	DUP-5 (74 2-4)	SJSB075	DUP-1 (75 4-6)	SJSB076	SJSB077	DUP-3 (77 6-8)	SJSB078	DUP-2 (78 14-16)	SJSB079	DUP-7 (79 8-10)	SJSB080	DUP-4 (80 16-18)	SJSB081	DUP-13 (81 6-8)	SJSB082	DUP-16 (82 6-8)
+5																			
+4			7,800																
+3					NA		3,000												
+2	NA	9.6	70,000	59,000				NA		33,000		32,000		23,000					
+1					NA		49,000												
0	NA	31,000	30,000					NA		47,000		52,000		14,000					
-1					NA	55,000	63,000											15,000	
-2	NA	26,000	87					NA		86,000		28,000		9,200		2,300			
-3					NA		210											670	
-4	NA	68,000	5.1					63,000	61,000	32		50,000		3,200		47,000			
-5					NA		11											2,000	
-6	12	83,000	3.1					77,000		64		45,000	50,000	1,500		47,000			
-7					270		150											7.7	5.4
-8	340	41	0.37					50		91		190		12		5.3	2.1		
-9					0.88		21											120	
-10	1.3	5.2	2.6					24		16		3.1		1.5		19,000			
-11					1.8		5.2											4.1	
-12	1.7	15	0.84					350		7.3	12	16		0.44		280			
-13					6.7		3.7											1.1	
-14	34	5.6						0.21		120		0.64		13	3	2.8			
-15																		3.7	
-16	0.52									2.7						1.7			
-17																		0.99	
-18	74									260						0.87			
-19																			
-20	0.81									0.42									
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

	SJSB083	SJSB083 WC	SJSB084	SJSB085	SJSB086	DUP-12 (86 6-8)	SJSB087	DUP-17 (87 6-8)	SJSB088	DUP-14 (88 6-8)	SJSB089	DUP-19 (89 6-8)	SJSB090	DUP-11 (90 6-8)	SJSB091	DUP-18 (91 6-8)	SJSB092	SJSB094	DUP-8 (94 6-8)
ELEVATION																			
+5																			
+4																			
+3																			
+2																			
+1																			
0																			
-1																			
-2	46,000				5				39,000		820		62,000						
-3	2,200		12,000		2.3		4,600		43,000		53		6,600		16		43,000	36,000	
-4	9.8		3,200	42,000	1.3		25,000		50,000		18		930		6.7		28,000	39,000	
-5	14		45	720	1.2	1.1	2,300		54,000	63,000	2.5	3.5	6.4	2.9	5.2		130	41,000	
-6	15,000	4,400	23	27	2.2		10	2.4	51,000		52		260		2.5	2.7	4.8	15,000	830
-7	200	47	6.1	44	2.3		570		5.3		34		5.3		2.1		27	5,500	
-8	24		7.8	25	3.2		3.5		0.68		2		9.1		2.4		26	32	
-9	9		6.1	4.3	2.9		110		1.3		2.3		4.1		2.4		10,000	2	
-10	0.72		3.7	7	1.6		570		520		0.4		2.3		2.2		11	3.2	
-11	4.8		3.9	11			3		2.5						2.7		7.2	1.9	
-12				7.8					2.2										
-13									1.1										
-14																			
-15																			
-16																			
-17																			
-18																			
-19																			
-20																			
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			

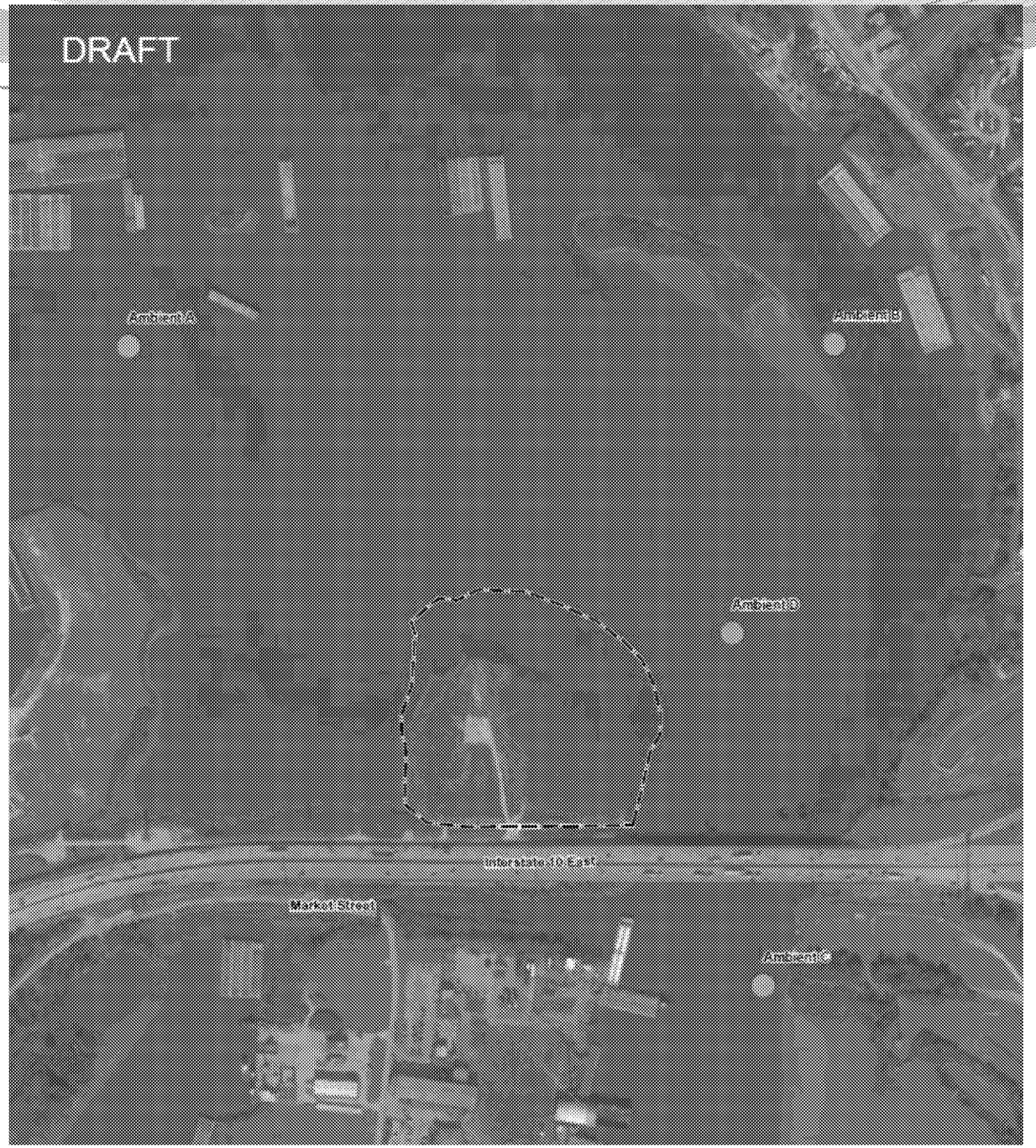
Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB095	DUP-10 (95 6-8)	SJSB096	DUP-9 (96 6-8)	SJSB097	DUP-20 (97 6-8)	SJSB098	SJSB099	DUP-6 (99 16-18)	SJSB101	SJSB101 WC	SJSB102	SJSB103	SJSB104	SJSB105	SJSB0106	DUP-15 (106 6-8)
+5																	
+4																	
+3																	
+2																	
+1																	
0								53,000		63,000	52,000						
-1																	
-2	35,000							54,000		59,000	47,000	1,400					
-3																39	
-4	59							130		25,000		5.9			36,000		
-5														15		3.6	
-6	1		87,000					13		18		340			48,000		
-7														2.8		9.4	
-8	2.3	9.7	22,000					15		2.7		24			240		
-9														11		2.9	1.1
-10	1,200		310					180		230		5.6			29		
-11														2.6		3.4	
-12	57		4.9	4.2				1.9		0.62		2.5			13		
-13														1.7		2.6	
-14	6		2,800				71	26		0.27		34			17		
-15					5.2								2.2	1.8		2.6	
-16	54		67				1,900	7	14	11		1.4			350		
-17					1.2								1.1	0.53		1.6	
-18	0.6		5.2				1,800			3.2		110			60		
-19					1.8								14	0.25		3.4	
-20			1.9				160					8.9			7.7		
-21					1.4	1.3							4.8	0.2			
-22			13				9,600					3.9					
-23					2.6								3.9				
-24							3,900					4					
-25					0.77								0.49				
-26							680										
-27					1.4								0.46				
-28							11										
-29					0.29												
-30							0.16										
-31																	
-32																	



Velocity and Turbidity Monitor Deployment

- Getting final approvals from USCG.
- May move ambient monitor A closer to site.

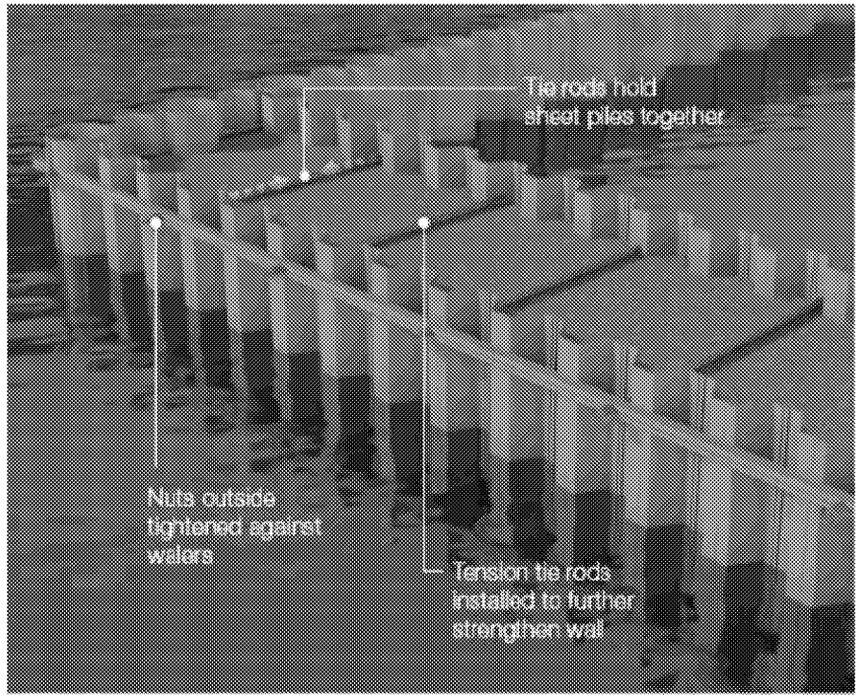


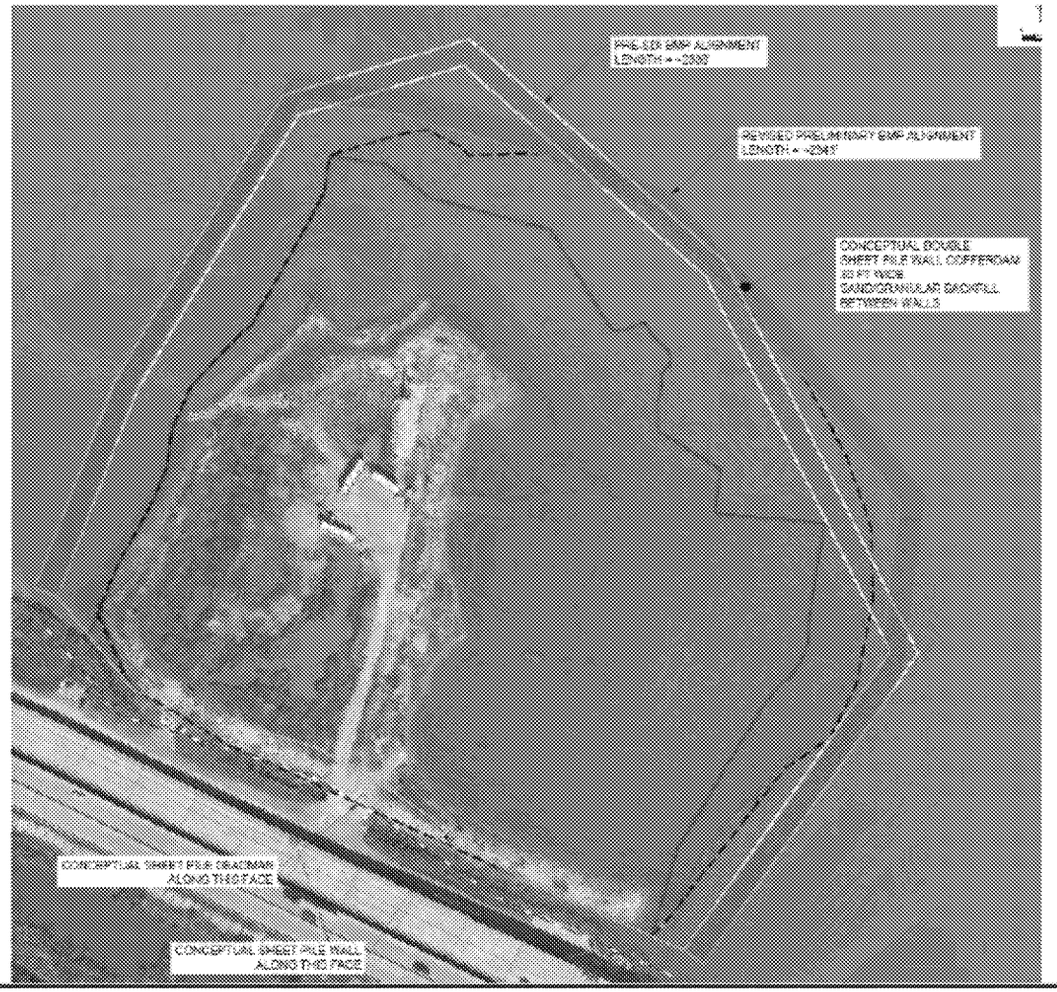
Remedial Design Update

ED_014247_00001106-00011

Preliminary Revised BMP Alignment

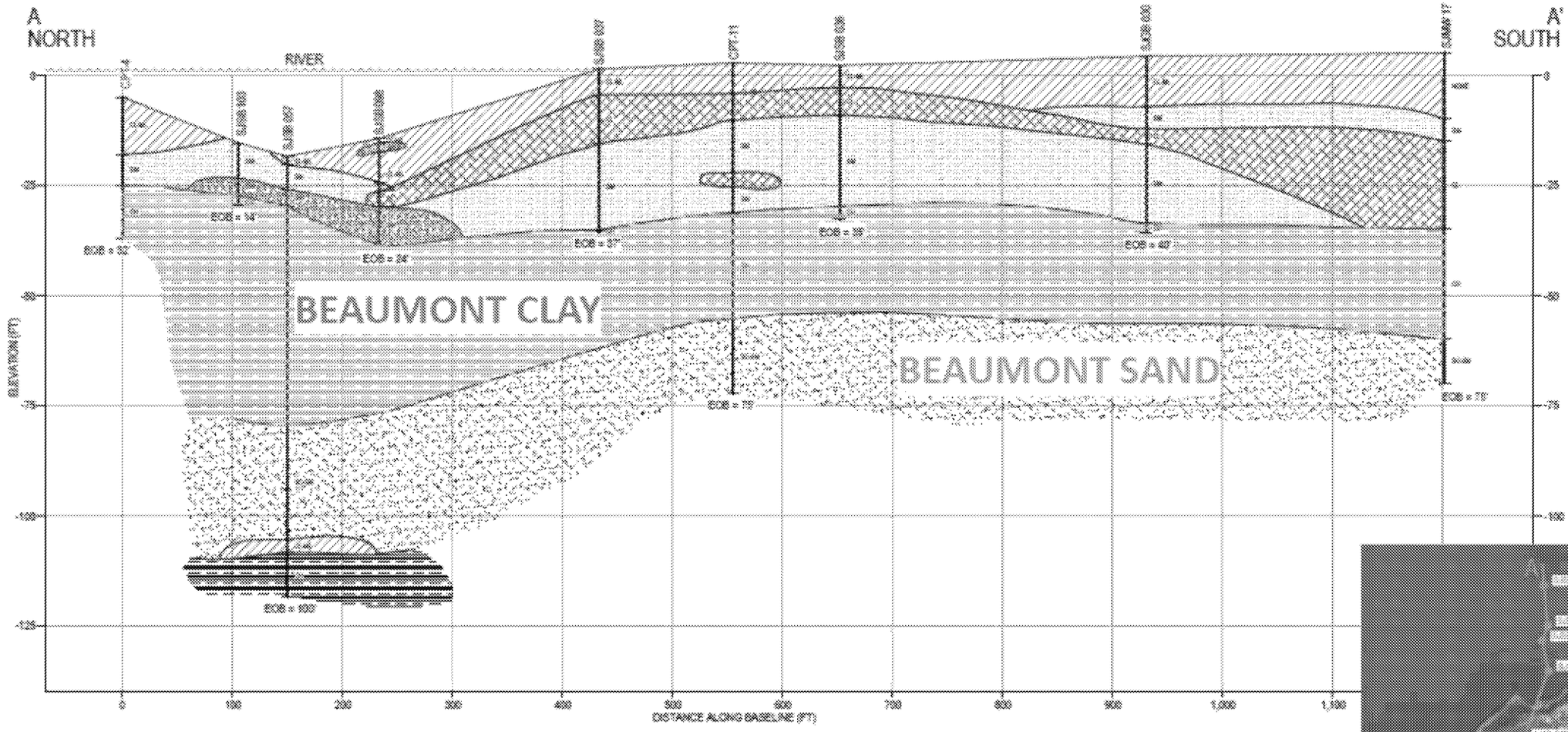
- BMP alignment has shifted further to the east and has been pulled in in the Northwest corner
- The BMP is now fully outside the footprint of the TCRA Cap
- Will be working to refine the alignment based on the excavation surface, site-specific bathymetry, and presence of rock

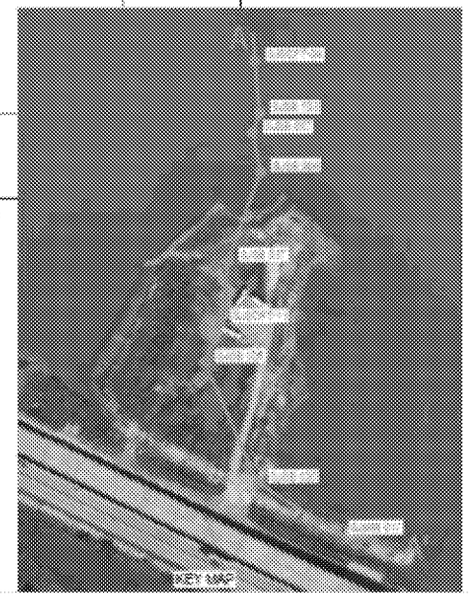




DRAFT - FOR DISCUSSION PURPOSES

Geological Cross-Section





SILTY CLAY TO CLAYEY SILT, SOFT (CL-ML)

SILTY SAND WITH CLAY (SM)

BEAUMONT CLAY (CH)

SANDY TO SILTY CLAY (CL)

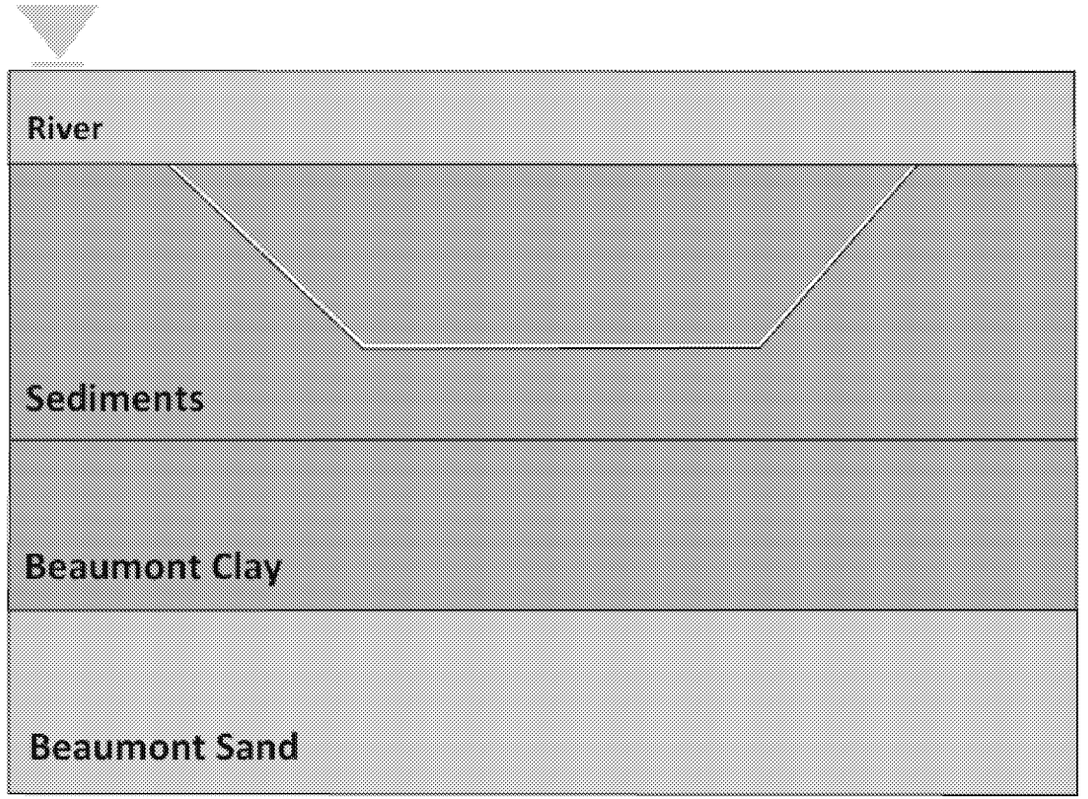
CLAYEY SILTY SAND (SC-SM)

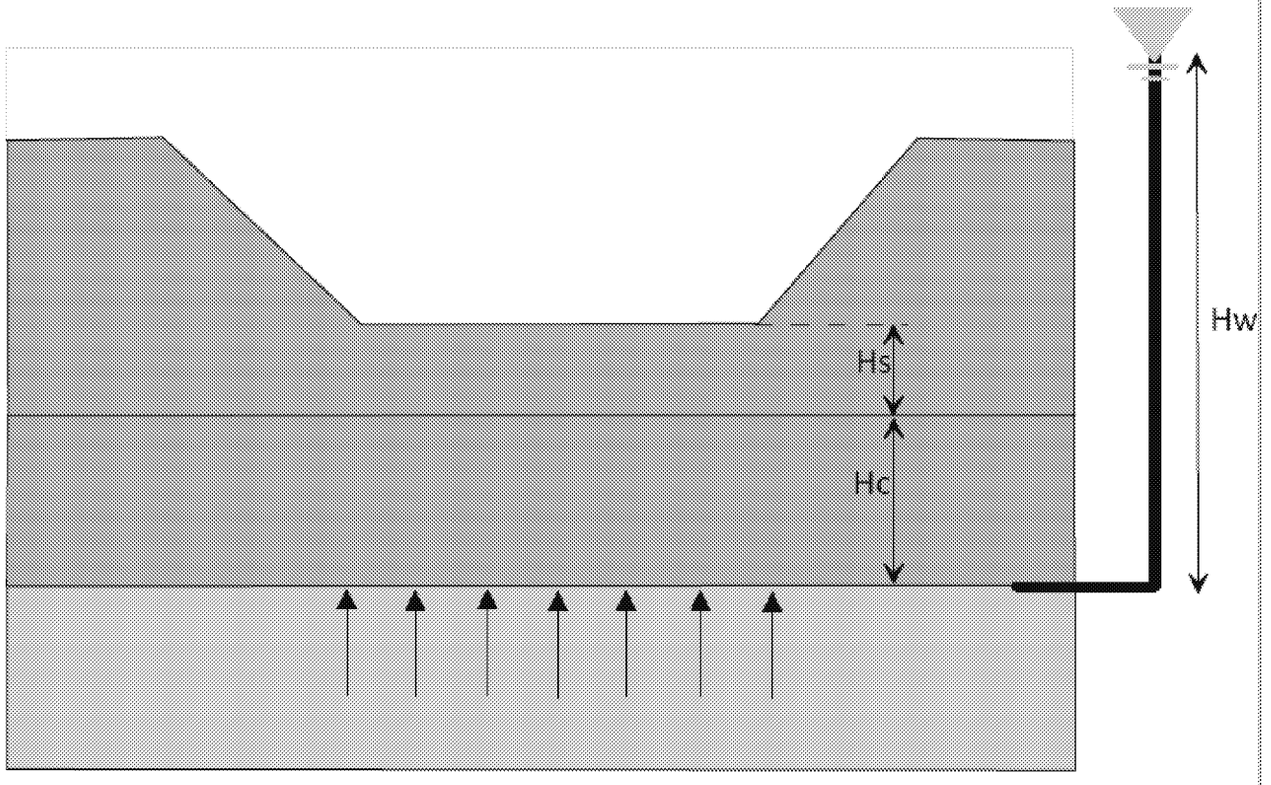
GRAVELLY SAND (SW)

GRAY CLAY (CH)

DRAFT - FOR DISCUSSION PURPOSES

Hydraulic Heave – Basic Concepts





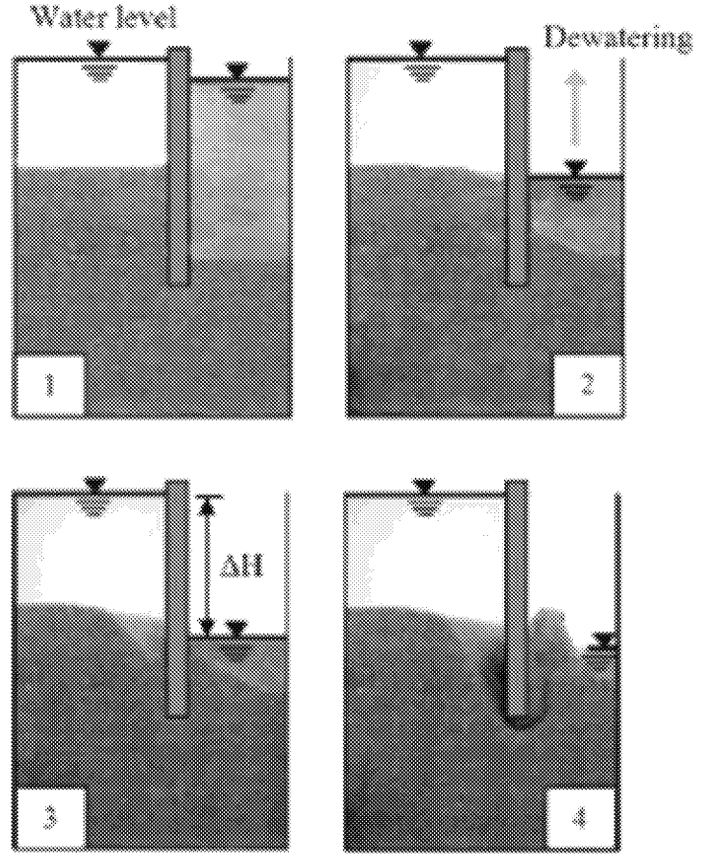
$$FS = \frac{Hs.\gamma s + Hc.\gamma c}{Hw.\gamma w} > 1.25$$

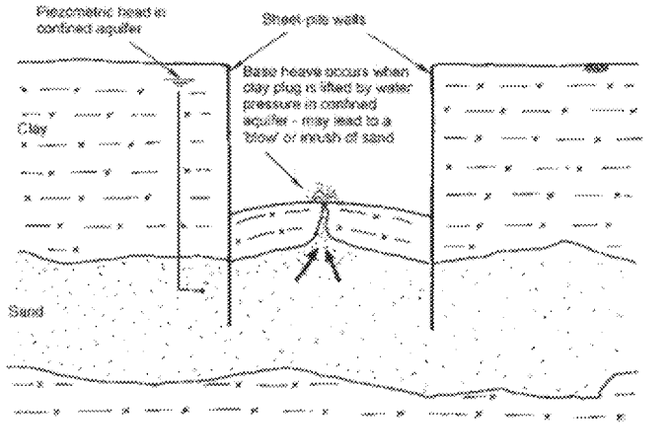
DRAFT - FOR DISCUSSION PURPOSES

ED_014247_00001106-00014

Potential Consequences of Hydraulic Heave

- Worker safety risks
- Excavation stability (ie: excavation fills with sand and water)
- Introduction of contamination into deep aquifer (Beaumont Sand)

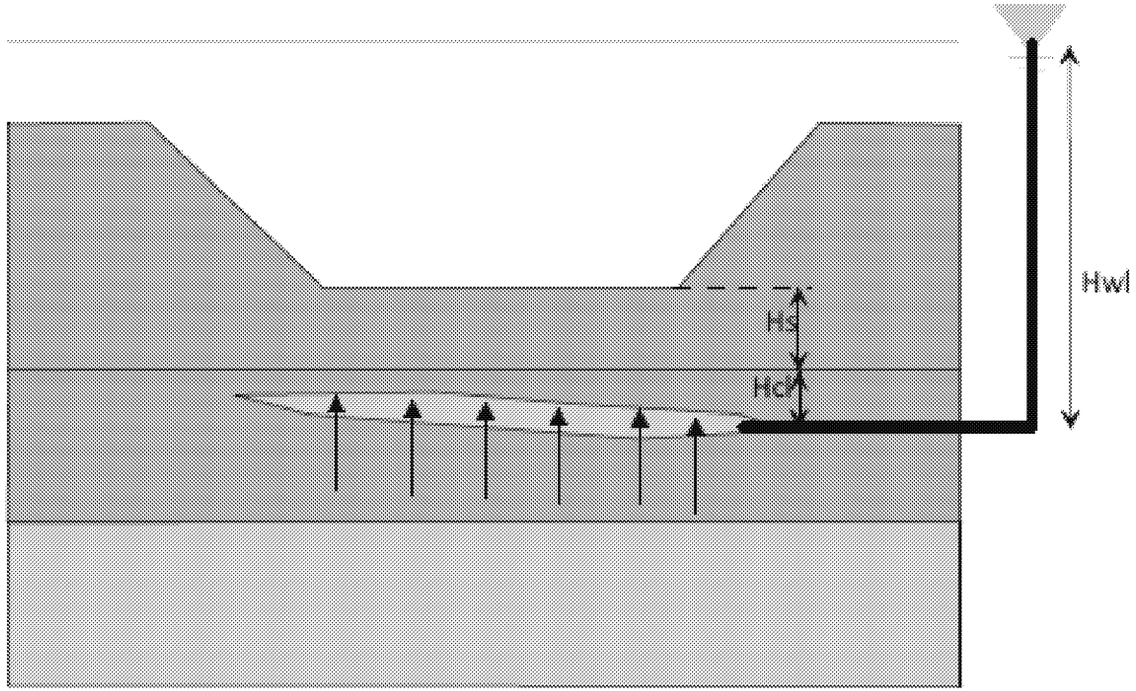




DRAFT - FOR DISCUSSION PURPOSES

https://www.youtube.com/watch?v=ZQvtz3KISvw)

Potential Impact of Sand Lenses on the Hydraulic Heave



$$FS = \frac{Hs.\gamma s + Hcl.\gamma c}{Hwl.\gamma w} > 1.25$$

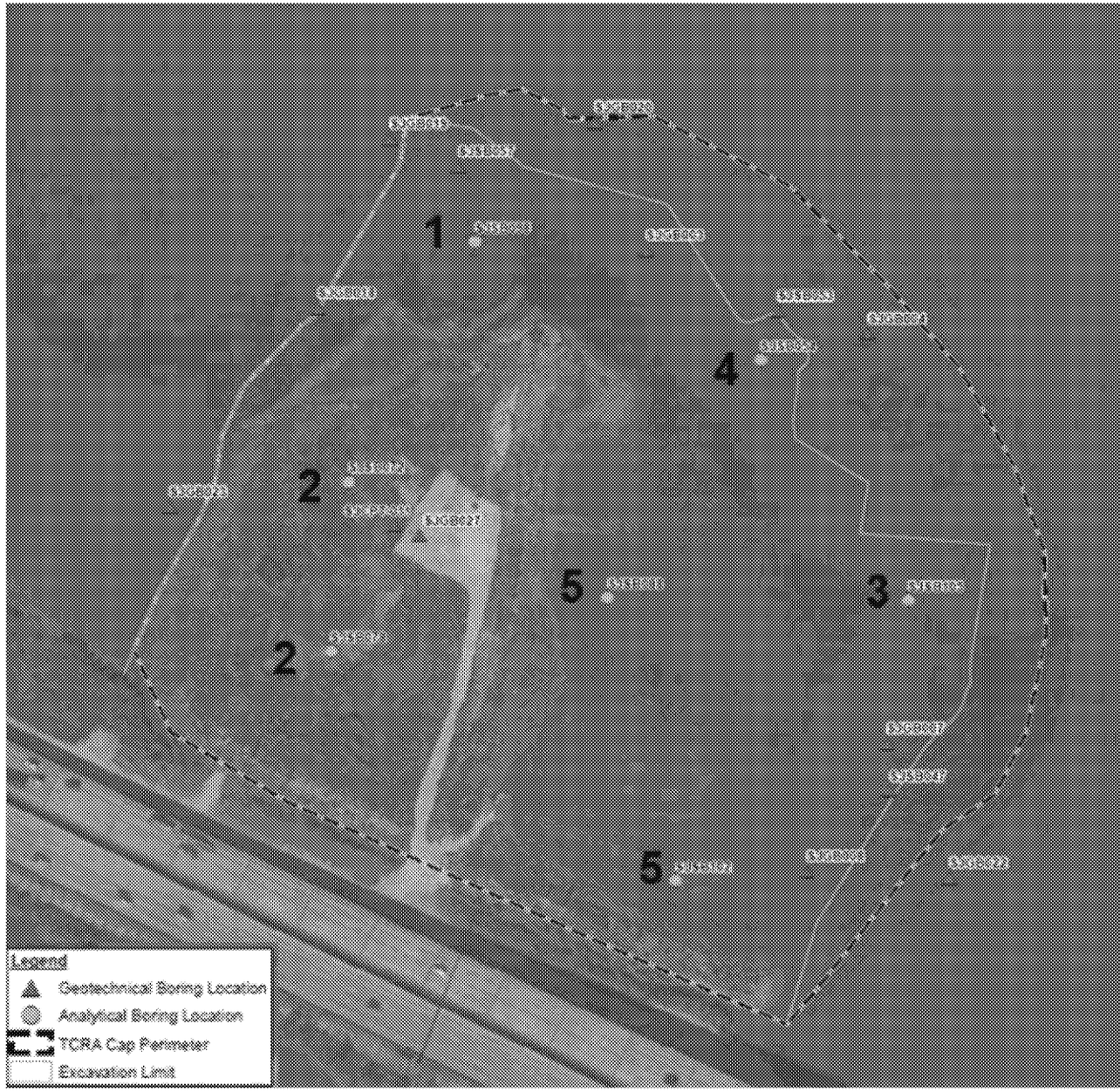
DRAFT - FOR DISCUSSION PURPOSES

ED_014247_00001106-00016

Factor of Safety Results

Zone	Floor Excavation Elevation (ft)	FS
1	-28.4 (SJSB098)	1.21* 0.84* 0.69*
2	-20.4 (SJSB072 & SJSB078)	1.00* 1.12 1.21 1.11
3	-20.4 -20.4 (SJSB105)	1.12 1.17 1.17
4	-23.4 (SJSB054)	1.45 1.24 1.22
5	-20.1 (SJSB088 & SJSB102)	1.29

*FS Considers Sand Lenses



DRAFT - FOR DISCUSSION PURPOSES

Hydrogeological Data Evaluation

- During the SDI, 4 temporary piezometers were installed -2 shallow wells at different depths in the alluvium and 2 deep piezometers in the Beaumont Sand
- Aquifer testing (slug testing) was performed
  - The resulting hydraulic conductivity values were consistent with those assumed in the 30% RD
  - Results indicate that the deeper alluvial sand will produce water at a high rate in the excavations –that water will need to be managed during the RA
- A transducer was installed in one of the deep piezometers to assess deep aquifer background fluctuations
  - Results indicate that the Beaumont Sand is tidally influenced

Other Updates

ED_014247_00001106-00019

TxDOT Projects

- Dolphin/Fender Project
  - Delayed
  - Will take approximately 1 year.
  - Do not expect to impact site.
- I-10 Bridge Project
  - Continue quarterly calls regarding I-10 design.
  - Bridge project currently unfunded.
  - Updated TxDOT regarding Southern Impoundment UAO.

ED_014247_00001106-00020

Extension Request

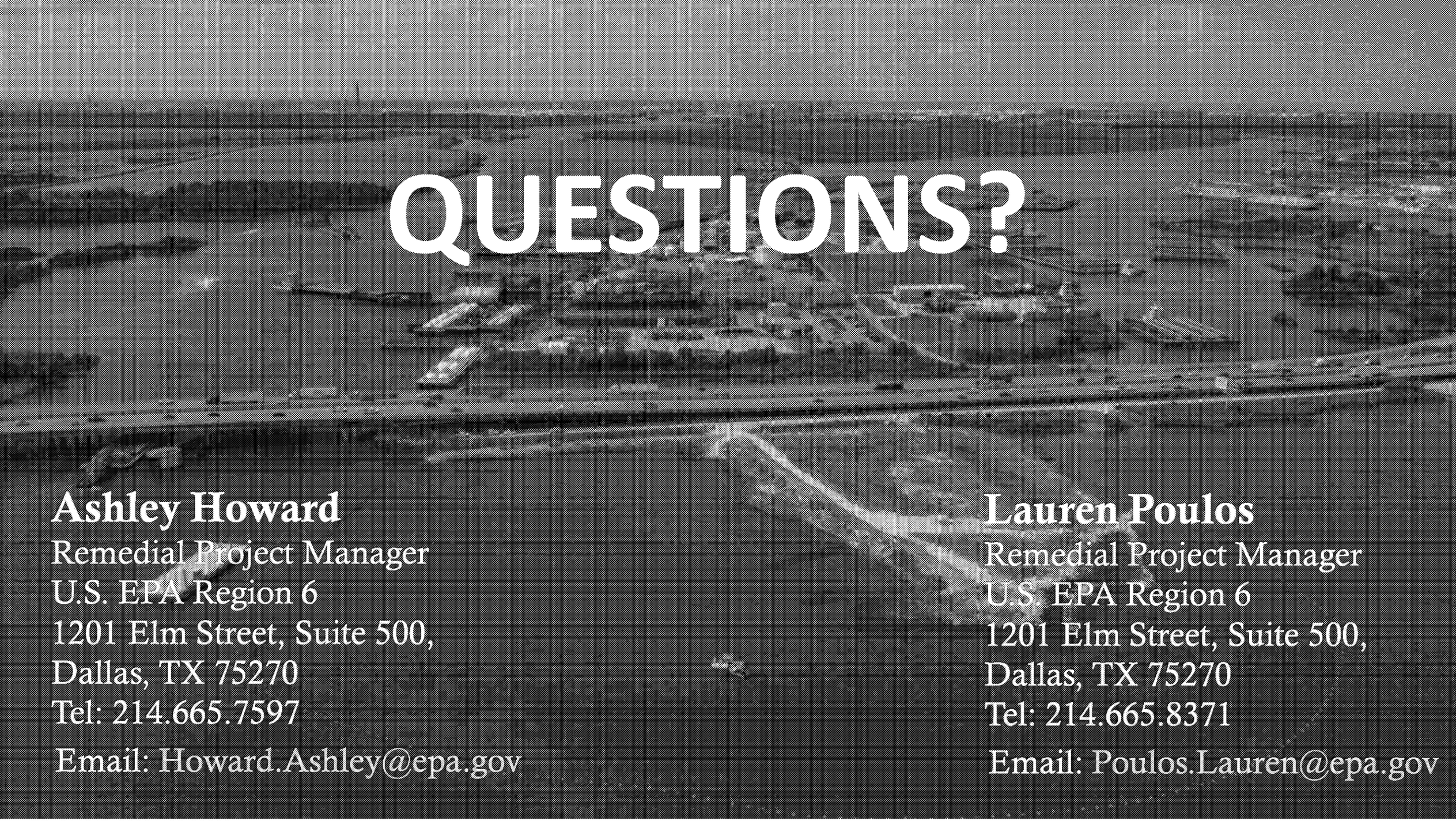
- GHD requested an additional 160 days after receipt of the preliminary SDI data to complete the Northern Impoundment 90% RD. Based on a date of October 1, 2021 for receipt of all preliminary analytical data, they requested an extension to June 26, 2022.
- This request is still under EPA review.

ED_014247_00001106-00021

Southern Impoundment

- UAO finalized September 2, 2021
- Supervising Contractor (GHD) and Project Coordinator (Charles Munce) approved September 2021
- Remedial Action Work Plan submitted to EPA October 14, 2021
  - Currently under review
  - Reminder: provide any comments to Lauren Poulos by this Friday, October 29, 2021 (poulos.lauren@epa.gov)
- Next Steps: Pre-Construction Sampling

ED_014247_00001106-00022



Ashley Howard
Remedial Project Manager
U.S. EPA Region 6
1201 Elm Street, Suite 500,
Dallas, TX 75270
Tel: 214.665.7597
Email: Howard.Ashley@epa.gov

Lauren Poulos
Remedial Project Manager
U.S. EPA Region 6
1201 Elm Street, Suite 500,
Dallas, TX 75270
Tel: 214.665.8371
Email: Poulos.Lauren@epa.gov

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 17, 2021

Ashley Howard
US EPA
1201 Elm Street
Dallas, Texas 75270

Via email

Subject: Comments on the Draft Supplemental Design Investigation Sampling Plan, San Jacinto River Waste Pits Superfund Site, Harris County, Texas

Dear Ms. Howard:

The Texas Commission on Environmental Quality has reviewed the Draft Supplemental Design Investigation Sampling Plan for Northern Impoundment of the San Jacinto River Waste Pits site and has the following comments.

1. **Section 2.1.1:** The plan proposes that if the 16-18 ft interval is above the clean-up level, the next interval sample will be analyzed, and so on until a clean interval is observed. To save time and thoroughly delineate the bottom of waste, the TCEQ suggests analyzing all three of the archived samples below 18 ft bgs if the 16-18 ft bgs interval concentration is above the clean-up level.
2. **Section 2.3, p. 5:** The final paragraph of this section proposes that a slug test will be performed to evaluate the hydraulic conductivity of the strata through which each temporary monitoring well is screened. Aquifer tests were not part of the Pre-Design Investigation Phase 2 (PDI-2) scope of work so standard operating procedures (SOPs) for aquifer testing methodology were not included in PDI-2 Field Sampling Plan Appendix C-1. Please provide an SOP or similarly detailed description of the aquifer testing methodology proposed (slug test and Pressuremeter test).
3. To reduce the need for re-digging and the risks associated with it, the TCEQ suggests more extensive delineation be conducted at the deep northwestern corner of the removal area and surrounding the articulated concrete block mat (ACBM).
4. Since hydraulic heave may be more likely to occur in the deep excavation areas, the TCEQ suggests installation of additional deep piezometer(s) in the northwest area and eastern area in addition to the proposed location.
5. The TCEQ requests that additional waste characterization samples be taken in locations of known contamination to supplement waste characterization sampling performed during previous PDI activities.

Please let me know if you have any questions or would like to arrange a call to discuss these comments.

Sincerely,

Katie Delbecq, P.G.
Superfund Section
Remediation Division
Texas Commission on Environmental Quality
Phone: (512) 239-2505

Cc: Lauren Polous, EPA Region 6 Remedial Project Manager, via email.

5551 Corporate Boulevard, Suite 200
Baton Rouge, Louisiana 70808
United States
www.GHD.com

Our Ref.: 11215702-Howard-8

July 26, 2021

Ms. Ashley Howard
Environmental Protection Agency Remedial Project Manager (SEDRA)
1201 Elm Street, Suite 500
Dallas, Texas 75270

SDI Sampling Plan Refinement Notice - 1
San Jacinto River Waste Pits Superfund Site
EPA Region 6, CERCLA Docket No. 06-02-18 for Remedial Design

Dear Ms. Howard:

GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents), has prepared a Work Plan Refinement Notice for the *Supplemental Design Investigation Sampling Plan - Revision 1* (Sampling Plan), approved by the United States Environmental Protection Agency (EPA) on June 4, 2021. As discussed during a weekly call with the EPA on Monday, July 19, 2021, the Respondents request to revise the approach to the collection of additional waste characterization samples due to short analytical hold times for Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics parameters.

As detailed in the Sampling Plan, during installation of analytical borings SJSB083 and SJSB101, duplicate samples would be collected from each planned 2-foot (ft) interval from 0 to 24 feet below ground surface (ft bgs) and archived for potential waste characterization, pending dioxins analytical results. Upon receipt of the dioxins analytical results, the two samples in each boring with the highest dioxins concentrations would be identified and the duplicate samples from those intervals would be analyzed for RCRA hazardous waste characteristics per EPA-required test methodology in 40 Code of Federal Regulations (CFR) Part 261.

Certain RCRA constituents must be analyzed within seven days of sample collection to be in accordance with the required test methodology in 40 CFR Part 261, which would not allow sufficient time to receive the results of the initial dioxins analyses. To avoid hold time issues, specific intervals from SJSB083 and SJSB101 have been pre-selected based on the highest dioxins concentrations reported in the collocated historic soil borings (SJSB046-C1 and SJSB071, respectively) completed during the Second Pre-Design Investigation (PDI-2). These selected intervals are:

- SBSB083:
  - 8 to 10 ft bgs (PDI-2 boring SJSB046-C1 dioxin concentration - 11,700 nanograms per kilogram [ng/kg])
  - 10 to 12 ft bgs (PDI-2 boring SJSB046-C1 dioxin concentration - 14,900 ng/kg)
- SBSB101:
  - 0 to 2 ft bgs (PDI-2 boring SJSB071 dioxin concentration - 34,700 ng/kg)
  - 2 to 4 ft bgs (PDI-2 boring SJSB071 dioxin concentration - 45,900 ng/kg)

Should you have any questions or require additional information regarding this submittal, please contact GHD at (225) 292-9007.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(832) 380-7655
Charles.Munce@GHD.com

CWM/jlf/8

cc: Lauren Poulos, EPA
Phil Slowiak, IPC
Brent Sasser, IPC
Judy Armour, MIMC

Approvals:

San Jacinto Project Coordinator: _____ Date: July 26, 2021
Charles W. Munce

EPA Remedial Project Manager: Ashley Howard _____ Date: August 4, 2021
Ashley Howard

Message

From: Howard, Ashley [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D150EBA7F6F84A9CA2356C2080A966B4-HOWARD, ASHLEYA]
Sent: 11/16/2021 1:05:42 PM
To: Janie Smith [Janie.Smith@ghd.com]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Philip J Slowiak [Philip.Slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Charles Munce [charles.munce@ghd.com]; Armour, Judy [jarmour@wm.com]; Poulos, Lauren [poulos.lauren@epa.gov]
Subject: RE: San Jacinto April TWG Meeting Summary

Janie,

Please incorporate the following into the April TWG notes. We can discuss language further during weekly meeting tomorrow if needed.

- RTC Table
  - Please add the date the Draft RTC table was received in first page bullet (April 15, 2021).
  - Please add RTC table as attachment to notes.
- Waste Characterization
  - Under the waste characterization section, please add the following discussion point from EPA's notes:
    - EPA suggested choosing a different sample location on the west side that is co-located with a boring from a more recent investigation since location currently specified is co-located with RI data, which may be out of date. EPA will discuss potential locations with GHD outside of TWG meeting.
  - Under the final closing discussion section, please add "waste characterization locations" to the list of outstanding questions.
- EPA Comment 1&2
  - Add the following discussion point from EPA's notes:
    - EPA reemphasized prioritizing locations where terminal depth of waste has not been reached, and locations near the BMP installation, where practicable, so results of samples in these areas could be analyzed early in case further investigation was needed while in the field.
- TxDOT Update: Please add the following sentence to the last bullet.
  - TxDOT continues to emphasize that all dates are dependent on project receiving funding, which it has not at the time of this meeting. Quarterly calls with TxDOT will continue to keep all parties informed of developments.

Thanks,

Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Janie Smith <Janie.Smith@ghd.com>
Sent: Thursday, June 3, 2021 4:58 PM

To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Philip J Slowiak <Philip.Slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Charles Munce <charles.munce@ghd.com>; Armour, Judy <jarmour@wm.com>; Poulos, Lauren <poulos.lauren@epa.gov>
Subject: San Jacinto April TWG Meeting Summary

Ashley,

Please see attached the Meeting Summary from the April 19, 2021 Technical Working Group (TWG) meeting regarding the San Jacinto River Waste Pits Superfund Site in Channelview, Texas. Please let us know if you have any questions/comments.

Thanks!

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

San Jacinto River Waste Pits Superfund Site

TWG Update Meeting
Port of Houston Authority

October 27, 2021

Discussion Topics

- Supplemental Design Investigation Update
  - Data Review
  - Waste Characterization
  - Monitor Deployment
- Remedial Design Update
  - BMP Alignment
  - Hydraulic Heave
  - Hydrogeological Data Evaluation
- Other Updates
  - TxDOT Projects
  - Extension Request (Currently Under Review)
  - Southern Impoundment Update

June 2021: Summary of Northern Impoundment Technical Challenges and Uncertainties

- Excavation Strategy
  - Excavation depth
  - BMP (Wall) Design
  - Water infiltration and risk of hydraulic heave
  - Confirmation Sampling
- TxDOT I-10 Bridge Replacement
- Expansion of Lake Houston Control Structures
  - Data currently being incorporated into design.

ED_014247_00001270-00003

Supplemental Design Investigation Updates

- Validated Data
  - Waste Characterization results validated. (Sample locations 101 and 83)
  - Summary table with depth of contamination shown by elevation.
- Data Evaluation
  - Soil boring data increased from 7 locations from RI (used for ROD) to a total of 74 locations across the northern impoundment.
  - Vertical Delineation – Deeper
  - Horizontal Delineation
    - Excavation area expanded in east. (Locations 92 and 105 above 30 ng/kg)
    - Two samples below cleanup value in NW corner (Locations 103 and 97 under 30 ng/kg)
    - Expect realignment of BMP

ED_014247_00001270-00004

Supplemental Design Investigation Update

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

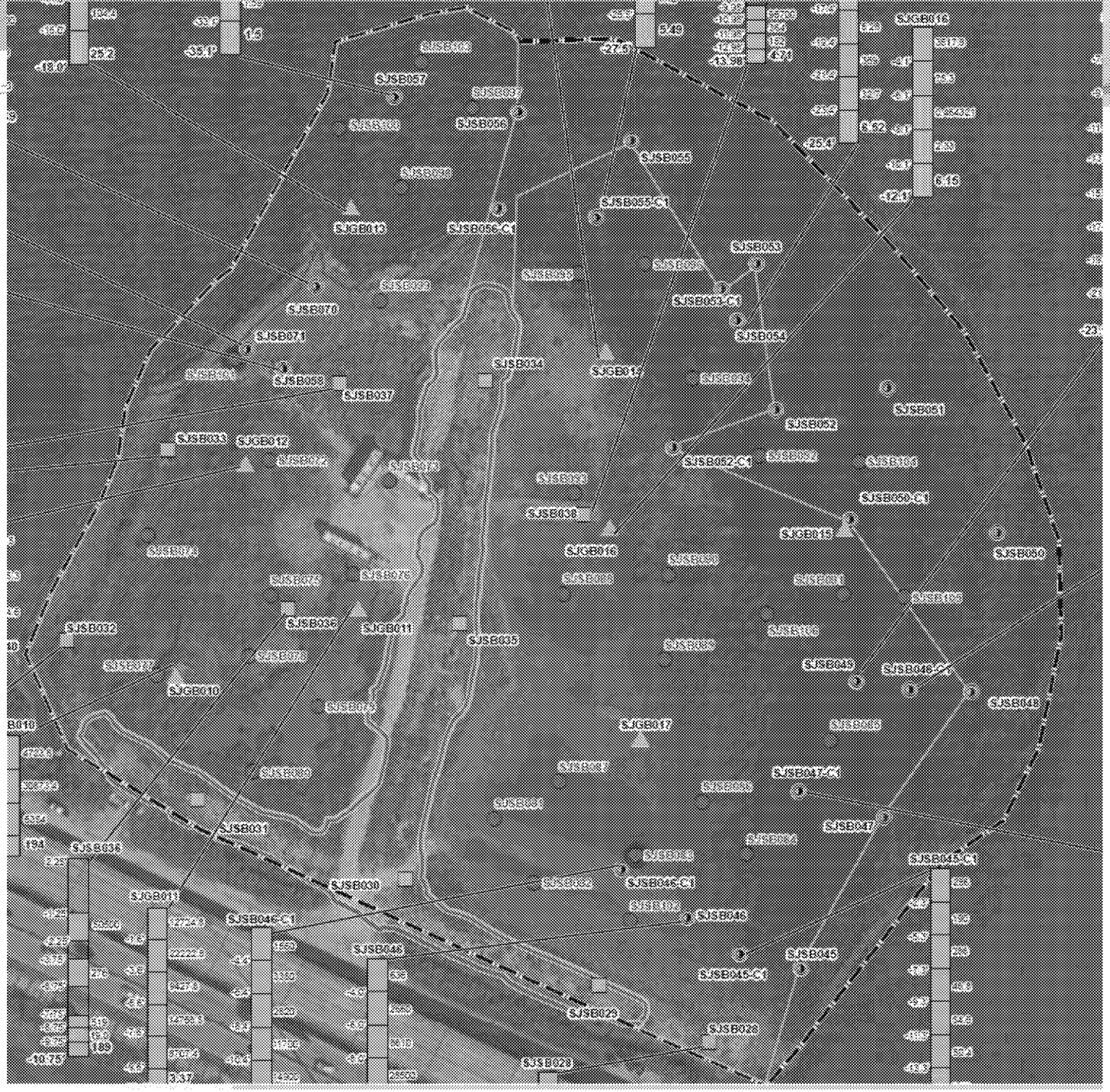
ELEVATION	SJSB072	SJSB073	SJSB074	DUP-5 (74 2-4)	SJSB075	DUP-1 (75 4-6)	SJSB076	SJSB077	DUP-3 (77 6-8)	SJSB078	DUP-2 (78 14-16)	SJSB079	DUP-7 (79 8-10)	SJSB080	DUP-4 (80 16-18)	SJSB081	DUP-13 (81 6-8)	SJSB082	DUP-16 (82 6-8)
+5																			
+4			7,800																
+3					NA		3,000												
+2	NA	9.6	70,000	59,000				NA		33,000		32,000		23,000					
+1					NA		49,000												
0	NA	31,000	30,000					NA		47,000		52,000		14,000					
-1					NA	55,000	63,000											15,000	
-2	NA	26,000	87					NA		86,000		28,000		9,200		2,300			
-3					NA		210											670	
-4	NA	68,000	5.1					63,000	61,000	32		50,000		3,200		47,000			
-5					NA		11											2,000	
-6	12	83,000	3.1					77,000		64		45,000	50,000	1,500		47,000			
-7					270		150											7.7	5.4
-8	340	41	0.37					50		91		190		12		5.3	2.1		
-9					0.88		21											120	
-10	1.3	5.2	2.6					24		16		3.1		1.5		19,000			
-11					1.8		5.2											4.1	
-12	1.7	15	0.84					350		7.3	12	16		0.44		280			
-13					6.7		3.7											1.1	
-14	34	5.6						0.21		120		0.64		13	3	2.8			
-15																		3.7	
-16	0.52									2.7						1.7			
-17																		0.99	
-18	74									260						0.87			
-19																			
-20	0.81									0.42									
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			

Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB083	SJSB083 WC	SJSB084	SJSB085	SJSB086	DUP-12 (86 6-8)	SJSB087	DUP-17 (87 6-8)	SJSB088	DUP-14 (88 6-8)	SJSB089	DUP-19 (89 6-8)	SJSB090	DUP-11 (90 6-8)	SJSB091	DUP-18 (91 6-8)	SJSB092	SJSB094	DUP-8 (94 6-8)
+5																			
+4																			
+3																			
+2																			
+1																			
0																			
-1																			
-2	46,000				5				39,000		820		62,000						
-3	2,200		12,000		2.3		4,600		43,000		53		6,600		16		43,000	36,000	
-4	9.8		3,200	42,000	1.3		25,000		50,000		18		930		6.7		28,000	39,000	
-5	14		45	720	1.2	1.1	2,300		54,000	63,000	2.5	3.5	6.4	2.9	5.2		130	41,000	
-6	15,000	4,400	23	27	2.2		10	2.4	51,000		52		260		2.5	2.7	4.8	15,000	830
-7	200	47	6.1	44	2.3		570		5.3		34		5.3		2.1		27	5,500	
-8	24		7.8	25	3.2		3.5		0.68		2		9.1		2.4		26	32	
-9	9		6.1	4.3	2.9		110		1.3		2.3		4.1		2.4		10,000	2	
-10	0.72		3.7	7	1.6		570		520		0.4		2.3		2.2		11	3.2	
-11	4.8		3.9	11			3		2.5						2.7		7.2	1.9	
-12				7.8					2.2										
-13									1.1										
-14																			
-15																			
-16																			
-17																			
-18																			
-19																			
-20																			
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			

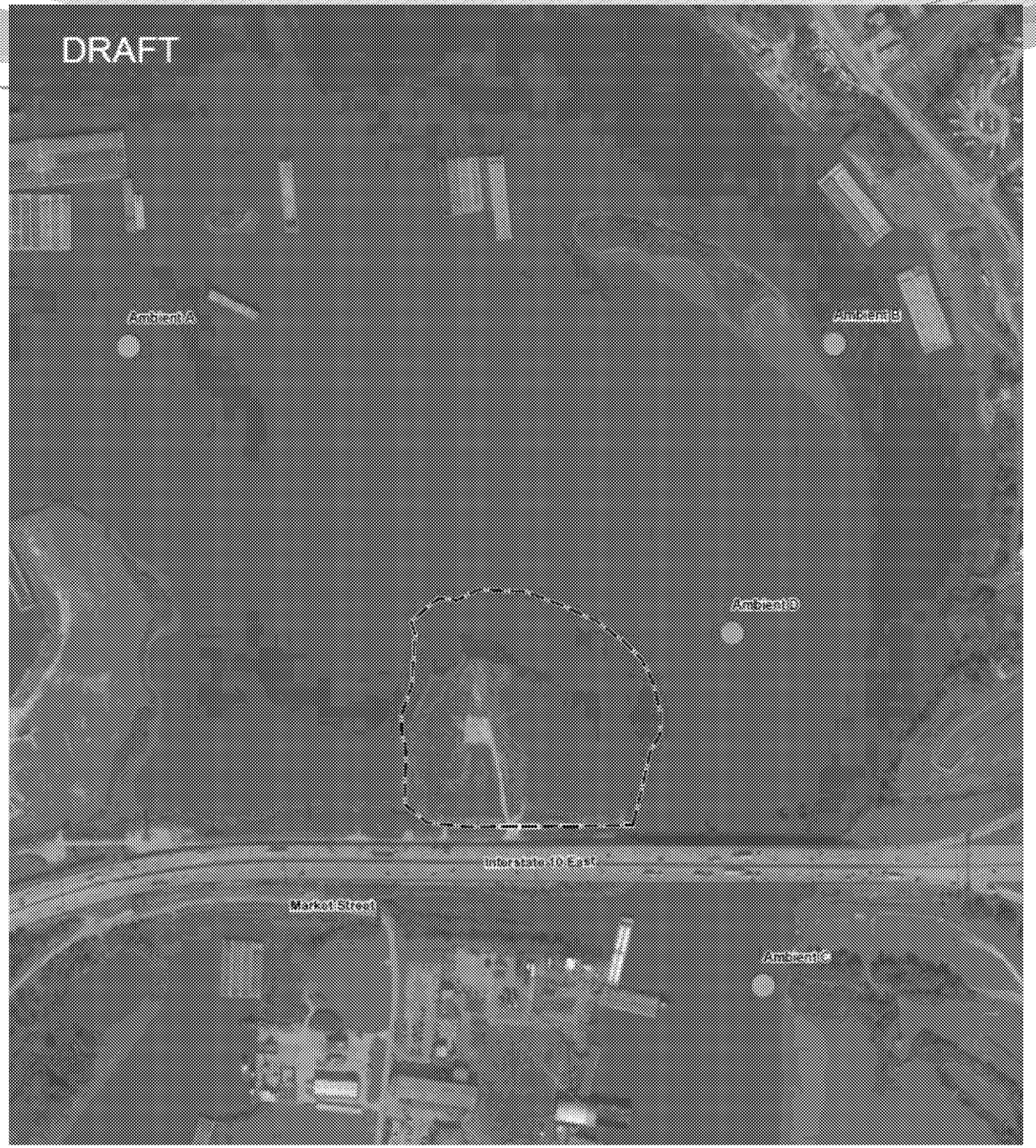
Supplemental Design Investigation – Dioxins/Furans Results Summary
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB095	DUP-10 (95 6-8)	SJSB096	DUP-9 (96 6-8)	SJSB097	DUP-20 (97 6-8)	SJSB098	SJSB099	DUP-6 (99 16-18)	SJSB101	SJSB101 WC	SJSB102	SJSB103	SJSB104	SJSB105	SJSB0106	DUP-15 (106 6-8)
+5																	
+4																	
+3																	
+2																	
+1																	
0								53,000		63,000	52,000						
-1																	
-2	35,000							54,000		59,000	47,000	1,400					
-3																39	
-4	59							130		25,000		5.9			36,000		
-5														15		3.6	
-6	1		87,000					13		18		340			48,000		
-7														2.8		9.4	
-8	2.3	9.7	22,000					15		2.7		24			240		
-9														11		2.9	1.1
-10	1,200		310					180		230		5.6			29		
-11														2.6		3.4	
-12	57		4.9	4.2				1.9		0.62		2.5			13		
-13														1.7		2.6	
-14	6		2,800				71	26		0.27		34			17		
-15					5.2								2.2	1.8		2.6	
-16	54		67				1,900	7	14	11		1.4			350		
-17					1.2								1.1	0.53		1.6	
-18	0.6		5.2				1,800			3.2		110			60		
-19					1.8								14	0.25		3.4	
-20			1.9				160					8.9			7.7		
-21					1.4	1.3							4.8	0.2			
-22			13				9,600					3.9					
-23					2.6								3.9				
-24							3,900					4					
-25					0.77								0.49				
-26							680										
-27					1.4								0.46				
-28							11										
-29					0.29												
-30							0.16										
-31																	
-32																	



Velocity and Turbidity Monitor Deployment

- Getting final approvals from USCG.
- May move ambient monitor A closer to site.

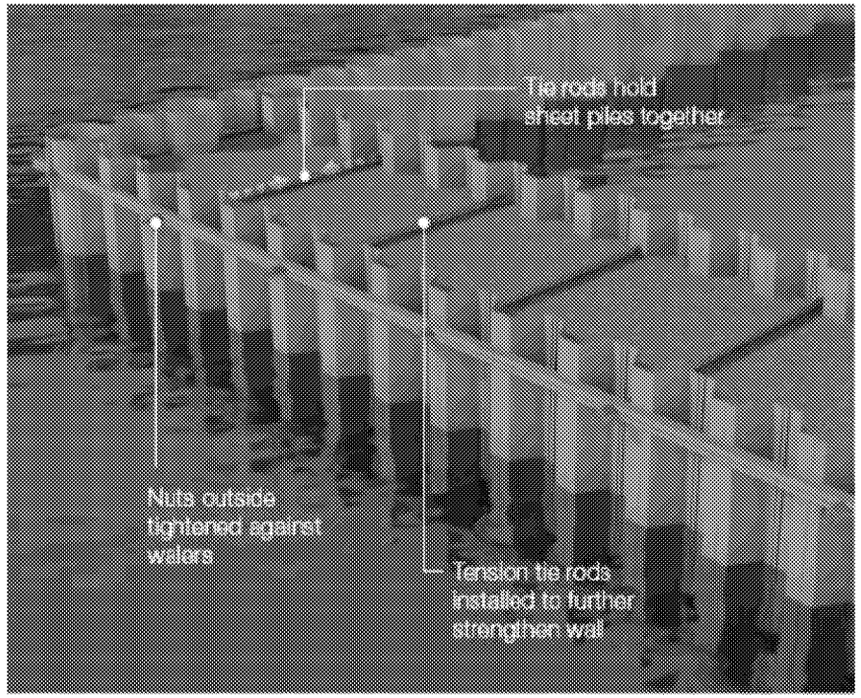


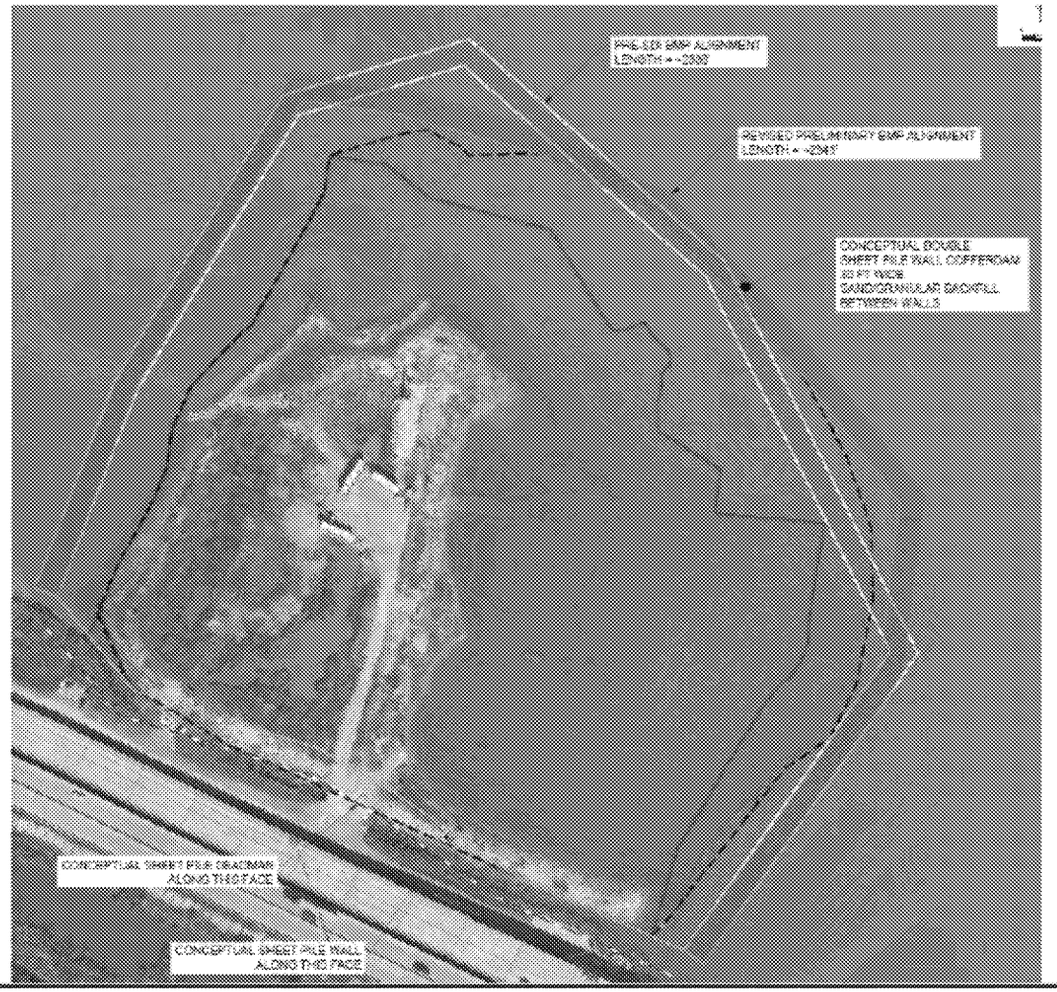
Remedial Design Update

ED_014247_00001270-00011

Preliminary Revised BMP Alignment

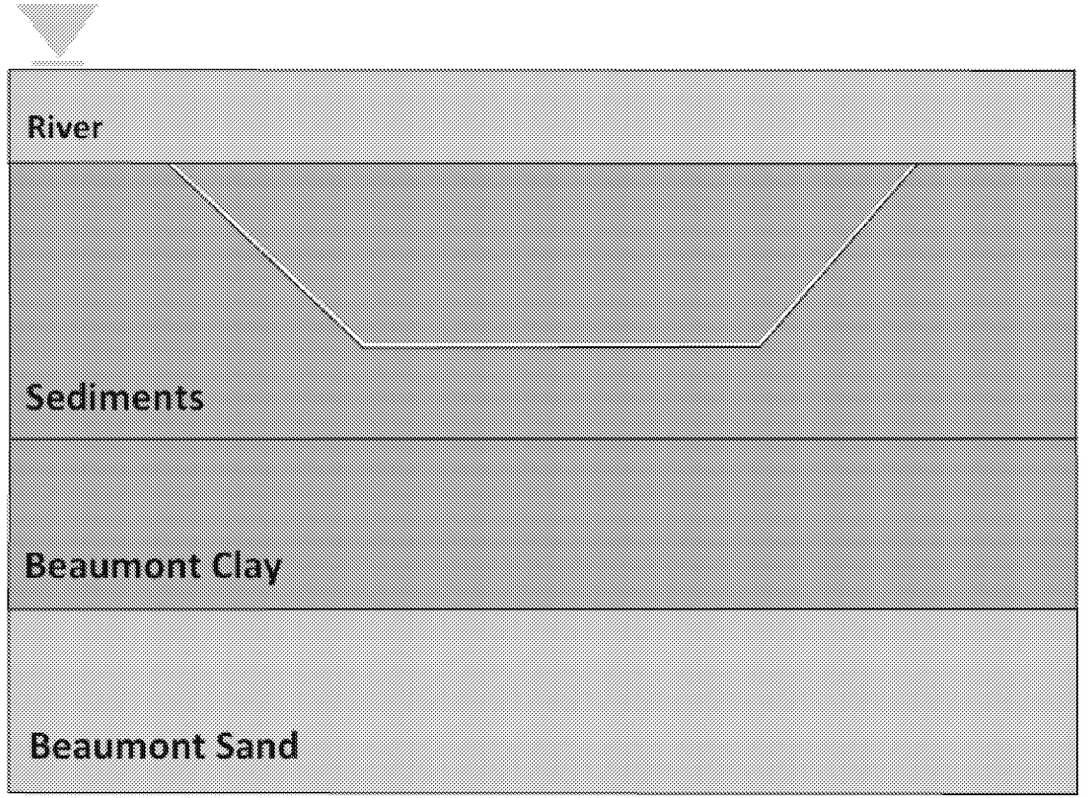
- BMP alignment has shifted further to the east and has been pulled in in the Northwest corner
- The BMP is now fully outside the footprint of the TCRA Cap
- Will be working to refine the alignment based on the excavation surface, site-specific bathymetry, and presence of rock

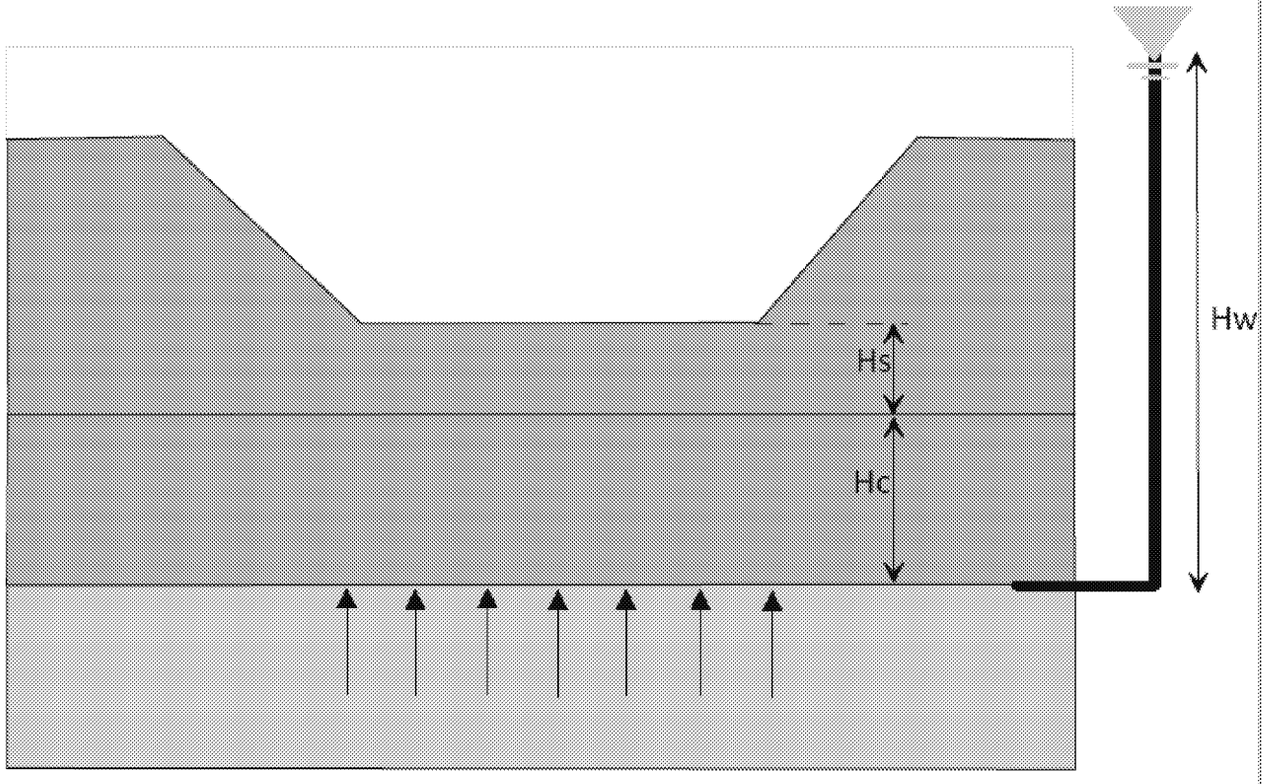




DRAFT - FOR DISCUSSION PURPOSES

Hydraulic Heave – Basic Concepts



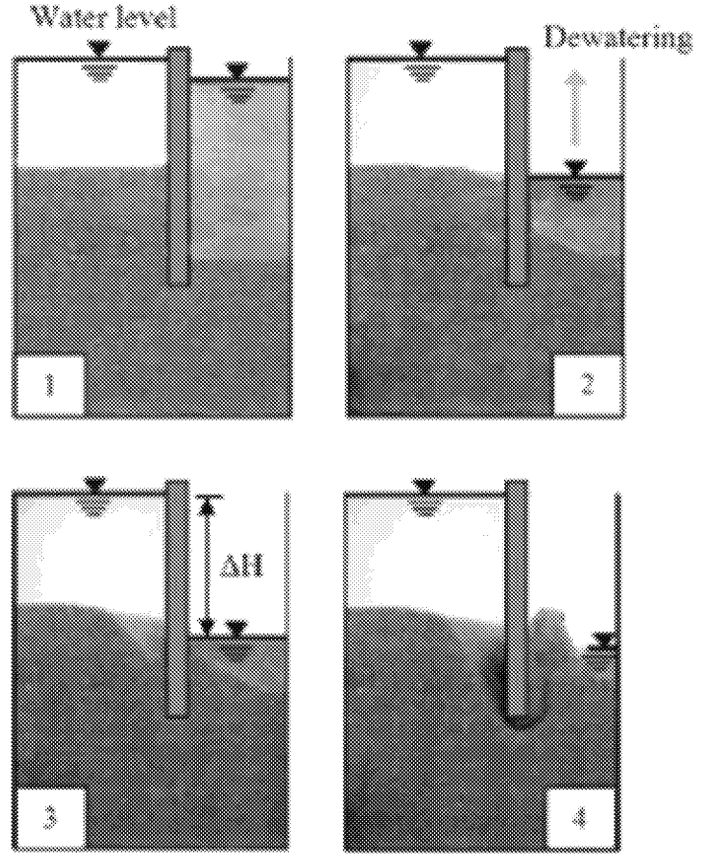


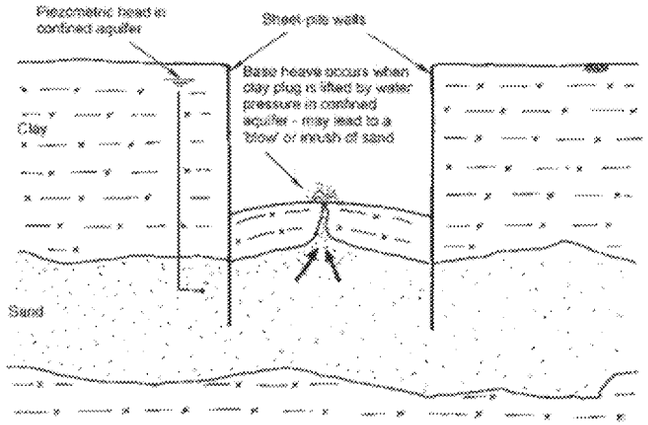
$$FS = \frac{Hs.\gamma s + Hc.\gamma c}{Hw.\gamma w} > 1.25$$

DRAFT - FOR DISCUSSION PURPOSES

Potential Consequences of Hydraulic Heave

- Worker safety risks
- Excavation stability (ie: excavation fills with sand and water)
- Introduction of contamination into deep aquifer (Beaumont Sand)

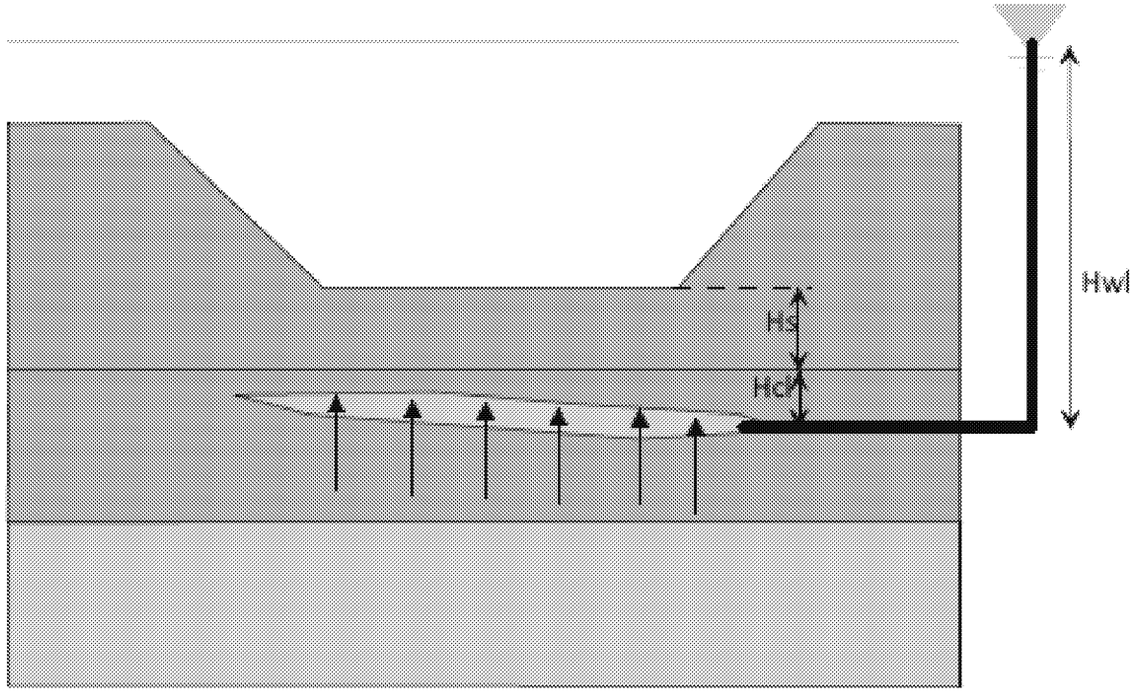




DRAFT - FOR DISCUSSION PURPOSES

https://www.youtube.com/watch?v=ZQvtz3KISvw)

Potential Impact of Sand Lenses on the Hydraulic Heave



$$FS = \frac{Hs.\gamma s + Hcl.\gamma c}{Hwl.\gamma w} > 1.25$$

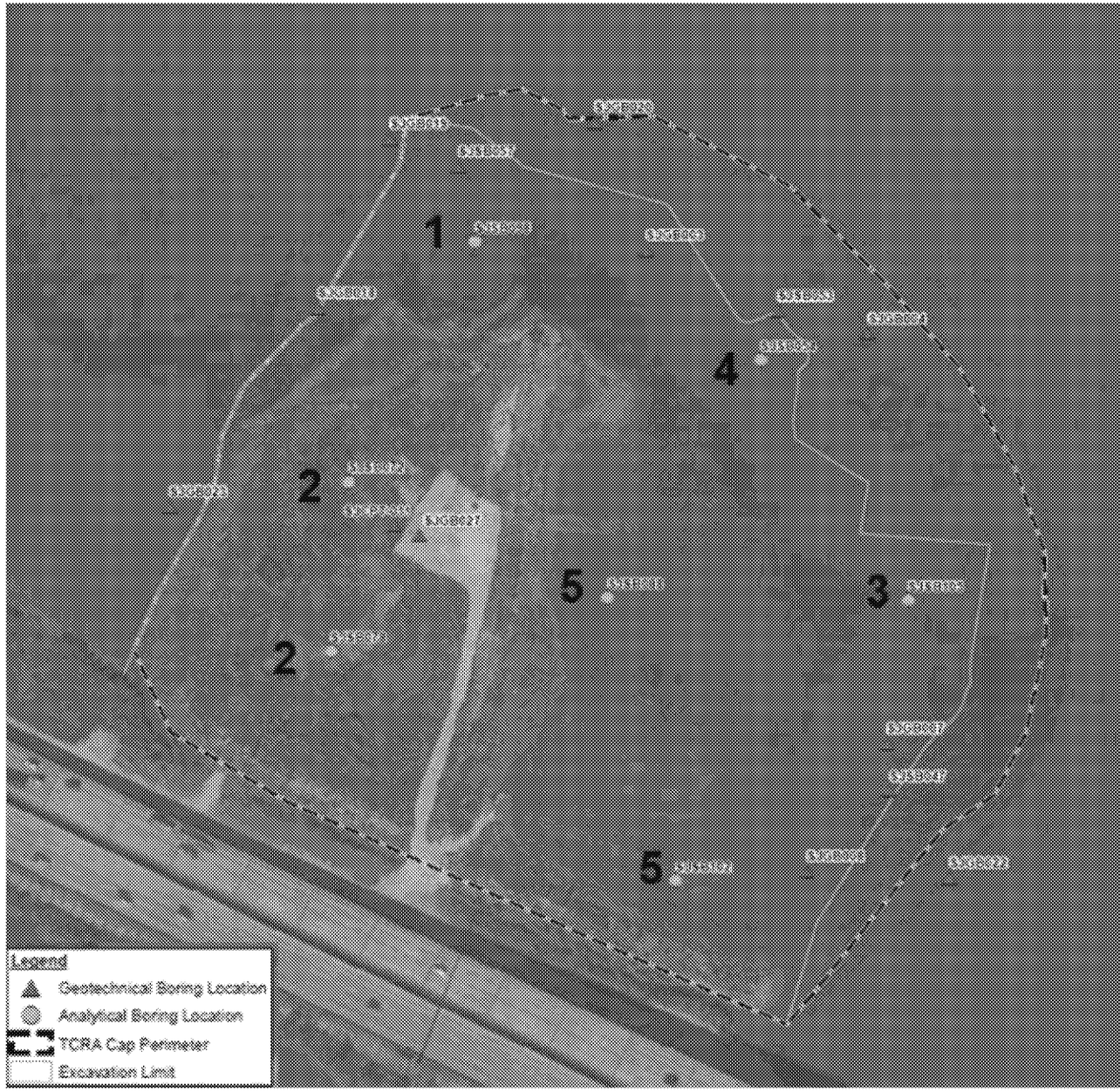
DRAFT - FOR DISCUSSION PURPOSES

ED_014247_00001270-00015

Factor of Safety Results

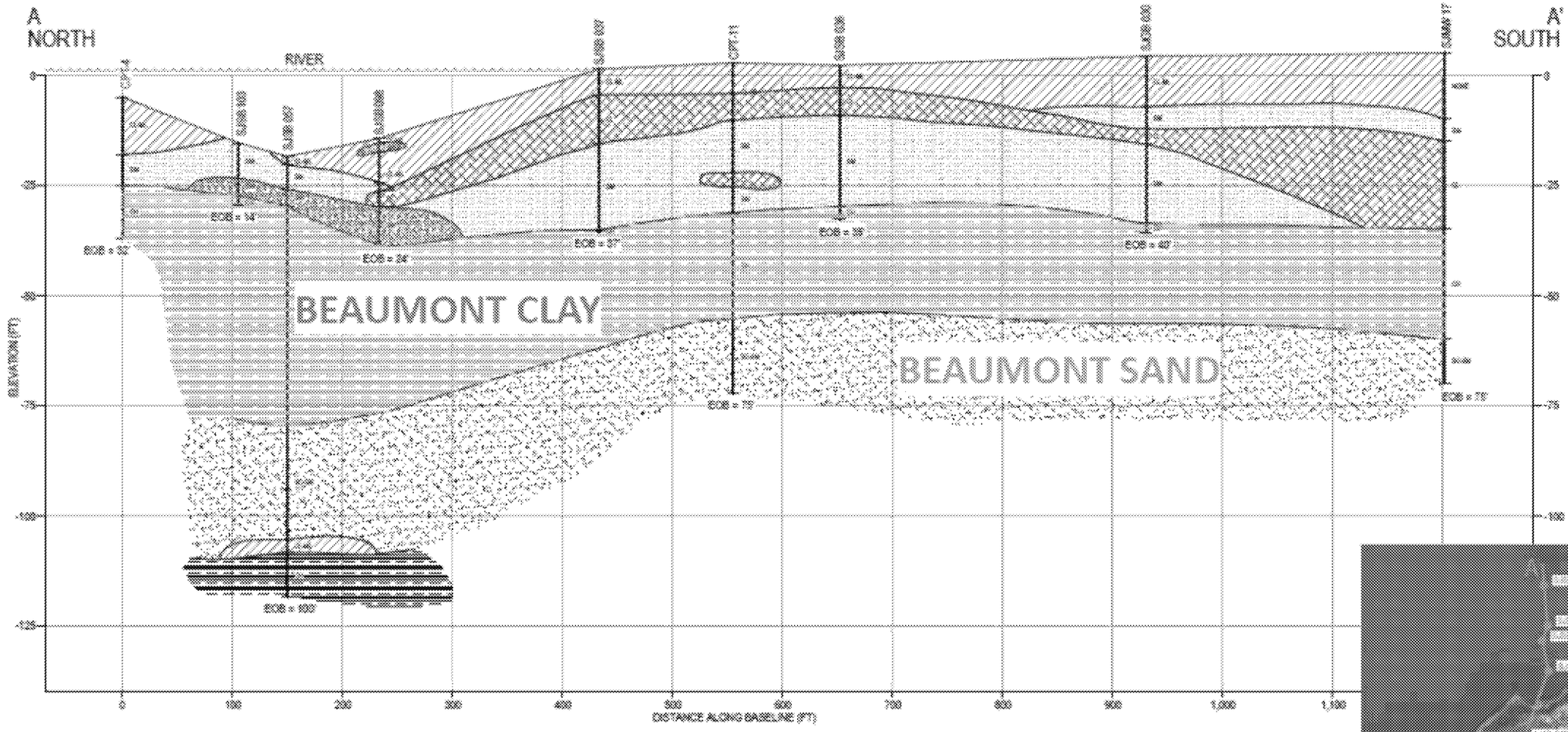
Zone	Floor Excavation Elevation (ft)	FS
1	-28.4 (SJSB098)	1.21* 0.84* 0.69*
2	-20.4 (SJSB072 & SJSB078)	1.00* 1.12 1.21 1.11
3	-20.4 -20.4 (SJSB105)	1.12 1.17 1.17
4	-23.4 (SJSB054)	1.45 1.24 1.22
5	-20.1 (SJSB088 & SJSB102)	1.29

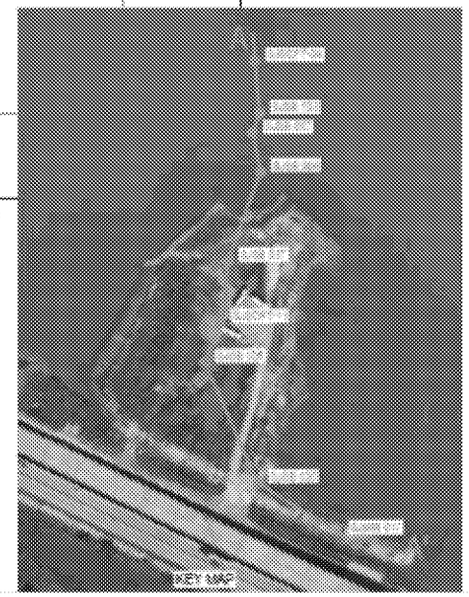
*FS Considers Sand Lenses



DRAFT - FOR DISCUSSION PURPOSES

Geological Cross-Section





SILTY CLAY TO CLAYEY SILT, SOFT (CL-ML)

SILTY SAND WITH CLAY (SM)

BEAUMONT CLAY (CH)

SANDY TO SILTY CLAY (CL)

CLAYEY SILTY SAND (SC-SM)

GRAVELLY SAND (SW)

GRAY CLAY (CH)

DRAFT - FOR DISCUSSION PURPOSES

Hydrogeological Data Evaluation

- During the SDI, 4 temporary piezometers were installed -2 shallow wells at different depths in the alluvium and 2 deep piezometers in the Beaumont Sand
- Aquifer testing (slug testing) was performed
  - The resulting hydraulic conductivity values were consistent with those assumed in the 30% RD
  - Results indicate that the deeper alluvial sand will produce water at a high rate in the excavations –that water will need to be managed during the RA
- A transducer was installed in one of the deep piezometers to assess deep aquifer background fluctuations
  - Results indicate that the Beaumont Sand is tidally influenced

Other Updates

ED_014247_00001270-00019

TxDOT Projects

- Dolphin/Fender Project
  - Delayed
  - Will take approximately 1 year.
  - Do not expect to impact site.
- I-10 Bridge Project
  - Continue quarterly calls regarding I-10 design.
  - Bridge project currently unfunded.
  - Updated TxDOT regarding Southern Impoundment UAO.

ED_014247_00001270-00020

Extension Request

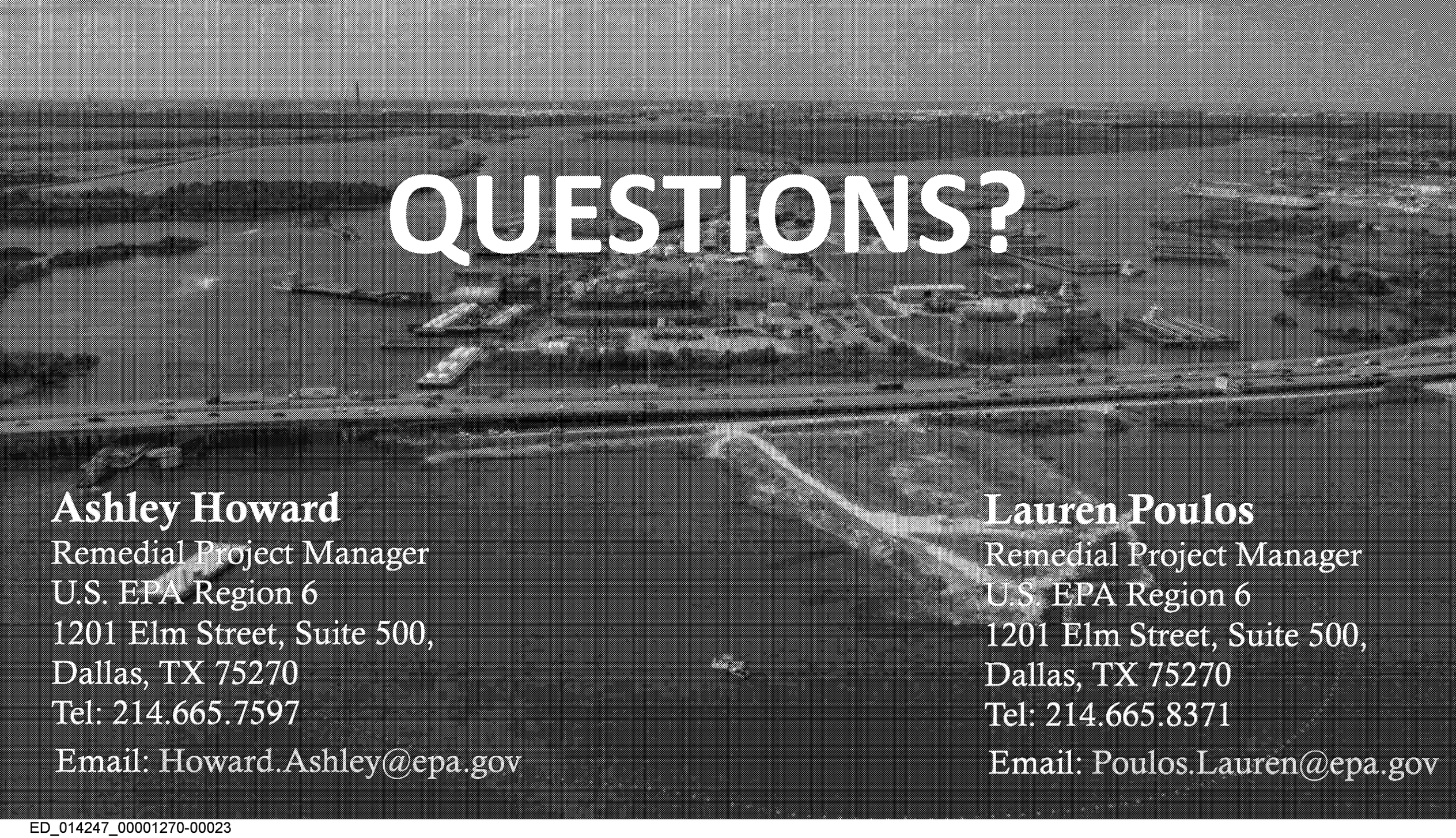
- GHD requested an additional 160 days after receipt of the preliminary SDI data to complete the Northern Impoundment 90% RD. Based on a date of October 1, 2021 for receipt of all preliminary analytical data, they requested an extension to June 26, 2022.
- This request is still under EPA review.

ED_014247_00001270-00021

Southern Impoundment

- UAO finalized September 2, 2021
- Supervising Contractor (GHD) and Project Coordinator (Charles Munce) approved September 2021
- Remedial Action Work Plan submitted to EPA October 14, 2021
  - Currently under review
  - Reminder: provide any comments to Lauren Poulos by this Friday, October 29, 2021 (poulos.lauren@epa.gov)
- Next Steps: Pre-Construction Sampling

ED_014247_00001270-00022



Ashley Howard
Remedial Project Manager
U.S. EPA Region 6
1201 Elm Street, Suite 500,
Dallas, TX 75270
Tel: 214.665.7597
Email: Howard.Ashley@epa.gov

Lauren Poulos
Remedial Project Manager
U.S. EPA Region 6
1201 Elm Street, Suite 500,
Dallas, TX 75270
Tel: 214.665.8371
Email: Poulos.Lauren@epa.gov

Supplemental Design Investigation Sampling Plan - Revision 1

Northern Impoundment
San Jacinto River Waste Pits Superfund Site

International Paper Company and
McGinnes Industrial
Maintenance Corporation

ED_014247_00001293-00001

Table of Contents

1. Introduction 1
   - 1.1 Background 1
   - 1.2 Objectives 3
2. Sampling Plan 4
   - 2.1 Sample Collection Objective and Location Rationale 4
     - 2.1.1 Analytical Samples 4
     - 2.1.2 Geotechnical Samples 5
     - 2.1.3 Additional Waste Characterization Samples 6
   - 2.2 Drilling and Sampling Methods 6
   - 2.3 Supplemental Data Collection 7
     - 2.3.1 Sediment and Rock Thickness 7
     - 2.3.2 Surficial Sediments Geotechnical Properties 7
     - 2.3.3 Water Velocity Measurements 7
   - 2.4 Piezometer Installation 8
   - 2.5 Restoration of TCRA Cap 9
3. Sample Analysis 9
4. Data Validation, Quality Control, and Reporting 10
5. Investigation Derived Wastes (IDW) 10
6. Health and Safety 10
7. References 11

Figure Index

Figure 1 Northern Impoundment

Figure 2 Supplemental Design Investigation Analytical Sample Locations

Figure 3 Supplemental Design Investigation Geotechnical Evaluation

Figure 4 Additional Data Collection

ED_014247_00001293-00002

Table Index

Table 1 Response to Comments - Supplemental Design Investigation Sampling Plan

Table 2 Details of Planned Supplemental Design Investigation Borings

Table 3 RCRA Hazardous Waste Parameters

Appendix Index

Appendix A GHD Groundwater Well Slug Testing Standard Operating Procedure

Appendix B Braun Intertec Pressuremeter Testing Standard Operating Procedure

ED_014247_00001293-00003

1. Introduction

GHD Services Inc. (GHD), on behalf of the International Paper Company and McGinnes Industrial Maintenance Corporation (collectively referred to as the Respondents), submits to the United States Environmental Protection Agency (EPA) this *Supplemental Design Investigation Sampling Plan - Revision 1* (Sampling Plan) for investigation activities at the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site in Harris County, Texas. The Northern Impoundment is shown on Figure 1.

As the methods described herein for conducting the sampling are similar to those that were implemented during the 2019 Second Phase Pre-Design Investigation (PDI-2), this Sampling Plan is supported by the Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Standard Operating Procedures (SOPs) prepared for the PDI-2 sampling event. The QAPP, HASP and SOPs were included as part of the *Final Second Phase Pre-Design Investigation Work Plan* (PDIWP-2), submitted to the EPA on June 3, 2019 (GHD, 2019) and approved by the EPA on August 8, 2019 (EPA, 2019).

On February 19, 2021, the *Supplemental Design Investigation Sampling Plan* (GHD, 2021a) was submitted to the EPA. A Technical Working Group (TWG) Meeting was held on March 10, 2021 to discuss preliminary comments on the Sampling Plan. Following this meeting, the EPA provided written comments in a letter dated March 29, 2021 (EPA, 2021a). Additionally, a TWG meeting was held on April 19, 2021 to review the Respondents' draft responses to EPA's comments. Following this TWG meeting, additional discussions were held and correspondence were received from the EPA to further review the comments and proposed responses.[1],[2]. Respondents' responses to the comments (RTC) are summarized in Table 1 and the comments have been addressed throughout this Sampling Plan.

1.1 Background

During the February 19, 2020, TWG meeting, GHD reported that, based upon newly obtained PDI-2 data, material exceeding the Record of Decision (ROD) clean-up level for the Northern Impoundment of 30 nanograms per kilogram (ng/kg) toxicity equivalents for mammals ($TEQ_{DF,M}$) extended to depths that were significantly deeper than previously understood. GHD further explained that utilizing traditional excavation methodology in dry conditions (referred to as "Approach A" in the *Preliminary 30% Remedial Design - Northern Impoundment* [Northern Impoundment 30% RD], GHD, 2020b) would pose significant risk and technical challenges for the deeper areas within the Northern Impoundment, as excavating within the confines of an impermeable sheet pile barrier, herein referred to as the best management practice (BMP), to the required depth could undermine the structural integrity of the BMP. Therefore, when the Northern

[1] Email correspondence from the EPA dated May 5, 2021 and May 9, 2021.

[2] The schedule as outlined in the Request for Extension Letter approved by the EPA on March 29, 2021, was contingent upon final approval of the Supplemental Design Investigation Sampling Plan by April 30, 2021. The extended EPA review period and the expansion in the scope of the work mean that the information needed to complete the 90% Remedial Design will not be available in time to meet the current extended deadline for its submission, and that an additional extension of the schedule will be necessary, as will be detailed in a forthcoming extension request.

ED_014247_00001293-00004

Impoundment 30% RD was submitted, it included an "Approach B" as an alternative for excavation in areas of deeper waste depths. This approach included installing the BMP and then removing material exceeding the clean-up level through a column of water using barge-mounted excavation equipment. As described in the Northern Impoundment 30% RD, this approach requires that prior to the end of an excavation season, the water within the BMP would be recirculated through a treatment system until it achieved the Texas Surface Water Quality Standard (as demonstrated through compliance with the Minimum Level [ML]). In order to evaluate the practicality and effectiveness of this conceptual approach, additional treatability testing was proposed. The proposed treatability testing was summarized in the *Additional Treatability Testing Notice*, submitted to the EPA on April 16, 2020 (GHD, 2020a). Comments were received from the EPA on May 5, 2020 (EPA, 2020a). These comments were addressed in the *Revised Additional Treatability Testing Notice* (Notice), submitted to the EPA on June 5, 2020 (GHD, 2020c), and approved by the EPA on June 11, 2020 (EPA, 2020b).

The additional treatability testing, as described in the Notice, included a bench-scale simulation of the recirculation process through a bench-scale filtration system. The recirculation testing was conducted by the GHD Treatability Laboratory in Niagara Falls, New York. Recirculation testing was initiated on November 7, 2020 (testing was delayed by material and supply chain issues associated with the COVID-19 Pandemic). Treatability data indicated that after 16 days of recirculation, the total suspended solids (TSS) reduction had plateaued at around 500 milligrams per liter (mg/L), meaning that the ML could not be achieved. Testing was suspended and modifications were made to the mixing methodology. The recirculation testing was then resumed for an additional 225 hours. Results from the additional testing were consistent with those obtained during the initial 16 days, with TSS never reaching levels below 500 mg/L.

As presented during the December 15, 2020, TWG meeting, Approach B water treatment is infeasible for full-scale application during the remedial action (RA) based on the results of the recirculation testing described above. Since the water treatment for Approach B is infeasible, Approach B excavation methodology is also infeasible. As a result, the Respondents are evaluating a significant modification to the RD to focus on performing all excavation work "in the dry". As was discussed during the February 2020 TWG meeting when Approach B was proposed, there are significant challenges and risks associated with excavating the deeper areas in dry conditions. Additional data is required to evaluate the feasibility of excavating the deeper areas in the dry.

As discussed during the December 15, 2020, TWG meeting, an additional field investigation needs to be performed to better inform the modified RD and to fill data gaps in the delineation of the vertical extent of the material that must be excavated. Based on data collected during the first and second phases of the PDI, there are three locations where vertical delineation to concentrations below the clean-up standard of 30 ng/kg $TEQ_{DF,M}$ was not achieved. There are also data gaps in the spatial coverage of sampling locations along the perimeter and in the interior of the Northern Impoundment where, in the absence of additional sampling, target excavation elevations would have to be based on assumptions from surrounding datapoints. These data gaps were less of a concern when Approach B excavation methodology was thought to be feasible. The supplemental design investigation, described herein, will provide the Respondents with information that will aid in designing a structurally robust BMP, potentially capable of withstanding forces associated with excavation in the deeper areas of the Northern Impoundment. It will also allow the Respondents to

ED_014247_00001293-00005

develop a more robust estimate of the total volume of material for disposal, information that will aid in logistical planning, sequencing, and scheduling of the RA.

The current proposed BMP design includes a double wall system with shallower embedment depths than the single cantilever wall proposed in the Northern Impoundment 30% RD. The double wall is expected to be further offset from the area of excavation than had been previously described in the Northern Impoundment 30% RD in order to increase the structural stability of the BMP system. Prior investigations did not include collection of data regarding soil properties and stratigraphy in the areas of potential wall construction for the current conceptual BMP. Given the modified alignment and shallower embedment depths of the BMP resulting from the infeasibility of Approach B methodology, it is essential to collect additional geotechnical data to better understand the soil properties and thickness of the shallow stratigraphy in locations in and near the current conceptual BMP alignment. With the change in excavation methodology, an additional risk that needs to be evaluated is the potential for hydraulic heave during the RA in the deeper excavation areas. GHD proposes to install geotechnical borings as part of the supplemental design investigation to evaluate this risk, and to collect additional subsurface stratigraphy to better inform the current conceptual alignment of the BMP. The geotechnical evaluation will also include collection of hydraulic conductivity data for the material to be excavated to better estimate the amount of infiltration water that will require management during the RA.

1.2 Objectives

The objectives of the supplemental design investigation include the following:

- Further delineate the vertical extent of the material exceeding the ROD clean-up level around the perimeter of the excavation area to support the recently optimized conceptual BMP design, elements of the anticipated remediation methodology (such as the double wall cofferdam, Approach A only excavation, BMP alignment to allow a soil buttress for stability, etc.) and other aspects of the RD.
- Fill data gaps in the vertical and horizontal extent of material exceeding the ROD clean-up level across the area anticipated to be excavated to better refine the estimated excavation bottom and volume of material to be removed (due to the increased depths encountered during the PDI, and to provide information for post-excavation confirmation sampling).
- Collect additional geotechnical data along the current conceptual alignment of the BMP to inform the BMP design.
- Collect additional hydraulic conductivity data of the material to be excavated to better estimate the amount of seepage water that will require management during the RA.
- Collect additional hydraulic conductivity and pressure data to evaluate the risk of hydraulic heave during the RA.

Additional activities with separate objectives are being required by the EPA that were not a part of the original plan or the objectives listed above.

ED_014247_00001293-00006

2. Sampling Plan

Data collection will be conducted in accordance with applicable EPA and Texas Commission on Environmental Quality (TCEQ) guidance and utilize best practices and lessons learned from the investigation activities conducted during the first and second phases of the PDI.

2.1 Sample Collection Objective and Location Rationale

2.1.1 Analytical Samples

Samples will be collected at the Northern Impoundment to further delineate the vertical and horizontal extent of material exceeding the ROD clean-up level. Northern Impoundment analytical sample locations were selected to supplement previously obtained horizontal and vertical $TEQ_{DF,M}$ delineation data. Sampling locations were chosen to fill data gaps from previous sampling events. Proposed sample locations are shown on Figure 2. These locations are approximate and are subject to change based upon field conditions, including (but not limited to) subsurface impediments and accessibility. If it is necessary to move a boring location, the EPA will be notified to discuss alternatives.[3]. Figure 2 also includes the boring locations from the Remedial Investigation (RI), First Phase Pre-Design Investigation (PDI-1), and PDI-2.

A total of 420 discrete samples will be collected from 35 locations across the area of excavation. Discrete samples will be collected from 2-foot intervals, beginning at 0 to 2 feet below ground surface (ft bgs) to 22 to 24 ft bgs. The sample intervals from 0 to 18 ft bgs will be analyzed by an accredited laboratory, and the sample intervals from 18 to 24 ft bgs will be archived by the laboratory pending the results of the 16 to18 ft bgs sample interval. Analysis of the 16 to18 ft bgs interval from each location will be prioritized to expedite the determination as to whether the samples from the deeper intervals should be analyzed. If the 16 to 18 ft interval yields an analytical result with $TEQ_{D,F,M}$ levels > 30 ng/kg, the three deeper intervals from 18 to 24 ft will all be analyzed. If the 22-ft to 24-ft interval is greater than 30 ng/kg, the Respondents will discuss with the EPA whether it is technically practicable to sample at lower depths.

For the proposed collocated borings adjacent to historical borings with $TEQ_{D,F,M}$ levels > 30 ng/kg (SJGB010, SJGB012, SJSB036, SJSB046-C1, and SJSB071), with the exception of SJSB083 and SJSB101 which will be analyzed for waste characterization purposes, only samples in the collocated borings that are deeper than the terminal depth of each historical boring with $TEQ_{D,F,M}$ levels > 30 ng/kg will be analyzed. For example, at proposed boring location SJSB072, the first sample analyzed would be the interval from 8 to 10 ft bgs, because collocated historical boring SJGB012 had a $TEQ_{D,F,M}$ level > 30 ng/kg at its terminal depth of 8 ft bgs.

Determining the sequence in which the borings will be advanced will be heavily dependent on weather and tidal conditions. Tidal conditions contribute to the water level in the San Jacinto River along with the wind speed and direction. These weather and tidal conditions will largely determine what type of drilling method (tracked drilling rig versus airboat-mounted drilling rig) will need to be used to complete borings in locations with highly variable water depths.

[3] Any delay on the part of the EPA in responding to requests to adjust boring locations based upon field conditions could impact the schedule and time necessary to complete the investigation.

ED_014247_00001293-00007

There are five proposed boring locations that are collocated with historical sample locations in which an interval below the clean-up standard was not observed at the bottom of the boring (i.e., SJSB072, SJSB075, SJSB077, SJSB083, and SJSB101). Three of the five locations are in upland areas (SJSB072, SJSB075, SJSB077). These three borings will be completed first by the land-based drill rig. The other two locations (SJSB083 and SJSB101) are in areas that are normally covered in water. These locations will be prioritized, but access may be affected by weather, tidal conditions, etc. In addition, boring locations in which subsurface data is more critical to the design of the BMP (i.e., around the perimeter) will be prioritized to the extent possible.

2.1.2 Geotechnical Samples

To delineate the subsurface stratigraphy along or in reasonable proximity to the current conceptual BMP alignment, eleven geotechnical borings will be installed to facilitate a Cone Penetrometer Test (CPT) investigation. CPT is a widely accepted in-situ geotechnical investigation method that involves pushing a cone penetrometer into the ground at a constant rate that records data in real-time during penetration. The cone penetrometer is equipped with electronic sensors that measure pore pressure, cone resistance at the tip and sleeve friction. As the cone takes continuous readings through the soil, the data can be correlated to data regarding the soil's strength, friction angle, pore water pressure, and soil behavior (soil classification and type).

Ten of these CPT borings will be installed along or in reasonable proximity to the current conceptual BMP alignment. No geotechnical samples will be collected for analysis at these locations. In order to correlate the newly-collected CPT data to existing geotechnical laboratory test data, a "calibration boring" is necessary. The calibration boring will collect both CPT data and geotechnical laboratory test data from ground surface to the Beaumont Sands. To that end, an eleventh CPT boring will be installed adjacent to planned piezometer location, SJMW-016 (described in Section 2.4) to provide the CPT data. To provide the corresponding laboratory test data for comparison, during the installation of piezometer SJMW-016, geotechnical samples will be collected for laboratory analysis. CPT data and physical samples will be collected along the entire length of this deep boring, including from the Beaumont Clay and Beaumont Sand layers (historical investigations have had limited data from these lower geological strata). Using the common set of information and well-defined relationships for various parameters available from the two tests, the CPT results obtained from the ten borings along the current conceptual BMP alignment can be calibrated using data from SJMW-016 and correlated to existing geotechnical laboratory test data from past investigations.

The locations of the proposed CPT borings and historical geotechnical borings are shown on Figure 3. These locations are approximate and are subject to change based upon field conditions encountered. Shear vane strength readings in accordance with ASTM Methods D2573 and STP 1014 will be taken in the top four to five feet of CPT borings SJCPT-002, SJCPT-003, and SJCPT-004 to provide more information about the shallow sediments in the northwest corner.

Consistent with the protocol followed during PDI-2 for all boring locations, a CPT boring location may be moved within 25 feet of its proposed location if necessary, to avoid refusal or surface impediments. If it is necessary to move a CPT boring location farther than 25 feet from the proposed

ED_014247_00001293-00008

location, the proposed new location will be discussed with the EPA at that time.[4]. To supplement the geotechnical dataset for the RD, and to refine the assumptions regarding the grade of the excavation slope, three planned analytical boring locations on the southeast side of the Northern Impoundment will be extended beyond 24 ft bgs until the Beaumont clay formation is encountered. Subsurface stratigraphy will be logged but no samples will be collected below 24 ft bgs for analysis. These boring locations (SJSB084, SJSB085, and SJSB091) are shown on Figures 2 and 3.

2.1.3 Additional Waste Characterization Samples

As required by EPA, four additional waste characterization samples will be collected. The waste characterization samples will be collected from two planned analytical borings (SJSB083 and SJSB101), as shown on Figure 2. During installation of borings SJSB083 and SJSB101, duplicate samples will be collected from each planned 2-ft interval from 0 to 24 ft bgs. The samples for analytical characterization will be analyzed per the sampling program outlined in the proposed Sampling Plan and the waste characterization samples will be archived pending the results of the characterization samples. Upon receipt of the analytical results for the characterization samples, the two samples in each boring with the highest dioxins concentrations will be identified and the duplicate samples from those intervals will be analyzed for all four RCRA hazardous waste characteristics per EPA-required test methodology in 40 CFR Part 261. The list of parameters is provided in Table 3.

2.2 Drilling and Sampling Methods

Drilling methods suitable for sample collection at the Northern Impoundment during this Sampling Event were identified using ASTM D6286-12, Selection of Drilling Methods for Environmental Site Characterization. Drilling methods that may be used include sonic, large diameter, dual-tubed direct-push (e.g., Geoprobe®DT45), mud-rotary, or a hollow stem auger drilling rig. Typically, these types of drill rigs are mounted onto specialized tracked or self-propelled vehicles, trucks, or boats. Similar to the work performed during PDI-2, upland boring locations will likely be installed using track or truck-mounted drilling equipment and water borings will be installed using barge or airboat-mounted drilling equipment.

Sonic and direct push methods are widely accepted throughout the United States for soil sampling and are standardized by ASTM Methods D6914, D6282, and D5784. All sampling equipment, materials, consumables, tools, and other support equipment will be provided by the drilling subcontractor and will be stored on the drill rig.

Upon completion of sampling, soil borings will be plugged with cementitious grout, in accordance with 16 Texas Administrative Code (TAC) §76.104, Standards for Capping and Plugging of Wells. After each boring is filled with grout, any sample collected from a location within the Time Critical Removal Action (TCRA) cap will be restored, as described in Section 2.5.

[4] As noted in Section 2.1.1, a delay in the EPA's responses to requests to adjust boring locations based upon field conditions could impact the schedule and delay completion of the investigation

2.3 Supplemental Data Collection

In addition to the sampling described above, supplemental data will be collected to support the design of turbidity control measures for use during installation and removal of the BMP during the RA. These data collection activities will focus on thicknesses of surface materials, geotechnical characteristics of surficial sediment and velocity measurements in locations outside the proposed BMP alignment (Figure 4). Each of these data collection activities is described below.

2.3.1 Sediment and Rock Thickness

The extent and thickness of armor rock along the alignment of the proposed BMP will be investigated, together with the thickness of any sediment deposited on top of the armor rock. The information will be collected by diver assisted probing at specific intervals and will be further verified by examining past quarterly bathymetry surveys.

2.3.2 Surficial Sediments Geotechnical Properties

Six samples of river sediment that has deposited on top of the armor rock will be collected with diver assistance in Lexan® tubes that are hand driven into the sediment. The sediment within each tube will be composited to form a single sample for geotechnical analyses. Multiple cores may be collected adjacent to each other if necessary to collect sufficient sample for testing. If the sediment is too soft to stay within the tube, alternate sample collection techniques will be employed such as scooping sediment into a sample container. Sample locations are shown in orange on Figure 4. Divers will be required to clear surficial rock prior to installing each of the CPT borings. At the time of clearing the CPT boring locations, the nearby six surficial sediment samples will be collected at the six locations referenced above. In addition to surficial rock, geotextile also will be temporarily removed as necessary to facilitate sample collection and replaced following sample collection. Samples will be collected by the divers pushing a Lexan® tube into the sediment to collect a minimum 6-inch thick sample. Multiple cores may be collected adjacent to each other if necessary, to collect sufficient sample for testing. If the sediment is too soft to stay within the tube, alternate sample collection techniques will be employed. An additional four locations (shown in red on Figure 4) will be sampled in a similar manner though the removal of rock and/or geotextile at these locations should not be necessary. Both sets of samples will be shipped under chain-of-custody procedures to a geotechnical laboratory for testing. Each sample will be tested for water content (ASTM D2216), dry density (ASTM D2937), Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422) and organic carbon content (ASTM D2974). The samples will also be tested for consistency/stickiness using the Natural Resources Conservation Service method. Planned analytical tests are summarized in Table 2.

2.3.3 Water Velocity Measurements

Up to four velocity meters (e.g., acoustic doppler current profiler) will be deployed outside of the conceptual BMP alignment in the approximate locations shown on Figure 4. The exact locations will be determined in the field to avoid interfering with ongoing activities and other monitoring data collection devices. The meters will be deployed for a minimum of six months. The goal is to collect continuous velocity data via data loggers that can be transmitted automatically or retrieved through

ED_014247_00001293-00010

periodic downloads. These data will be used in the selection and design of turbidity controls to be utilized during the RA.

2.4 Piezometer Installation

Four piezometers will be installed during the supplemental design investigation to better understand the hydraulic conductivity and subsurface hydrostatic pressure of the groundwater bearing units below the Northern Impoundment. The locations of the proposed piezometers are shown on Figure 3.

A shallow piezometer will be installed at proposed boring SJMW-014 to get a better understanding of the hydraulic conductivity of the waste material itself. This information will aid in the design of water management and storage systems during the RA. Data from adjacent RI boring, SJGB012, indicate that the waste material extends to a depth of -8 ft mean sea level (msl), so a piezometer will be installed to a total depth of -8 ft msl and screened across the entire interval.

An intermediate piezometer will be installed at proposed boring SJMW-015 to obtain a better understanding of the hydraulic conductivity of the more permeable zone directly below the waste material. This information will be used to support the evaluation of water infiltration rates and volumes expected during the RA. A piezometer will be installed to a total depth of -25 ft msl and screened from approximately -20 to -25 ft msl.

With the change in planned excavation methodology, the design must now account for deep excavation areas that will be excavated in the dry. To account for the lack of weight and downward pressure from the water under the Approach B flooded condition, additional geotechnical data is needed to evaluate the potential for hydraulic heave during excavation in those locations. Deep piezometers will be installed at proposed borings SJMW-016 and SJMW-017. These piezometers will extend into the sand layer below the Beaumont Clay Formation, approximately -50 ft msl. Upon completion of the boreholes, piezometers will be installed and screened from approximately -50 to -60 ft msl, or the top ten feet of the lower sand layer.

During the installation of deep piezometer, SJMW-016, split spoon and Shelby Tube samples will be collected as explained in Section 2.1.2 and as summarized in Table 2. The samples will be shipped under chain-of-custody procedures to a geotechnical laboratory for testing. Each sample will be tested for Unconsolidated Undrained Compression Test (ASM D2850), Atterberg Limits (ASTM D4318), moisture content (ASTM D2216), grain size (ASTM D6913/D7928), and #200 wash (ASTM D1140).

The confined Beaumont Sand is expected to have a relatively gradual hydraulic gradient. The two measurement points obtained from SJMW-016 and SJMW-017 will be compared to each other and available historical well measurements to confirm the gradual hydraulic gradient. This low gradient will allow the water levels taken at SJMW-016 and SJMW-017 to be extrapolated to approximate water levels across the entire excavation area.

All four piezometers will be constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) threaded casing. After development, a transducer will be installed, and a slug test will be performed to evaluate the lateral hydraulic conductivity of the strata through which each piezometer is screened, in accordance with the Standard Operating Procedure (SOP), included as Appendix A. A slug test is a controlled field experiment in which the water level in a well/piezometer is caused to

ED_014247_00001293-00011

change suddenly (e.g. by purging a known amount of water) and the subsequent water-level response (displacement or change from static) is measured through time. Aquifer properties, such as hydraulic conductivity, are estimated by fitting mathematical models to displacement data using a procedure known as curve matching. Piezometer locations SJMW-14 and SJMW-15 were selected from adjacent boring log data to capture the highest representative conductivity values These values will inform choices on peak excavation seepage rates and water volumes. The hydraulic head in the lower sand will be measured after development of the deep piezometers to determine the confined hydrostatic pressure. Pressuremeter Tests will also be performed at multiple intervals in each of the deep piezometers to evaluate the at-rest horizontal pressures of the Beaumont Clay Formation and the sand layer below the Beaumont Clay Formation, in accordance with the SOP included as Appendix B.

2.5 Restoration of TCRA Cap

Collection of samples will require a temporary opening be made in the TCRA cap and removal of armor rock. After sample collection, any casing will be pushed to the sediment surface. In areas in which geotextile is present below the armor rock, new geotextile will be placed over the opened area with a minimum of three feet of overlap and the armor rock will be replaced. In areas in which geomembrane and geotextile are present below the armor rock, a geomembrane patch will be hot-welded onto the existing geomembrane, new geotextile will be placed over the opened area with a minimum of three feet of overlap, and the armor rock will be replaced.

3. Sample Analysis

All samples will be analyzed by an accredited laboratory using EPA approved methods. The sample media, number of samples, and associated analyses are listed in Table 2. All analytical chemistry samples will be analyzed for $TEQ_{D,F,M}$ using EPA Method 1613B, in accordance with the QAPP developed for the PDI-2 fieldwork. The four waste characterization samples will be analyzed for all four RCRA hazardous waste characteristics in accordance with RCRA Title 40 CFR 261.

In accordance with the QAPP, a chain-of-custody (COC) record will be completed during sample collection and will accompany each shipment identifying the contents of the shipment to the laboratory. The field personnel will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require that the individuals relinquishing and receiving the samples sign, date, and note the time of the sample transfer on the COC record.

Samples will be shipped or delivered in a timely fashion so that holding times and/or analysis times can be met and allow for any carrier delays.

Samples will be transported in containers (i.e., coolers) packed with ice. Samples will be transported via commercial transport or lab provided courier. Samples will be packaged and shipped to the accredited laboratory with a separate COC in each cooler. All samples will be placed in an upright position and limited to one layer of samples per each cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping containers will be secured with strapping and custody tape for shipment to the laboratory.

ED_014247_00001293-00012

As previously stated, initially only the 2-ft interval samples collected from 0 to 18 ft bgs will be analyzed by the laboratory. All sample intervals will be analyzed on a standard TAT, though the 16 to 18 ft bgs samples will be prioritized. Samples from intervals 18 to 20, 20 to 22, and 22 to 24 ft bgs will be archived by the laboratory pending results from the 16 to 18 ft bgs interval sample. Upon evaluation of the results from the 16 to 18 ft bgs samples, samples collected from the deeper intervals may be analyzed, as described in Section 2.1.1.

Upon receipt of the preliminary analytical results from SJSB083 and SJSB101, the two 2-ft intervals from each boring that have the highest dioxins concentrations will be analyzed by the laboratory for waste characterization parameters as described in Section 2.1.3

4. Data Validation, Quality Control, and Reporting

The QAPP developed for PDI-2 will be followed for this sampling event. All laboratory analytical data will be reviewed and subsequently validated by a GHD project chemist. The validation of laboratory data will follow the guidance presented in the QAPP and will result in a completed data validation report that will be included in the *Pre-Final 90% Remedial Design - Northern Impoundment*. Analytical results from soil sampling efforts will be presented in a tabular format.

5. Investigation Derived Wastes (IDW)

Investigation derived waste (IDW) will be managed and tracked following the procedures developed for PDI-2 and outlined in the Investigation Derived Material Management SOP included in the PDIWP-2. Solid and liquid IDW from sampling and decontamination activities will be containerized and temporarily stored on-Site. Liquid waste (e.g., decontamination water) and dry waste (e.g., soil cuttings) will be segregated and transferred into United States Department of Transportation approved 55-gallon drums and temporarily stored on-Site prior to shipment to an authorized disposal facility.

All disposable materials used for sample collection and processing, such as paper towels and gloves, will be placed in heavyweight garbage bags or other appropriate containers. Disposable supplies that do not contain contaminated material will be removed from the work-site by sampling personnel and placed in a normal refuse container for disposal at a solid waste landfill.

IDW will be disposed of in accordance with applicable regulations and guidelines.

6. Health and Safety

GHD has developed task-specific Job Safety Analyses (JSAs) and a Site-specific HASP to protect the safety of on-Site workers. The HASP was submitted with the 2019 PDIWP-2. The HASP and JSAs will be present on-Site at all times during fieldwork activities, and they will be updated as needed.

ED_014247_00001293-00013

7. References

EPA, 1989. Methods for Evaluating the Attainment of Clean-Up Standards, Volume 1. Soils and Solid Media. PB89-234959. Washington, D.C.

EPA, 2002. "Guidance on Choosing a Sampling Design for Environmental Data Collection", EPA QA/G-5S. Washington, D.C.

EPA, 2019. Letter to C. Munce, GHD Services Inc., regarding approval of *Final Second Phase Pre-Design Investigation Work Plan*, dated August 8, 2019. U.S. Environmental Protection Agency.

EPA, 2020a. Letter to C. Munce, GHD Services Inc., regarding comments on *Additional Treatability Testing Notice*, dated May 5, 2020. U.S. Environmental Protection Agency.

EPA, 2020b. Letter to C. Munce, GHD Services Inc., regarding approval of *Revised Additional Treatability Testing Notice*, dated June 11, 2020. U.S. Environmental Protection Agency.

EPA, 2020c. Letter to C. Munce, GHD Services Inc., regarding comments on the *Preliminary 30% Remedial Design - Northern Impoundment*, dated July 16, 2020. U.S. Environmental Protection Agency.

EPA, 2020d. Letter to C. Munce, GHD Services, Inc., regarding the Waste Characterization Evaluation, dated November 19, 2020. U.S. Environmental Protection Agency.

EPA, 2021a. Letter to C. Munce, GHD Services Inc. regarding comments on the San Jacinto Supplemental Design Investigation Plan, dated March 29, 2021. U.S. Environmental Protection Agency.

GHD, 2019. *Final Second Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and the U.S. Environmental Protection Agency, Region 6. June 3, 2019.

GHD, 2020a. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding *Additional Treatability Testing Notice*, dated April 16, 2020. GHD Services Inc.

GHD, 2020b. *Preliminary 30% Remedial Design - Northern Impoundment*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and the U.S. Environmental Protection Agency, Region 6. May 28, 2020.

GHD, 2020c. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding *Revised Additional Treatability Testing Notice*, dated May 5, 2020. GHD Services Inc.

GHD, 2020d. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding the Waste Characterization Evaluation, dated October 20, 2020. GHD Services Inc.

GHD, 2021a. *Supplemental Design Investigation Sampling Plan - Northern Impoundment*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and the U.S. Environmental Protection Agency, Region 6. February 19, 2021.

ED_014247_00001293-00014

Paper Size ANSI B

0 30 60 90 120

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

Project No. 11215702
Revision No. -
Date Feb 8, 2021

NORTHERN IMPOUNDMENT

FIGURE 1

I:\GIS\GIS\Projects\11180000s\11187072\Layouts\MISC001\11187072-00(MISC001)GIS-BR041.mxd
Print date: 08 Feb 2021 - 13:44

Data source: Imagery - Google, 2019

ED_014247_00001293-00015

Proposed Boring	Latitude	Longitude
SJSB072	29.79498	-95.0634
SJSB073	29.79492	-95.063
SJSB074	29.7948	-95.0638
SJSB075	29.79463	-95.0634
SJSB076	29.79468	-95.0632
SJSB077	29.79444	-95.0637
SJSB078	29.79448	-95.0635
SJSB079	29.79434	-95.0633
SJSB080	29.79418	-95.0635
SJSB081	29.79404	-95.0628
SJSB082	29.79387	-95.0626
SJSB083	29.79393	-95.0623
SJSB084	29.79392	-95.062
SJSB085	29.79421	-95.0618
SJSB086	29.79406	-95.0621
SJSB087	29.79413	-95.0626
SJSB088	29.79461	-95.0625
SJSB089	29.79443	-95.0622
SJSB090	29.79465	-95.0622
SJSB091	29.79459	-95.0617
SJSB092	29.79495	-95.0619
SJSB093	29.79487	-95.0625
SJSB094	29.79516	-95.0621
SJSB095	29.79544	-95.0625
SJSB096	29.79546	-95.0623
SJSB097	29.79588	-95.0628
SJSB098	29.79568	-95.063
SJSB099	29.79539	-95.063
SJSB100	29.79584	-95.0632
SJSB101	29.79525	-95.0635
SJSB102	29.79376	-95.0624
SJSB103	29.796	-95.0629
SJSB105	29.79458	-95.0615
SJSB104	29.79493	-95.0616
SJSB106	29.79454	-95.0619

Legend

- PDI-2 Sample Location <30 ng/kg
- PDI-2 Sample Location >30 ng/kg
- PDI-1 Boring Location <30 ng/kg
- PDI-1 Boring Location >30 ng/kg
- RI Boring Location <30 ng/kg
- RI Boring Location >30ng/kg
- Proposed Supplemental Design Boring
- Collocated Waste Characterization Boring
- Conceptual BMP Alignment
- Non-impacted Berm Area
- TCRA Cap Perimeter
- Extent of ACBM
- Excavation Limit

Note: Proposed locations are subject to change based upon field conditions

Paper Size ANSI B

0 30 60 90 120

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

SUPPLEMENTAL DESIGN INVESTIGATION
ANALYTICAL SAMPLE LOCATIONS

Project No. 11215702
Revision No. -
Date May 13, 2021

FIGURE 2

I:\GIS\GIS\Projects\11180000s\11187072\Layouts\MISC001\11187072-00(MISC001)GIS-BR051.mxd
Print date: 13 May 2021 - 12:38

Data source: Imagery - Google, 2019

ED_014247_00001293-00016

Legend

- Proposed CPT Boring
- CPT Calibration Boring
- Shear Vane Testing
- Proposed Shallow Piezometer
- Proposed Intermediate Piezometer
- Proposed Deep Piezometer
- Proposed Deep Piezometer with SPT and Shelby Tubes
- RI Geotechnical Core with Primary and Secondary COPCs
- RI Geotechnical Core
- PDI-1 Geotechnical Boring Location
- PDI-1 Analytical and Geotechnical Boring Location
- PDI-2 Analytical Geotechnical Boring Location
- PDI-2 Geotechnical Boring Location
- Proposed Geotechnical Stratigraphy Borings
- Conceptual BMP Alignment
- Non-impacted Berm Area
- TCRA Cap Perimeter
- Extent of ACBM
- Excavation Limit

Note: Proposed locations are subject to change based upon field conditions

Paper Size ANSI B

0 30 60 90 120

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

SUPPLEMENTAL DESIGN INVESTIGATION GEOTECHNICAL EVALUATION

Project No. 11215702
Revision No. -
Date May 13, 2021

FIGURE 3

I:\GIS\GIS\Projects\11180000s\11187072\Layouts\MISC001\11187072-00(MISC001)GIS-BR052.mxd
Print date: 13 May 2021 - 12:43

Data source: Imagery - Google, 2019

ED_014247_00001293-00017

Paper Size ANSI B

0 30 60 90 120

Feet

N

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

SUPPLEMENTAL DESIGN INVESTIGATION
ADDITIONAL DATA COLLECTION

Project No. 11215702
Revision No. -
Date May 7, 2021

FIGURE 4

I:\GIS\GIS\Projects\11180000s\11187072\Layouts\MISC001\11187072-00(MISC001)GIS-BR045.mxd
Print date: 07 May 2021 - 12:19

Data source: Imagery - Google, 2019

ED_014247_00001293-00018

Table 1

Response to Comments – Supplemental Design Investigation
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
General Comments from the EPA			
1	General	Additional waste characterization samples should be taken in locations of known contamination to supplement waste characterization sampling performed during previous PDI activities. Update the plan to include details regarding this additional effort.	During the Pre-Design Investigations (PDI), nine waste characterization samples were collected and analyzed for ignitability, corrosivity, reactivity, and toxicity to determine whether the waste in the Northern Impoundment would be considered Resource Conservation and Recovery Act (RCRA) hazardous waste. In addition to the analysis of these samples, a thorough evaluation of the history and nature of the waste material was also conducted as part of a waste characterization evaluation that was summarized in a letter submitted to the EPA on October 20, 2020. As detailed in the October submittal, the waste material in the Northern Impoundment is not listed hazardous waste under 40 CFR Part 261, Subpart D; nor is it characteristically hazardous, as defined in 40 CFR Part 261, Subpart C. The EPA agreed with this determination in an approval letter dated November 19, 2020. As such, collection of further waste characterization samples is not necessary. However, in response to EPA's request, the Respondents will collect the additional waste characterization samples described below during the supplemental sampling event in areas with known elevated concentrations of dioxins. As required by EPA, four additional waste characterization samples will be collected from two planned analytical borings (SJSB083 and SJSB0101), as shown in Figure 2. During installation of borings SJSB083 and SJSB0101, duplicate samples will be collected from each planned 2-ft interval from 0 - 24 feet below ground surface (ft bgs). The samples for analytical characterization will be analyzed per the sampling program outlined in the proposed Sampling Plan and the waste characterization samples will be archived pending the results of the characterization samples. Upon receipt of the analytical results for the characterization samples, the two samples in each boring with the highest dioxins concentrations will be identified and the duplicate samples from those intervals will be analyzed for all four RCRA hazardous waste characteristics per EPA-required test methodology in 40 CFR Part 261. An explanation of this procedure has been added as Section 2.1.3 of the Sampling Plan. Table 2 was updated to indicate which borings will be analyzed for waste characterization and the list of RCRA hazardous waste parameters is included as Table 3. Figure 2 has been updated to indicate the borings that will be sampled for waste characterization.
Analytical Samples Comments from the EPA			
1	Section 2.1.1	The plan proposes that if the 16-18 ft interval is above the clean-up level, the next interval sample will be analyzed, and so on until a clean interval is observed. To save time and thoroughly delineate the bottom of waste, all three of the archived samples below 18 ft bgs should be analyzed if the 16-18 ft bgs interval concentration is above the clean-up level.	The Respondents acknowledge that there are five historic sample locations (SJGB010, SJGB012, SJSB036, SJSB046-C1, SJSB071) where TEQ levels < 30 ng/kg were not observed at the terminal depth of the boring. Three of these five borings were shallow borings, only extending to terminal depths of 8 - 12 ft bgs. Further, it should be noted that historically, there are no locations at which TEQ levels > 30 ng/kg have been observed in an interval deeper than 18 ft bgs. That said, the Respondents propose to collect samples deeper than 18 ft bgs, as necessary, in an attempt to identify terminal depth TEQ levels < 30 ng/kg. Due to limitations of the drilling methodology, it may not be possible to extend the terminal depth of some borings below 24 ft bgs. The Respondents propose to prioritize the analysis of all 16-18 ft bgs sample intervals to expedite the receipt of results so a determination can be made as to whether to analyze the samples from deeper intervals. If the 16 to 18 ft interval yields an analytical result with a TEQ level > 30 ng/kg, the 18-24 ft intervals will be analyzed. If the 22-ft to 24-ft interval is greater than 30 ng/kg, the Respondents will discuss with the EPA whether it is technically practicable to sample at lower depths. Sections 2.1.1 and 3.0 and Table 2 of the Sampling Plan have been revised to reflect that analysis of the 16-18 ft bgs sample interval will be prioritized to expedite the determination of whether the deeper intervals (18 ft bgs +) need to be analyzed.

Table 1

Response to Comments – Supplemental Design Investigation
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
2	Section 2.1.1 and 3.0	Priority should be given to sample locations where TEQ levels > 30 ng/kg have been observed at depths of 18 ft bgs or more so that analytical results can be reviewed while fieldwork is ongoing and additional samples can be taken if needed. Update the plan to include a schedule/timeline that identifies prioritized sampling locations.	As stated above, the Respondents acknowledge that there are five historic sample locations (SJGB010, SJGB012, SJSB036, SJSB046-C1, and SJSB071) where TEQ levels < 30 ng/kg were not observed at the terminal depth of the boring. Proposed boring locations which are collocated with historic sample locations in which an interval below the clean-up standard was not observed at the bottom of the boring (i.e., SJSB072, SJSB075, SJSB077, SJSB083, SJSB101) will be prioritized to the extent practicable (taking into account weather, tidal conditions, etc.). Three of the five locations are located in upland areas (SJSB072, SJSB075, SJSB077). These three borings will be completed first by the land-based drill rig. The other two locations (SJSB083 and SJSB101) are located in areas that are normally covered in water. These locations will be prioritized, but access may be affected by weather, tidal conditions, etc. In addition, boring locations in which subsurface data is more critical to the design (i.e., around the perimeter) will be prioritized to the extent possible. The text in Section 2.1.1 of the Sampling Plan has been updated accordingly.
3	Section 2.0	One stated objective of the additional sampling is to "further delineate the vertical extent of the material exceeding the ROD clean-up level around the perimeter of the excavation area to support the recently optimized conceptual BMP design." The 30% Northern Impoundment Remedial Design states that "Once the BMP is designed and constructed, excavation to deeper elevations in an attempt to reach a clean-up level cannot exceed the design excavation elevations for the BMP, as doing so has the potential to put more hydraulic force on the BMP and presents a risk of a significant BMP failure." The depth of the dredge prism for BMP design would need to accommodate the uncertainty in the depth of contamination. Therefore, particularly in areas in proximity of the BMP that would impact BMP stability, review the spatial coverage of sample points to ensure there is sufficient density to reduce uncertainty in the dredge prism design. This information will aid in designing a structurally robust BMP that is capable of withstanding forces associated with excavation of all impacted materials in the deeper areas of the Northern Impoundment.	The supplemental investigation includes 14 proposed boring locations around the perimeter of the excavation area, in proximity to the conceptual alignment of the BMP. Analytical results from those borings will be used in conjunction with the existing subsurface data to inform the design of the BMP. The number and locations of the borings are based upon best engineering judgement.
4	Section 2.0, Figure 2	Conduct more extensive delineation at the deep northwestern corner of the removal area and surrounding the articulated concrete block mat (ACBM).	In the Sampling Plan, the spatial coverage of the proposed borings in the northwestern corner was the same as the spatial coverage in the rest of the Northern Impoundment (approximately one boring per 1/4 acre, when historic and proposed borings are combined). It should be noted, however, that due to significant water depths in this area, a different drilling method may be required that will be extremely challenging to utilize and poses logistical and safety-related risks. In response to this comment, the Respondents have added three boring locations (SJSB100, SJSB101, and SJSB103) in the northwestern corner in the vicinity of the ACBM to further delineate this area. The boring locations are shown on Figure 2.
5	Section 2.0, Figure 2	Conduct more extensive delineation in the southeast corner of the site in the vicinity of cores SJSB046, SJSB046-C1, and SJSB047-C1.	The proposed soil borings in the southeastern corner of the Northern Impoundment have been adjusted and an additional boring location (SJSB102) has been added between historic borings SJSB046 and SJSB045-C1 to further delineate this area. The boring locations are shown on Figure 2.

Table 1

Response to Comments – Supplemental Design Investigation
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
6	Section 2.0, Figure 2	Supplemental borings are required as part of this sampling event if previous borings did not reached TEQ levels < 30 ng/kg.	As stated in the response to Analytical Sampling Comment 1 above, there are five historic sample locations (SJGB010, SJGB012, SJSB036, SJSB046-C1, and SJSB071) where TEQ levels < 30 ng/kg were not observed at the terminal depth of the boring. The initial submittal of this Sampling Plan included proposed borings adjacent to each of these historic borings, with the exception of SJSB071. A proposed boring location (SJSB101) has been added adjacent to SJSB071 such that now there will be a collocated boring installed beside all five of these historic boring locations as part of the Supplemental Design Investigation. With the exception of borings SJSB083 and SJSB101 which will be analyzed for waste characterization purposes, the Respondents will only analyze the samples in the collocated borings that are deeper than the terminal depth of each historic boring with TEQ levels > 30 ng/kg (e.g. at proposed boring location SJSB072, the first sample analyzed would be the interval from 8 - 10 ft bgs, because collocated historic boring SJGB012 had a TEQ level > 30 ng/kg at its terminal depth of 8 ft bgs). The text in Section 2.1.1 of the Sampling Plan has been updated accordingly. The planned sample intervals are detailed in Table 2. The boring locations are shown on Figure 2.
7	Section 2.0, Figure 2	Some of proposed supplemental borings are close to a PDI-2 sample location showing contamination as opposed to equally spaced between two PDI-2 sample location showing contamination, such as SJSB085 and SJSB076, despite the adjacent core having reached clean. Review these sample locations.	The number and locations of the proposed borings have been adjusted in accordance with the boring placement specified by the EPA in email correspondence dated May 9, 20201.Borings moved or added at the EPA's direction appear to be investigative in nature and the Respondents do not regard the addition of these borings to be necessary or appropriate to inform the 90% RD. The adjusted boring locations are shown on Figure 2.
Geotechnical Samples Comments from the EPA			
1	Figure 3	Update Figure 3 to include locations of geotechnical samples that were taken during previous investigations.	Figure 3 has been updated to include previous geotechnical sample locations from the Remedial Investigation (RI), and first and second phases of the PDI.

Table 1

Response to Comments – Supplemental Design Investigation
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
2	Section 2.1.2	Based on the proposed CPT exploration plan along the alignment of the BMP, conduct at least one CPT adjacent to a previously completed SPT boring with laboratory shear strength and consolidation testing for data comparison and site specific correlation. Update plan to include discussion on how this correlation will be done.	In order to correlate the CPT data collected during this investigation to the abundant geotechnical laboratory test data collected during past geotechnical investigations, a "calibration boring" will be necessary. The calibration boring will have both CPT data and geotechnical laboratory test data from ground surface to the Beaumont Sands. To that end, an eleventh CPT boring will be installed adjacent to planned piezometer location, SJMW-016 to provide the CPT data. To provide the corresponding laboratory test data for comparison, during the installation of piezometer SJMW 016, geotechnical samples will be collected for laboratory analysis (including shear strength and consolidation testing). CPT data and physical samples will be collected along the entire length of this deep boring, including from the Beaumont Clay and Beaumont Sand layers. Using the common set of information and well defined relationships for various parameters available from the two tests, the CPT results obtained from the ten borings along the current conceptual BMP alignment can be calibrated using data from SJMW-016 and correlated to existing geotechnical laboratory test data from past investigations. The location of this boring and all other historic geotechnical borings have been added to Figure 3. Section 2.1.2 of the Sampling Plan has been updated to discuss the correlation of the CPT data.
3	Section 2.1.2	Per prior designs and documentation, a key concern with the site stratigraphy is potential long-term strengths of the clay layers. Testing was performed in the preliminary subsurface investigation to characterize the long-term strength. Based on the original and new findings, tabulate skin friction values for steel piling that could be referenced by a Contractor for developing the pile installation plan, and possible removal during the Remedial Action.	Acknowledged. The site stratigraphy, details of soil characterization and friction parameters, and calculated skin friction values will be included in the Northern Impoundment Remedial Design and will be available to the Remedial Contractor during the Remedial Action.
4	Section 2.1.2	Review the site history to evaluate the risk of potential early CPT refusal due to obstructions and/or stiff/dense soil conditions. The CPT operator should evaluate the existing conditions to confirm the equipment can penetrate to the required depths. Additionally, if CPT cannot be advanced, adjustments to the sampling locations may be made in the field. Add a description as to how these decisions will be made and what the adjustment will be.	Site stratigraphy information from the RI and PDIs was reviewed with the project team to determine the CPT locations and was incorporated into the Sampling Plan. Consistent with the protocol followed during PDI-2, a CPT boring location may be moved within 25 feet of its proposed location if necessary, to avoid refusal or surface impediments. If it is necessary to move a CPT boring location farther than 25 feet from the proposed location, it will be discussed with the EPA at that time. Section 2.1.2 of the Sampling Plan has been updated to provide information about the procedure that will be followed if there are problems advancing a boring due to subsurface refusal or some other field condition.
Piezometer Installation Comments from the EPA			

Table 1

Response to Comments – Supplemental Design Investigation
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
1	Section 2.3	As stated in the plan, "With the change in planned excavation methodology, the design must now account for deep excavation areas that will be excavated in the dry." During the March 2021 TWG meeting we discussed the concern that hydraulic heave may be more likely to occur in the deep excavation areas. There was also discussion regarding the placement of the piezometers and whether there was a need for installation of additional deep piezometer(s) in the northwest area and eastern area where deep excavations are planned in addition to the proposed locations. After consideration of this concern, update the plan to include additional deep piezometers, or add an explanation to support how the proposed location near boring SJMW-016 will be representative of the pressures at other deep excavation areas at the site.	With the change in planned excavation methodology, the design must now account for the need to excavate to deeper depths in the dry. To account for the lack of weight and downward pressure from what would have been a flooded condition under Approach B, additional geotechnical data are needed to evaluate the potential for hydraulic heave during the RA. In addition to the deep piezometer (SJMW-016) proposed in the initial submittal of this Sampling Plan, an additional deep piezometer has been added (SJMW-017) in the southeast corner. These piezometers will extend into the sand layer below the Beaumont Clay Formation, approximately 50 ft msl. Upon completion of the boreholes, temporary monitoring wells will be installed and screened from approximately 50 to 60 ft msl, or the top ten feet of the lower sand layer. The confined Beaumont Sand is expected to have a relatively gradual hydraulic gradient. The two measurement points obtained from SJMW-016 and SJMW-017 will be compared to each other and available historical well measurements to confirm this. This low gradient will allow the water levels taken at SJMW-016 and SJMW-017 to be extrapolated to approximate water levels across the entire excavation area. Section 2.3 of the Sampling Plan has been updated to provided further detail and Table 2 and Figure 3 have been updated to include the addition of SJMW-017.
2	Section 2.3, Page 5	The final paragraph of this section proposes that a slug test will be performed to evaluate the hydraulic conductivity of the strata through which each temporary monitoring well is screened. Aquifer tests were not part of the Pre-Design Investigation Phase 2 (PDI-2) scope of work so standard operating procedures (SOPs) for aquifer testing methodology were not included in PDI-2 Field Sampling Plan Appendix C-1. Please provide an SOP or similarly detailed description of the aquifer testing methodology proposed (slug test and Pressure meter test).	SOPs for Slug Testing and Pressuremeter Testing have been added as Attachments 1 and 2, respectively, and referenced in Section 2.3, paragraph 5 of the Sampling Plan.
3	Section 1.2, Objective, 4th Bullet	As discussed in the March 2021 TWG, lateral hydraulic conductivity of the waste materials may be needed for estimating drainage from the waste pile while excavating deeper areas. During the March 2021 TWG meeting, it was clarified that the slug test from the upper well screen will provide an estimate of the lateral drainage or seepage from the waste pile during drawdown activities. Update the report to clarify how the proposed method in the plan will measure lateral hydraulic conductivity.	A slug test is a controlled field experiment in which the water level in a well is caused to change suddenly (e.g. by purging a known amount of water) and the subsequent water-level response (displacement or change from static) is measured through time. Aquifer properties, such as hydraulic conductivity, are estimated by fitting mathematical models to displacement data using a procedure known as curve matching. The locations of piezometers SJMW014 and SJMW015 were selected from adjacent boring log data to capture the highest representative conductivity values testable from dry land. The observed conductivity values will inform choices on peak excavation seepage rates and water volumes. The text in paragraph 5 of Section 2.3 of the Sampling Plan has been updated to provide clarification regarding how the proposed method will measure lateral hydraulic conductivity. In addition, the fourth bullet in Section 1.2 of the proposed Sampling Plan has been updated to replace the word "infiltration" with the word "seepage".
Additional Scope Added Since February Submittal of the Supplemental Design Investigation Sampling Plan			
1	Section 2.1.1	Seven analytical borings have been added to the Sampling Plan (SJSB100 - SJSB106), as detailed in Section 2.1.1 and Table 2. At EPA's direction, the locations of many of the proposed borings have also been adjusted. The final proposed boring locations are shown in Figure 2.	
2	Section 2.3	Supplemental data will be collected to support the design of turbidity control measures for use during installation and removal of the BMP during the RA. Additional data collection will include verifying thicknesses of surface materials, geotechnical characteristics of surficial sediment, and velocity measurements in locations outside the proposed BMP alignment as detailed in Section 2.3, Figure 4, and Table 3.	
3	Section 2.4	An additional deep piezometer (SJMW-017) will be installed in the southeast corner of the Northern Impoundment, as detailed in Section 2.4, Figure 3, and Table 2.	

Table 1

Response to Comments – Supplemental Design Investigation
Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
4	Sections 2.1.2 and 2.4	As detailed in Sections 2.1.2 and 2.4, an eleventh CPT boring (SJCPT-011) will be installed adjacent to deep piezometer SJMW-016 to serve as a "calibration boring". Geotechnical laboratory samples will also be collected during the installation of adjacent piezometer SJMW-016. Having a CPT boring that is collocated with a geotechnical boring with laboratory test data will serve to establish a correlation between the CPT investigation data and laboratory test data. This calibration data can then be used to correlate the CPT data collected from the borings around the perimeter to the laboratory test data collected during previous investigations to supplement limited existing data from the lower geological strata (Beaumont Clay and Beaumont Sands). Table 2 has been updated to include the additional data collection.	
5	Section 2.1.2	To further investigate shallow sediments in the northwest corner, shear vane strength readings will be taken in the top 4 to 5 feet of CPT borings SJCPT-002, SJCPT-003, and SJCPT-004. Details are provided in Section 2.1.2, Figure 3, and Table 2.	
6	Section 2.1.3	A total of four waste characterization samples will be collected from two boring locations (SJSB083 and SJSB101). Details are provided in Section 2.1.3, Figure 2, and Table 2.	

Table 2

Details of Planned Supplemental Design Investigation Borings
Supplemental Design Investigation Work Plan Revision 1
San Jacinto River Waste Pits Site
Harris County, Texas

Station ID	Location	Boring Type	Boring Details	Total Depth (feet bgs)	Analyses	Total Number of Samples Collected	Initial Sample Depth (feet bgs)	Coordinates[a]	
								X	Y
Soil Chemistry Borings									
SJSB072	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals from 8 f bgs to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	8	8	29.7950	-95.0634
SJSB073	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7949	-95.0630
SJSB074	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7948	-95.0638
SJSB075	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals from 10 ft bgs to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	6	12	29.7946	-95.0634
SJSB076	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7947	-95.0632
SJSB077	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals from 6 ft bgs to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	9	6	29.7944	-95.0637
SJSB078	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7945	-95.0635
SJSB079	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7943	-95.0633
SJSB080	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7942	-95.0635
SJSB081	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7940	-95.0628
SJSB082	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7939	-95.0626
SJSB083	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7939	-95.0623
		Waste Characterization	2-foot discrete intervals to depth of 24 feet. Upon receipt of the results analytical results for the soil chemistry borings, the two samples with the highest dioxins concentrations will be identified and the duplicate samples from those intervals will be analyzed.	24	RCRA Hazardous Waste Parameters	12	0		
SJSB084	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7939	-95.0620
		Deep Geotechnical Boring	SB-084 will be extended from 24 ft bgs into the Beaumont clay formation. Analytical samples will not be collected, only subsurface stratigraphy logged.	~40	NA	0	NA		

Table 2

Details of Planned Supplemental Design Investigation Borings
Supplemental Design Investigation Work Plan Revision 1
San Jacinto River Waste Pits Site
Harris County, Texas

Station ID	Location	Boring Type	Boring Details	Total Depth (feet bgs)	Analyses	Total Number of Samples Collected	Initial Sample Depth (feet bgs)	Coordinates[a]	
								X	Y
SJSB085	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7942	-95.0618
		Deep Geotechnical Boring	SB-085 will be extended from 24 ft bgs into the Beaumont clay formation. Analytical samples will not be collected, only subsurface stratigraphy logged.	~40	NA	0	NA		
SJSB086	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7941	-95.0621
SJSB087	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7941	-95.0626
SJSB088	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7946	-95.0625
SJSB089	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7944	-95.0622
SJSB090	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7947	-95.0622
SJSB091	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7946	-95.0617
		Deep Geotechnical Boring	SB-091 will be extended from 24 ft bgs into the Beaumont clay formation. Analytical samples will not be collected, only subsurface stratigraphy logged.	~40	NA	0	NA		
SJSB092	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7950	-95.0619
SJSB093	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7949	-95.0625
SJSB094	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7952	-95.0621
SJSB095	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7954	-95.0625
SJSB096	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7955	-95.0623
SJSB097	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7959	-95.0628
SJSB098	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7957	-95.0630
SJSB099	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7954	-95.0630
SJSB100	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7958	-95.0632

Table 2

Details of Planned Supplemental Design Investigation Borings
Supplemental Design Investigation Work Plan Revision 1
San Jacinto River Waste Pits Site
Harris County, Texas

Station ID	Location	Boring Type	Boring Details	Total Depth (feet bgs)	Analyses	Total Number of Samples Collected	Initial Sample Depth (feet bgs)	Coordinates[a]	
								X	Y
SJSB101	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals from 18 ft bgs to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7952	-95.0635
		Waste Characterization	2-foot discrete intervals to depth of 24 feet. Upon receipt of the results analytical results for the soil chemistry borings, the two samples with the highest dioxins concentrations will be identified and the duplicate samples from those intervals will be analyzed.	24	RCRA Hazardous Waste Parameters	12	0		
SJSB102	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7938	-95.0624
SJSB103	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7960	-95.0629
SJSB104	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7946	-95.0615
SJSB105	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7949	-95.0616
SJSB106	Northern Impoundment	Soil Chemistry Boring	2-foot discrete intervals to depth of 24 feet. Samples collected from 18-24 ft bgs will be held pending analysis of 16-18 ft bgs interval.	24	Dioxins and furans	12	0	29.7945	-95.0619
Cone Penetrometer Test (CPT) Geotechnical Borings[b]									
SJCPT001	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7950	-95.0641
SJCPT002	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7956	-95.0638
		Shallow Sediment	Real-time shear vane strength readings will be collected at 2 ft intervals down to approximately 4-5 feet below mudline of SJCPT-02. No analytical samples will be collected.	~4-5					
SJCPT003	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7960	-95.0635
		Shallow Sediment	Real-time shear vane strength readings will be collected at 2 ft intervals down to approximately 4-5 feet below mudline of SJCPT-03. No analytical samples will be collected.	~4-5					
SJCPT004	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7963	-95.0630
		Shallow Sediment	Real-time shear vane strength readings will be collected at 2 ft intervals down to approximately 4-5 feet below mudline of SJCPT-04. No analytical samples will be collected.	~4-5					
SJCPT005	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7962	-95.0624
SJCPT006	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7960	-95.0618
SJCPT007	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7953	-95.0613
SJCPT008	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7947	-95.0610
SJCPT009	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7940	-95.0610

Table 2

Details of Planned Supplemental Design Investigation Borings
Supplemental Design Investigation Work Plan Revision 1
San Jacinto River Waste Pits Site
Harris County, Texas

Station ID	Location	Boring Type	Boring Details	Total Depth (feet bgs)	Analyses	Total Number of Samples Collected	Initial Sample Depth (feet bgs)	Coordinates[a]	
								X	Y
SJCPT010	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7935	-95.0616
SJCPT011	Northern Impoundment	CPT Boring	CPT boring will be advanced into the top of the Beaumont sand formation. Analytical samples will not be collected but continuous in-situ data will be recorded.	~50-70	NA	0	NA	29.7948	-95.0632
Surficial Sediment Geotechnical Properties									
SJGC001	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties	1	0	29.7950	-95.0641
SJGC002	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties	1	0	29.7956	-95.0638
SJGC003	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties	1	0	29.7960	-95.0635
SJGC004	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties	1	0	29.7963	-95.0630
SJGC005	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties, Sediment and Rock Thickness	1	0	29.7962	-95.0624
SJGC006	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties, Sediment and Rock Thickness	1	0	29.7959	-95.0619
SJGC007	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties, Sediment and Rock Thickness	1	0	29.7953	-95.0614
SJGC008	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties, Sediment and Rock Thickness	1	0	29.7946	-95.0611
SJGC009	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties, Sediment and Rock Thickness	1	0	29.7941	-95.0611
SJGC010	Northern Impoundment	Surficial Sediment	0-6 inch surficial sediment interval analyzed for water content (ASTM D2216), dry density (ASTM D2937),Atterberg Limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422), organic carbon content (ASTM D2974), and consistency/stickiness using the Natural Resources Conservation Service method.	0.5	Geotechnical Properties, Sediment and Rock Thickness	1	0	29.7935	-95.0616

Table 2

Details of Planned Supplemental Design Investigation Borings
Supplemental Design Investigation Work Plan Revision 1
San Jacinto River Waste Pits Site
Harris County, Texas

Station ID	Location	Boring Type	Boring Details	Total Depth (feet bgs)	Analyses	Total Number of Samples Collected	Initial Sample Depth (feet bgs)	Coordinates[a]	
								X	Y
Piezometer Borings for Hydraulic Conductivity and Subsurface Hydrostatic Pressure									
SJMW-014	Northern Impoundment	Shallow Piezometer	Piezometer for waste material investigation, temporary well screened from 0-8 ft bgs.	~8	NA	0	NA	29.7950	-95.0633
SJMW-015	Northern Impoundment	Intermediate Piezometer	Piezometer to investigate permeable zone below waste material, temporary well screened at bottom five feet bgs.	~25	NA	0	NA	29.7949	-95.0633
SJMW-016	Northern Impoundment	Deep Piezometer	Piezometer advanced into the sand layer beneath the Beaumont Clay formation to evaluate the potential for hydraulic heave during RA, temporary well screened at the top ten feet of the lower sand layer.	~50-60	NA	0	NA	29.7949	-95.0633
		Geotechnical	Additional geotechnical data will be collected during SJMW-016 installation and between PMT tests to correlate to adjacent SJCPT-011. Shelby Tube samples will be collected at ~10 ft bgs intervals until boring termination. Geotechnical samples will be tested for tested for Unconsolidated Undrained Compression Test (ASM D2850), Atterberg Limits (ASTM D4318), moisture content (ASTM D2216), grain size (ASTM D6913/D7928), and #200 wash (ASTM D1140).		Geotechnical Properties	Up to 8	10		
SJMW-017	Northern Impoundment	Deep Piezometer	Piezometer advanced into the sand layer beneath the Beaumont Clay formation to evaluate the potential for hydraulic heave during RA, temporary well screened at the top ten feet of the lower sand layer.	~50-60	NA	0	NA	29.7935	-95.0623

Notes:
bgs = below ground surface
NA = Not applicable
[a] NAD 1983; State Plane Texas South Central FIPS 4204; US feet.
[b] In-situ geotechnical investigation method to record data in real-time at regular intervals during penetration.

Table 3

RCRA TCLP Regulatory Levels
Supplemental Design Investigation Sampling Plan
San Jacinto River Waste Pits Site
Harris County, Texas

Analysis	Units	EPA Regulatory Limits
General Chemistry		
Flash Point	°C	>60
Percent solids	%	--
pH, lab	s.u.	>2 or <12
Reactive cyanide	mg/kg	--
Reactive sulfide	mg/kg	--
Sulfur	mg/kg	--
TCLP-Herbicides		
2,4,5-TP (Silvex)	mg/L	1.0
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	10.0
TCLP-Metals		
Arsenic	mg/L	5.0
Barium	mg/L	100.0
Cadmium	mg/L	1.0
Chromium	mg/L	5.0
Lead	mg/L	5.0
Mercury	mg/L	0.2
Selenium	mg/L	1.0
Silver	mg/L	5.0
TCLP-Pesticides		
Chlordane	mg/L	0.03
Endrin	mg/L	0.02
gamma-BHC (lindane)	mg/L	0.4
Heptachlor	mg/L	0.008
Heptachlor epoxide	mg/L	0.008
Methoxychlor	mg/L	10.0
Toxaphene	mg/L	0.5
TCLP-Semi-Volatile Organic Compounds (SVOCs)		
o-Cresol	mg/L	200.0
m-Cresol	mg/L	200.0
p-Cresol	mg/L	200.0
Total Cresol[1]	mg/L	200.0
2,4,5-Trichlorophenol	mg/L	400.0
2,4,6-Trichlorophenol	mg/L	2.0
2,4-Dinitrotoluene	mg/L	0.13
Hexachlorobenzene	mg/L	0.13
Hexachlorobutadiene	mg/L	0.5
Hexachloroethane	mg/L	3.0
Nitrobenzene	mg/L	2.0
Pentachlorophenol	mg/L	100.0
Pyridine	mg/L	5.0
TCLP-Volatile Organic Compounds (VOCs)		
1,1-Dichloroethylene	mg/L	0.7
1,2-Dichloroethane	mg/L	0.5
1,4-Dichlorobenzene	mg/L	7.5
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	200.0
Benzene	mg/L	0.5
Carbon tetrachloride	mg/L	0.5
Chlorobenzene	mg/L	100.0
Chloroform (Trichloromethane)	mg/L	6.0
Tetrachloroethylene	mg/L	0.7
Trichloroethylene	mg/L	0.5
Vinyl chloride	mg/L	0.2

Notes:
TCLP - Toxicity Characteristic Leaching Procedure
mg/L - milligrams per Liter
mg/kg - milligram per kilogram
Deg F - Degrees in Fahrenheit
s.u. - standard unit
[1] If o, m, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

Appendices

ED_014247_00001293-00031

Appendix A
GHD Groundwater Well Slug Testing Standard Operating Procedure

ED_014247_00001293-00032

Appendix A

1. Introduction

This standard operating procedure (SOP) describes the approach to be taken to undertake slug or hydraulic conductivity tests on groundwater observation wells. The conventional form of slug test is carried out by the displacement of a 'slug' of water using a bailer or displacer and measuring the response of the recovering water level in the well through time. Slug tests are carried out on conventionally constructed, fully or partially penetrating wells.

A slug test is conducted by instantaneously removing or introducing a known volume (or slug) to a well that displaces (either decreases or increases) the water level in the well. The slug could comprise a known volume of water or a solid object of a known volume into a well. Slug tests are often classified as either rising-head tests or falling-head tests, depending on the direction of water level recovery being monitored.

The resulting recovery to equilibrium conditions (either rise or fall) of the water level in the well is then monitored, and the data analysed by one of several methods to determine the horizontal hydraulic conductivity.

1.1 Purpose of this document

This procedure describes the approach to be taken for conducting a slug test in a manner that is reliable, representative, and repeatable.

1.2 Scope of this document

This procedure applies to all projects where a rapid, simplistic estimation of hydraulic conductivity is required from a groundwater well. For a more accurate determination of aquifer properties, SOP 12 *Groundwater Well Pumping Test* should be consulted.

Slug tests are most commonly applied in situations where groundwater flow to the well is not sufficient to allow pumping or where well diameters are narrow (< 100 mm). In addition, this approach is useful when only an order of magnitude of aquifer transmissivity is desired.

They may not be appropriate in fractured rock or formations with a transmissivity greater than 250 m^2/day (Kruseman and de Ridder, 1990).

1.3 Planning

A number of factors must be considered during the field-planning phase. These include:

- Data required:
  - well diameter and depth (i.e. casing inside radius)
  - screen slot size and length
  - filter pack material (thickness, grain size and porosity)

ED_014247_00001293-00033

  - borehole diameter
  - depth to top of screen from water table (unconfined aquifer) or overlying confining unit (confined aquifer);
  - slug radius and length (solid slug);
  - static (pre-test) depth to water in well;
  - saturated thickness of aquifer
- Is your well fully or only partially penetrating the aquifer?
  - Analytical methods for slug test data require knowledge of the thickness of the tested water bearing zone (i.e. the aquifer). Correction factors (Cedegren, 1977) need to be applied when analysing the data from partially penetrating wells.
- Does the water table intersect the well screen? Rising versus falling head tests.
  - There is a need to consider problems encountered with wells in which the well screen crosses the water table.
  - For a rising head test, the slug test can be run as usual with a corrected value used for the casing radius in calculations.
  - For a falling head test however, introduction of a slug pushes water into both the saturated zone and unsaturated zone (i.e. above and below the surface of the water table). For equal screen lengths in the saturated and unsaturated zones, the flow into the unsaturated zone will generally be lower because unsaturated hydraulic conductivity is always lower than the saturated hydraulic conductivity, but the magnitude of the flow cannot be quantified with some calculation methods (e.g. Bouwer and Rice Method). When the screen length in the unsaturated zone is a significant portion of the total screen length, either limit the water level rise (by using a smaller slug), or run a rising head test only.

1.4 Health safety and environment

A site specific safety plan should be prepared prior to commencing all field work on site and should be regularly reviewed and updated throughout the project as changes in conditions or work methods occur.

Reference should be made to safety requirements and considerations described in specific sampling procedures and in SOP 19 *Safety Plan Preparation and PPE.*

The following provides a brief summary of some typical safety issues that should be considered when undertaking groundwater well slug tests.

- These tests are often undertaken on contaminated sites and therefore appropriate OH&S procedures should be followed. The procedure is similar to groundwater sampling and therefore exposure (both personal and equipment) to hazardous materials is possible;
- Suitable gloves (nitrile under leather) should be used when raising or lowering the slug as the weighted line can injure hands. A clean pair (double layer) of nitrile gloves should be worn when handling potentially contaminated groundwater. Care should be taken not to spread potentially contaminated material around the work area and / or cross-contaminate other materials;

- Slug tests cause rapid movements of water level in the well. They should not be carried out where the resultant rapid pressure changes could cause collapse of the well wall, or where serious particle rearrangement would be caused in a filter pack;
- The procedure involves the placement of tools and instruments within a groundwater well. Should water quality monitoring ever be undertaken in the well, instruments should be decontaminated both prior to and following removal from the well.
- At hazardous waste sites, the injection of water into a well will result in the well not being useful, for a period of time, for the collection of ground water samples. When potentially contaminated water is removed from a well it may require storage or treatment prior to disposal. (Refer to SOP 22 *Disposal of Waste Materials*).

1.4.1 Personal protective equipment

Personal protective equipment (PPE) required for groundwater sampling include as a minimum:

- Steel-cap lace-up boots.
- Long cotton drill pants (no jeans with elastin).
- Long-sleeved high-visibility shirt.
- Wide-brimmed hard hat (if in an area where something could fall on you); or wide-brimmed sun hat.
- Safety glasses.
- Manual handling gloves with a rubber (or similar) grip.
- Nitrile gloves.
- Sunscreen (broad spectrum SPF 30+).
- Insect repellent.
- Hearing protection (if using a generator).

2. Equipment specifications

2.1 Equipment

The following equipment is required:

- Dip meter or interface probe.
- Level logger, data transfer devise (ie optical reader), cable.
- Bailer/slug with cord / cable.
- Distilled water (if using a bailer rather than slug for the test).
- Decontamination equipment.
- Watch/timer.

- Notepad & pen, field record sheet (see Appendix A).
- Laptop computer with logger software installed.

3. Directions

3.1 Set-up

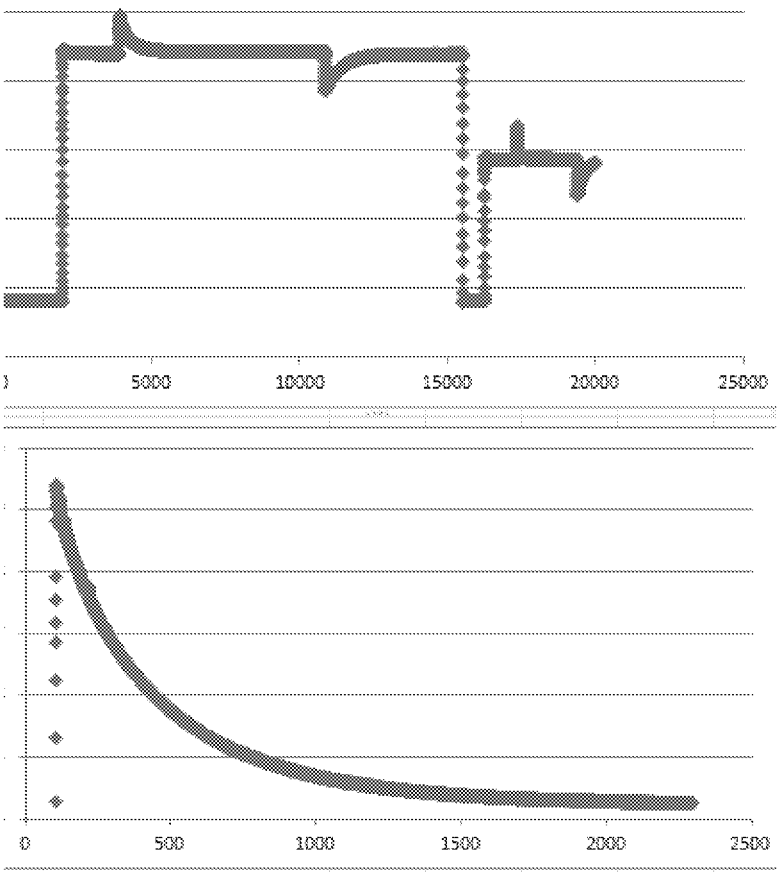
- Set up logger prior to use. You will need to specify the recording period (start & stop times) and the recording interval (time between measurements). Multiple tests can be done over a single recording period provided the test order and times are recorded. Ensure all units are appropriate (i.e. metres, cm, seconds etc.).
- Selection of appropriate logger recording time is important. Within permeable strata such as sands and gravels, a recording interval of 1 to 2 seconds is required. For clay, a 5-second interval will suffice, unless very long recovery times (hours/days) are anticipated, in which case a recording interval of 10 seconds may be adopted. Ensure that the selected interval and recording frequency will result in a total number of data points less than the capacity of the logger.
- On arrival at site, inspect the bore to be tested. Record signs of tampering or poor state of repair.
- Remove bore end cap & allow bore to equilibrate with the atmosphere.
- Decontaminate all items to be inserted into the bore (logger, slug & IP probe).
- Dip bore and record the standing water level (SWL) to the nearest mm. Record this value on the data sheet.
- Attach the logger securely to the loop of the marked cable using the D-shackle and pliers and/or shifter. **Ensure logger is securely attached prior to insertion into bore**.
- Insert logger so that it is a few metres below the groundwater surface in the bore - it will need to be a minimum of 2 metres below the base of the slug when it is inserted, however it must not be in any sediment at the base of the bore. Secure the logger so that it will not move. The logger may need to be weighted to keep it in place. **It is important that the pressure transducer is not disturbed over the life of the test.**

3.2 Falling head test

- Dip the bore. When the SWL has returned to the original level proceed to the next step.
- Lower the slug into the bore in a **single, fluid and rapid motion** so that it is completely submerged and secure firmly in place (only just submerged, **be very careful not to disturb the logger**). It is preferable to use a solid slug, however if a bailer is being used, fill the bailer with distilled water so that it will not fill with bore water (this water will need to be purged prior to sampling).
- Wait a short while
- Dip the bore again. If the water level has returned to the original level, proceed to the next step. If the water level has not returned to the original level, keep waiting. Dip the bore periodically. Proceed to the next step once water level has returned to the original level.

3.3 Rising head test

- Remove the bailer in a single fluid and rapid movement, being careful not to disturb the logger.
- Allow the bore to recover. Dip the bore periodically. When the SWL has returned to the original level (or very close to it) the test is complete. This may take in the order of a minute or two in higher permeability media (such as sand), to a few hours in clays.
- Ideally, the falling and rising head tests should be repeated again, using a slug of a different volume. For low permeability media, this will not always be practical.
- Download the data onto the laptop and check to ensure that the recovery curves look good. These are nice recovery curves:



- Decontaminate and dry equipment.
- ****TURN OFF LOGGER AFTER TESTS****** otherwise battery will go flat.

4. General notes

4.1 Field notes

Ensure that site notes are complete before removing equipment and moving to the next bore. Notes must include:

- Bore ID
- Date
- Original SWL
- SWL prior to insertion of slug/bailer
- SWL immediately prior to removal of bailer
- SWL immediately prior to removal of logger
- Final SWL
- Time when test was commenced and completed
- Volume of slug. This should be the gross volume of the bailer, not just the water volume within. If using the pre-fabricated screw together slug, note how many segments were used for the test.

4.2 General advice

- This method completes two tests per slug insertion - one when the slug is lowered into the well, and one when it is removed. The two data sets increase accuracy.
- In low permeability media, bores will respond slowly. It may be possible to complete the second phase of the test (ie removal of the slug/bailer) before the SWL has recovered completely. Ideally, the water level should have recovered 95% of the original displacement.
- Use of a bailer filled with distilled water is not ideal. A solid slug should be used whenever possible.
- Equipment must be cleaned and dried prior to leaving site / returned to the pelican case.
- Be sure to note the slug displacement dimensions. Refer to Lohman (1979) for additional detail regarding this method. The method is strictly applicable only to fully penetrating or fully screened wells in confined aquifers of rather low transmissivity - say less than 2,100 m^2/day.
  - For partially penetrating wells, the value of transmissivity obtained generally would apply only to that part of the aquifer in which the well is screened or open.
  - In addition, the estimated transmissivity is representative of the zone immediately adjacent to the well screen.
- When a well has been fitted with a screen with a limited open area per unit length, a slug test may provide little useful information about the aquifer characteristics, but can provide information on the degree of development of an observation well. An open area of at least 10% should be considered as the limiting value.
- An example log sheet from AS2368-1990 has been provided. For most applications time and drawdown measurements are recorded digitally and therefore only details regarding the well are required to be recorded on the form.

5. Edit history

Revision	Date	Title	Written by	Approved by
2	July 2014	SOP 13 Groundwater Well Slug Test	NA	Sherri Sibio
A	July 2016	GHD SOP (SQOC) - Groundwater Well Slug Testing	James Dowdeswell	James Dowdeswell

ED_014247_00001293-00039

Appendix A - Example slug test record sheet

Slug Test - Field Record Sheet

Sheet: .... of..... .... GHD job number: ....

Field personnel: ....

Bore ID	Test Date	Time				Standing Water Level (m below TOC)				Slug vol (L) number of segments or dimensions	Comments
		Start	Slug in	Slug out	Finish	1	2	3	4		

SWL - 1: SWL prior to insertion of logger into bore, 2: SWL prior to insertion of slug/bailer, 3: SWL prior to removal of slug/bailer, 4: SWL prior to removal of logger
SWL should return to original levels (or >85% recovery for slow response bores) prior to proceeding to next phase of test
Repeat test where possible, using different volume slug

Appendix B
Braun Intertec Pressuremeter Testing Standard Operating Procedure

ED_014247_00001293-00041

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish procedural guidelines to perform pressuremeter tests effectively and safely by utilizing the TEXAM pressuremeter for any Braun Intertec project.

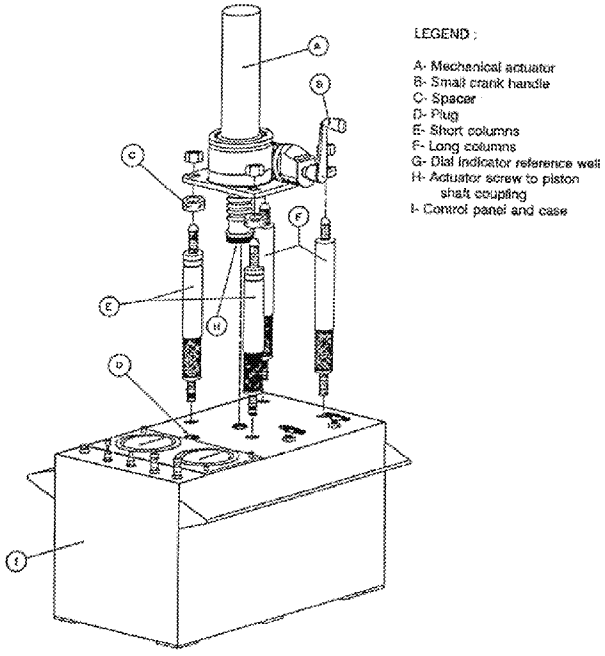
B. Health and Safety

Field work should be performed in accordance with the Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures and the site-specific health and safety plan (HASP), if applicable.

C. Equipment and Supplies

TEXAM control unit
    Cylinder, piston, pressure gauges, and valves
Actuator
70mm TEXAM probe
Volume counter
Tecalan Tubing
Level D Personal protective equipment (PPE)

C.1. Equipment Assembly



1. Remove the cover from the control unit case.
2. Screw in the 4 actuator support columns (E and F). The two columns (E), which have the 2 parallel grooves at one of their extremities are screwed into the two holes located near the center of the control panel and to the right of the pressure gauges. The columns are equipped with a ring fixed by a set screw. These rings are removed to permit the installation of the dial gauge used for the creep test (optional). The knurled portion of the columns point downward and the columns are hand tightened.

3. Remove the threaded PVC protective caps from the piston shaft.
4. Install the mechanical actuator (A) on its support columns. Position it so that the crank shaft is to the right of the control unit and perpendicular to the case handles. Secure the actuator (A) to the support columns with the four ¾" nuts. Tighten the nuts with a wrench.
5. Place the smaller of the two crank handles (B) provided on the crank shaft of the actuator (A). Turn the handle counterclockwise to bring the actuator screw in contact with the piston shaft. Couple the actuator screw with the piston shaft by threading the knurled nut onto the male thread of the piston shaft. Hand tighten the knurled nut.
6. Apply 50 kPa of pressure by rotating the crank handle (B) clockwise.
7. Stop the injection and record the corresponding counter reading and pressure after 30 seconds.
8. Continue the pressurization to 500 kPa in 50 kPa increments recording both pressure and volume after 30 seconds for each step.
9. Install the large crank handle.
10. For a low-pressure test calibration, increase the pressure to 2500 kPa taking readings at every 500 kPa.
11. For a high-pressure test, repeat the same procedure used for a low pressure calibration. When the pressure gauge No. 6 reaches 2500 kPa, place valve No. 8 on "TEST" with gauge 7. Continue to increase the pressure to 10,000 kPa again taking readings every 500 kPa.
12. Return the piston to its lowermost position stopping when gauge No. 7 reaches 2500 ka. At this point, place valve No. 8 on "TEST" with gauge 6 and continue to decrease the pressure to 0. Pressure gauges 6 and 7, and the counter, will now read 0.

D. Equipment Saturation

D.1. Fitting and Saturating the Instrument

1. Connect the two lengths of white flexible tubing to quick connects No. 4 and No. 5.
2. Set valve No. 8 on "FILL" and set valve No. 9 on "TEST".
3. Turn the small crank handle (B) clockwise to bring the cylinder piston to its uppermost position corresponding to about 1732 cc on the counter.
4. Place the free ends of the tubing connected at 4 and 5 in a reservoir of clean water or antifreeze solution. (Water and ethylene 50-50 by volume). It is imperative that during the saturation, the ends of the tubing in the reservoir are and remain submerged. Otherwise, air will enter the cylinder.
5. Lower the piston by turning the crank handle counter-clockwise at a rate of approximately 45 revolutions per minute (rpm).
6. When the piston has traveled to its lowermost positions corresponding to 0000.00 cc on counter, stop the cranking operations and wat one minute for the suction to stop.
7. Incline about 15 degrees the control unit toward yourself when facing the control unit. Turn the crank 16 revolutions (0192.00 cc on the counter) clockwise to expel any air that may have accumulated at the top of the cylinder. During this operation, watch closely to see that all entrapped air is evacuated and only bubble-free water is flowing into the reservoir.
8. Return the instrument to the vertical and bring the piston to its lowermost position (0000.00 cc) by turning the crank handle counterclockwise. When fully lowered, wait 30 seconds.

D.2. Saturating the Pressure Gauges

1. Hook-up the male quick connect fitted with the short length of ¼" outside diameter black tubing port No. 1.

ED_014247_00001293-00043

2. Place valve No. 8 on "TEST" with gauge 6. Raise the piston by rotating the crank handle 8 revolutions clockwise, 0096.00 cc on the counter. Make sure that the water flowing out of the black tubing does not contain any air bubbles.
3. Disconnect the quick connect from port No. 1.
4. Place valve No. 8 on "TEST" with gauge 6.
5. Raise the piston by turning 8 revolutions clockwise, the counter will indicate 0192.00 cc.
6. Place valve No. 8 on "TEST" with gauge 7 and valve No.9 on gauge 7 and raise the piston by turning revolutions clockwise, (0288.00 cc reading on the counter).
7. Place valve No. 9 on "TEST".
8. Place valve No. 8 on "TEST" with gauge 3.
9. Hook up he short length of black tubing fitted with the female quick connect to No. 3 port and raise the piston by turning 8 revolutions clockwise, (0380.00 cc reading on counter).
10. Disconnect the quick connect from outlet No. 3.
11. Place valve No. 8 on "FILL". Return the piston to its lowermost position (counter will indicate 0), and wait one minute.
12. Repeat steps D.1.7 and D.1.8.

D.3. Saturation Check Procedure

D.3.a. Verify Valve No. 8 is Not Leaking

Before checking saturation, you need verify that valve No. 8 is not leaking:

1. Disconnect the short length of tubing and place valve No. 8 on "TEST" with gauge 7 and valve No. 9 on "TEST".
2. Install the large crank handle on the rear section of the actuator crankshaft opposite the small one (B).
3. Increase pressure up to 10,000 kPa and make sure that dial gauge 6 does not show any pressure increase. If so, valve No. 8 is leaking. To stop the leak, remove the valve handle using a 3/32" Allen wrench and tighten the packing nut using the chrome plated packing nut tool provided with the instrument. Usually 1/8" of a turn will suffice to stop the leak. If the leak persists, valve No. 8 must be replaced.

D.3.b. Saturation Check

Once it has been verified that valve No. 8 is not leaking, you may proceed with the saturation check.

1. Place valve No. 8 on "TEST" with gauge No. 6 and valve 9 on "Test"
2. Install the large crank handle on the rear section of the actuator crankshaft opposite the small one.
3. The counter should indicate zero. Apply 2500 kPa to pressure gauge No. 6 and No. 7 by rotating the large crank handle clockwise. Read the counter.

   If the counter reads more than 0018.00 cc, the instrument is not completely saturated. Set valve No. 8 on "Fill" and valve No. 9 on "Test" and repeat the saturation procedure described in steps D.1.7 to this current step (D.3.b).

   The instrument is completely saturated when the counter indicates less than 0018.00 cc at 2500 kPa. Having determined that the instrument is completely saturated, place valve No. 8 on 7 and rotate the large crank handle until the pressure reaches 10,000 kPa.

   The pressure should stabilize after 2 minutes between 9500 kPa and 10,000 kPa if there is no leak in the system.

ED_014247_00001293-00044

Bring the pressure back to 2500 kPa and place valve No. 8 on gauge 6 and return the piston to the lowermost position.

D.4. Saturating the Tubing Probe Assembly

1. Connect the extremity of the Tecalan tubing fitted with the quick connect to outlet No. 1. Thread the other end of the tubing through the probe to rod adaptor and connect it to the probe. Tighten the nut firmly using two wrenches. Do not over-tighten.
2. Remove the tubing plug located at the lower extremity of the prove, Hold the probe bottom end up slightly inclined and with the saturation tubing in the 12 o' clock position.
3. Keep the prove in this position.
4. Inject water into the probe by rotating the crank handle clockwise until bubble-free water only is flowing out of the saturation tube. Valve No. 8 should be on "TEST" with gauge 6 and valve No. 9 should be on "TEST".
5. Stop turning the crank handle and hold the probe by its extremities and position it so that its center is at the same height as the pressure gauges and the saturation tube is in the 12 o'clock position, pointing upwards. Allow the excess water to flow out of the probe, until the probe reaches its original diameter. Replace saturation tubing plug and tighten.
6. Disconnect the Tecalan tubing from outlet No. 1. Refill the cylinder by placing valve No. 8 on "FILL" and returning the piston to its lowermost position.
7. Wait 1 minute.
8. Repeat steps D.3.b.1 through 3 as a final check on the saturation.
9. The instrument is ready to be calibrated. The instrument probe and tubing can be saturated before and transported to the site ready for testing.
10. Disconnect the two white tubing from ports No. 4 and No. 5.

E. Calibration Procedure

E.1. Saturating the Equipment

E.1.a. Saturating the Control Box Cylinder

Connect the short length of flexible tubing to the "Fill" quick connect Port 4. Push on the connector until you hear a 'click'.

Place the free ends of the saturation tubing in a small container – typically a 1-gallon plastic bottle - of clean water or antifreeze solution. It is imperative to maintain the ends of the tubing submerged during the saturation. Otherwise, air will enter the TEXAM. You may tape the tubing to the bottle for ensuring they stay submerged.

Set Valve 6 on "FILL".

Turn the small crank handle clockwise to bring the cylinder piston to its uppermost position corresponding to about 1732.00 cc on the counter. The uppermost position is reached when resistance is felt while cranking. Stop cranking then to not damage the equipment. While the piston is rising, the air in the cylinder is coming out from the tubing connected to the Port 4. Bubbles should be observed in the bottle.

Lower the piston by turning the crank handle counterclockwise at a rate of approximately 1 rotation per second, or slightly slower. While the piston is lowering, water is pumped inside the cylinder via the tubing connected to the Port 4.

When the piston has traveled to its lowermost position corresponding to 0 cc, stop the cranking operation and wait up to about a minute for the suction to stop, as indicated by a 0-kPa reading.

Set Valve 6 on "TEST".

Connect the short length of flexible tubing to the "Probe" quick connect Port 1.

ED_014247_00001293-00045

Incline the control unit about 45 degrees toward yourself when facing the control unit. Turn the crank about 20 revolutions (240 cc) clockwise to expel any air that may have accumulated at the top of the cylinder. During this operation, watch closely to see that all entrapped air is evacuated and only bubble free water is flowing into the bottle by the tubing connected on the Port 1.

Return the instrument to the vertical and disconnect tubing from the Port 1.

Connect the hose to Port 3 and turn the crank until water comes out from the short tubing to expel the air trapped in the gauge line. Disconnect the hose from Port 3.

When using the optional digital gauge kit, proceed the same way, but make sure to open the valve mounted on the pressure gauge assembly before cranking and to close it after cranking. If the gage does not read zero when the valve is open, re-zero it. Never re-zero this one when the valve is closed.

Set Valve 6 on "FILL".

Bring the piston to 0 cc, by turning the crank handle counterclockwise. When fully lowered, wait about 30 seconds, and perform the saturation check.

E.1.b. Saturation and Leak Checks

Set Valve 6 on "TEST".

The volume and pressure should indicate around zero.

Install the large crank handle (a) on the rear side of the actuator and pressurize the unit up to 2500 kPa by rotating the large crank handle clockwise. Read the volume. If the volume indicated on the readout is more than 15 cc, the instrument is not completely saturated, and the saturation procedure described in steps 7 to 14. in section E.1.a. must be repeated.

Having determined that the instrument is completely saturated, verify that the unit is not leaking at high pressure by rotating the large crank handle until the pressure reaches 10,000 kPa. The pressure should stabilize after 2 minutes between 10,000 kPa and 9,500 kPa if there is no leak in the system. Bring the pressure back to 0 kPa by returning the piston to its lowermost position.

E.1.c. Saturating the Tubing Probe Assembly

Connect the extremity of the Tecalan tubing fitted with the quick connect to Port 1. Thread the other end of the tubing through the probe to rod adaptor and connect it to the probe. Tighten the nut using two wrenches. Do not over tighten: the brass nut is fragile and may crack. Lay down the probe next to the control box.

Remove the plug located at the lower extremity of the probe. Hold the probe bottom end up slightly inclined and with the saturation outlet in the 12 o'clock position.

With the Valve 6 on "TEST", inject water into the probe by rotating the crank handle clockwise until bubble free water only is flowing out of the saturation outlet of the probe. Stop turning the crank handle. Put the plug-in place and tighten.

Inject 100 cc of fluid in the probe.

Disconnect the Tecalan tubing from Port 1. Refill the cylinder by placing Valve 6 on "FILL" and returning the piston to its lowermost position. Wait 30 to 60 seconds.

Repeat steps 1-3 in section D.1.b. as a final check on the saturation of the unit.

Disconnect the tubing from Port 4.

The instrument is ready to be calibrated. The instrument, probe and tubing can be saturated in advance and transported to the site ready for testing.

F. Calibration

Calibration should be performed before any use of the pressuremeter, and after any rebuild of the probe that may be required on site.

F.1. Calibrations for Pressure Correction

1. The probe is placed at ground level and is unconfined.
2. Connect the Tecalan tubing to outlet No. 1.
3. Place valve No. 8 on "TEST" with gauge 6.
4. Place valve No. 9 on "TEST".
5. Rotate the small crank handle clockwise at a rate of 1 revolution every 2 seconds, until 80 cc have been injected.
6. Stop the injection, wait 30 seconds, and record the pressure which corresponds to the 80 or 40 cc of injection depending on the size of the probe used.
7. Continue this procedure until 1600 cc are injected.
8. Slowly rotate the crank handle counterclockwise to return the piston to its initial position (lowermost). The counter will indicate 0000.00
9. Plot the curve of injected volume versus pressure on the counter.

F.2. Calibration for Volume Correction

1. Connect the Tecalan tubing to outlet No. 1
2. Place valve No. 8 on "TEST" with gauge 6.
3. Place valve No. 9 on "TEST".
4. Place the probe inside a 0.5 inch thick drill casing reserved for this purpose.
5. Counter should be at 0 cc.
6. Apply 50 kPa of pressure by rotating the handle clockwise.
7. Stop the injection and record the corresponding counter reading and pressure after 30 seconds.
8. Continue the pressurization to 500 kPa in 50 kPa increments recording both pressure and volume after 30 seconds for each step.
9. Install the large crank handle.
10. For a low pressure test calibration, increase the pressure to 2500 kPa taking readings at every 500 kPa.
11. For a high pressure test calibration, repeat the same procedure used for a low pressure calibration.
12. For a high pressure test calibration, repeat the same procedure used for a low pressure calibration. When pressure gauge No. 6 reaches 2500 kPa, place valve No. 8 on "TEST with gauge 7". Continue to increase the pressure to 10,000 kPa and take readings every 500 kPa.

G. Correct Borehole Preparation

Two conditions are required to obtain a quality borehole:

1. The diameter of the borehole must be within certain tolerances.
2. The equipment and the method used to prepare the borehole should cause the least possible disturbance to the soil and the wall of the borehole. The diameter of the drilling tool is D_1, the diameter of the deflated probe is D_2, and the initial diameter of the borehole is D_3. The tolerances on the diameters are:

$$D_2 \leq D_1 \leq 1.03D_2$$
$$1.03D_2 \leq D_3 \leq 1.2D_2$$

ED_014247_00001293-00047

Braun Intertec utilizes a 70mm diameter Texam Probe. Therefore, the above tolerances can be re-written as:

$$70mm \leq D_1 \leq 72.1mm$$
$$72.1mm \leq D_3 \leq 84mm$$
$$or$$
$$2.75in \leq D_1 \leq 2.84in$$
$$2.84in \leq D_3 \leq 3.3in$$

Use AW rods for a tricone roller drill bit (standard Braun Intertec bit for PM).

G.1. Drilling Requirements

Here are the requirements for proper borehole preparation once the correct tooling has been acquired. There are two methods used by Braun Intertec that depend on the soils at each site. These are the mud rotary method and the hollow stem auger method.

G.2. Mud Rotary Method

1. Mix drilling mud so that it is thick enough to keep hole open. If drilling in gravels, the mud should be very thick.
2. Drill rate should be very slow, 60 rpm. There should be no bubbles or big ripples on the return to the mud pit.
3. Do not move bit up and down while drilling. Only downward movement.
4. Dill approximately 3 feet past the test depth to allow cuttings to settle (not required, but best practice for high quality test), if difficult to achieve due to project requirements, this step may be ignored.

G.3. Hollow-Stem Auger Method

1. Advance auger approximately 3 feet above the test depth.
2. Push Thin-Wall samples, at least 2, to create an opening for the test probe.

A demonstration video produced by Roctest for a PM test and drilling can be viewed at the link below.

Borehole Preparation for a Pressuremeter Test

H. Inserting the Probe

Only rod weight should be used to lower probe. Do not use hydraulics on drill rig to lower probe. After double-checking that the borehole is filled with fluid, and the boring is drilled about 3 feet past the test depth, the probe is ready to be lowered in place.

1. Thread the probe tightly to the rods, using the adaptor for the tubing.
2. Keep the tubing taught as the probe is lowered. Secure the tubing to the rods every 10 feet with duct tape or electrical tape.
3. If a tight spot is encountered and it will not lower with the weight of the rods, two drillers can use two pipe wrenches to wiggle the probe up and down until the spot is cleared.
4. The test depth is the middle of the probe.

Vegetable oil can be placed on the outside membrane of the probe to prevent it from sticking to clayey soils.

ED_014247_00001293-00048

I. Test Execution

I.1. Strain Controlled Test: Procedure B from ASTM D4719-20

1. Place valve No. 9 on "TEST".
2. Place valve No. 9 on:
    1. "Test with gauge 6" for tests to 2,500 kPa.
    2. For tests to 10,000 kPa, initially place valve No. 8 on "Test with gauge 6" until the pressure reaches 2,500 kPa. When gauge 6 reaches 2,500 kPa, place valve No. 8 on "Test with gauge 7".
3. Should an auxiliary gauge be used, connect it to outlet No. 3 and place valve No. 8 on "Test with gauge 3".
4. Lower the probe to test depth. See section H for proper insertion procedure.

    With the probe set at the test depth, the test can begin. The test is carried out in 40 steps of equal volume increments. The volume increments are 40 cc. Rotate the crank handle clockwise at a uniform rate of 12 rpm. to inject water, stopping to record the pressure 30 seconds after each step of volume. The maximum volume injected is 1600 cc.

    It is possible to carry on load/unload cycles between steps or increments of volume during a normal test, by injecting and delating the probe by a preselected volume.

5. When the maximum volume for the probe is injected, return the piston to its initial position at a rate not exceeding 20 rpm (3 seconds per revolution).

    For tests where the pressure has exceeded 2,500 kPa, place valve No. 8 on "Test with gauge 6" when pressure gauge No. 7 reaches 2,500 kPa and continue to depressurize the system.

    During the final stage of depressurization, the pressure gauge should remain near zero. Rapid rotation of the crank handle will introduce air into the system by deairing the water.

While Braun Intertec does not regularly perform unload-reload cycles as part of pressuremeter testing, the data may be of significant value to a particular project. When performing, the unload-reload cycle It is suggested to carry on an unload-reload cycle should be performed in the pseudo-elastic zone i.e., between Pf (creep pressure) and Po (in-situ horizontal earth pressure). This cycle, started typically at the end of the pseudo-elastic zone, can be performed different ways. The ASTM -D4719 standard suggests running this cycle in one step down to Pf / 2, and then back the same way up to Pf. Another method consists in reducing pressure in three equal-pressure steps down to a point slightly above Po, and then back the same way up to Pf. Roctest recommends using the latter method. During a test, the end of the pseudo-elastic zone may be found by keeping track of Δp, which will start decreasing when the soil starts to yield. When the unload-reload cycle is completed, the test is resumed in the plastic zone as a normal test.

6. When the test is over, you are ready to deflate the probe. Deflation of the probe must be done slowly at 4 seconds per revolution. Using drilling fluid in the borehole is filled with fluid for helping will help in deflating the probe. For test depths greater than 20 feet, pause deflation every 400 cc and wait about 30 to 40 seconds. It can take more time for the fluids to migrate when the probe is at a deeper depth, therefore pausing helps the fluid catch up to the revolutions performed.
    If the pressure drops to zero or close to zero, this means that the sheath is punctured. Do not bring volume back to 0 cc. Dirty water or mud would get into the unit.

ED_014247_00001293-00049

7. Withdraw the probe. If this can't be done because the probe is sticks due to stiff plastic clay or because of caving problem, use the pipe wrench procedure described in Section H.
8. After retrieving the probe, clean the probe (outside and inside) using a nylon brush and a bucket filled with water. Be sure to swipe away from the fins on the probe to avoid water moving into the internal parts.

Stress-Controlled Test

This method is used during a creep test (see below). It can also be used for tests in very hard soils or in soft rock.

1. Lower the probe to the test depth.
2. For low pressure tests up to 2,500 kPa, place valve No. 8 on "TEST with gauge No. 6" For high pressure tests up to 10,000 kPa, place valve No. 8 on "TEST with gauge No. 6" until pressure gauge No. 6 reaches 2,500 kPa. At this point, place valve No. 8 on "TEST with gauge No. 7".
3. If an auxiliary gauge is used, connect it to outlet No. 3 and place valve No. 8 on position 3.
4. Using the large crank, set the pressure gauge reading to the first pressure step corresponding to 1/10 of the estimated pressure.
5. Maintain the pressure at this value and record the counter readings 30 to 60 seconds after the pressure step has been reached.
6. When the loading phase of the test is completed, return the piston to its initial position by turning the crank handle counterclockwise at a rate which will maintain the pressure greater than 2,500 kPa. Place valve No. 8 on "TEST with gauge 6" when gauge 7 reaches 2,500 kPa and continue to depressurize the system.

Additional comments for stress-controlled test:

1. Pressure step (ΔP) is generally 0.25, 0.5, 1 or 2 bars in soils, and 5 bars in rock. Pressure step can be estimated with the following relation: Pressure step (bar) = N (blow per foot) /20. Example if N = 17, start with a 0.5-bar pressure increment.
2. Calculate change in volume (ΔV) between the 30- and 60 second readings at each step to determine if you are in the pseudo-elastic zone or in the yielding zone. The pseudo-elastic zone is characterized by rather constant ΔV, while the yielding zone is characterized by increasing ΔV. If the test is still in the pseudo-elastic zone after 7 pressure steps, double the pressure increment. Adjust pressure steps to try to get 7-14 steps total in the test with at least 2 to 3 steps in the yielding zone.
3. An unload-reload cycle can be done. See instructions in Section H.1.
4. Warning: If the pressure drops to zero or close to zero, this means that the sheath is punctured. Do not bring volume back to 0 cc. Dirty water or mud would get into the unit.

J. Probe Disassembly and Assembly

J.1. Disassembly

1. Screw the probe vise adaptor onto one end of the probe and clamp the adaptor in the jaws of a bench vice.
2. Use a strap wrench to unscrew the bronze knurled (2) nut from the free extremity of the probe.
3. To extract the metal tapered rings (3), use the strap wrench to rotate the ring in the direction of the lamination of the metal strips and simultaneously pull the ring outwards from the center of the probe.
4. To extract Vulcolan tapered rings (3), use the extractor provided with the instrument. Insert and screw in the extractor pins into the diametrically opposite holes located on the metal collar of

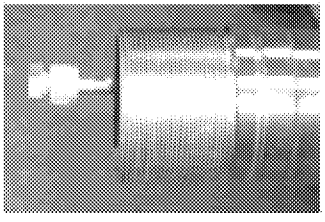
ED_014247_00001293-00050

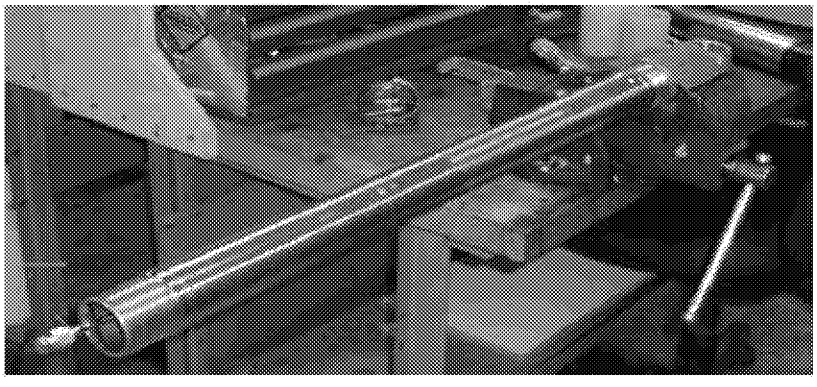
the Vulcolan ring. Rotate the extractor in the direction of lamination of the metal strips and simultaneously pull the extractor outwards.

5. In cases where removal of either type of tapered ring is difficult, the application of heat (using a propane torch or hot air gun with max temperature of 150°F) uniformly over the rings will facilitate their removal.
6. Clean all parts and probe's body and make sure O-rings are not damaged. For the probe body, see section I. For the interior parts, clean with dry or wet rags, using soap as needed. Clean at the end of every job. To clean the filter, flush it with water until any dirt has been washed away.

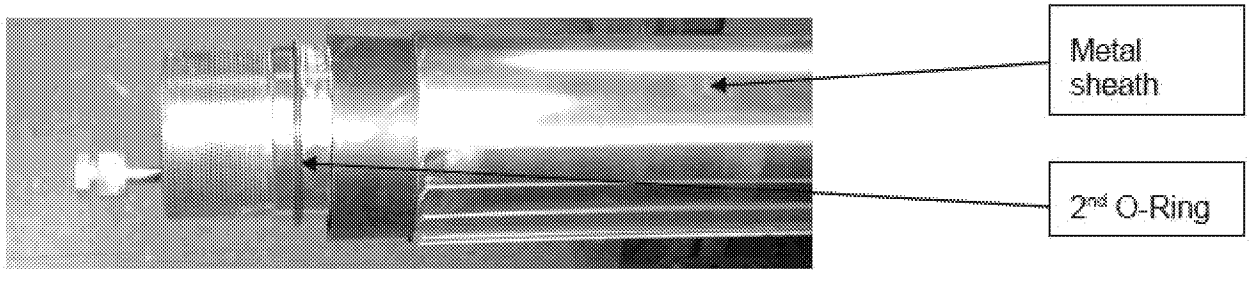
J.2. Assembly

1. Put an O-ring at the end close to the vice adaptor. Make sure probe's body is tightly fixed to the bench vice. Do not install the O-ring at the other end of the probe yet.



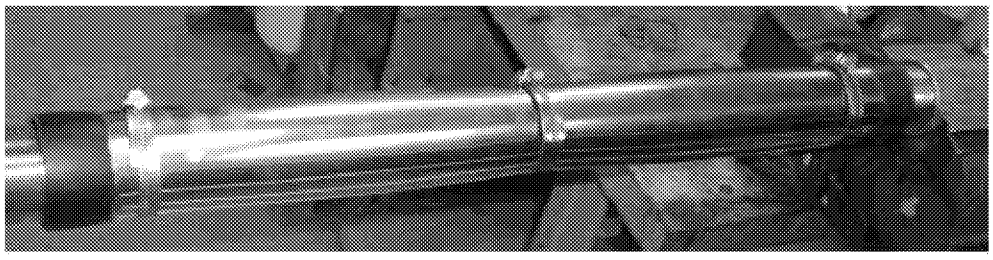


2. Do not grease the O-ring. Slide a metallic sheath on the probe's body. Make sure the electrical tape on each end of the sheath has been removed.
3. Place the second O-ring at the other end of the probe from the vice adaptor. Make sure the sheath is centered and that both O-rings are at their place.

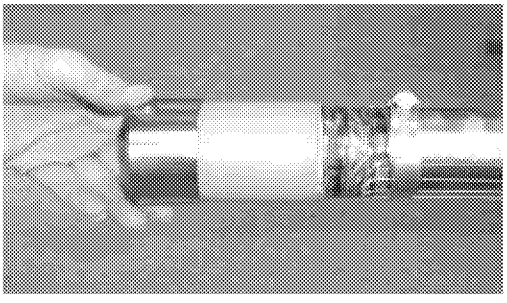


4. Make sure that the metallic strips are not twisted.

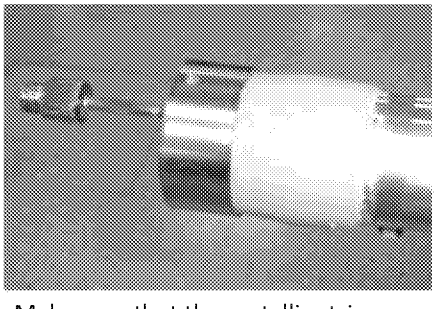
5. Put hose clamps over the sheath. Pay attention to the direction of these clamps to prevent them from damaging the metallic strips during clamp tightening. The bottom portion of the clamp should move in the direction of overlapping of the metal strips (i.e., slide over the metal strips as opposed to sliding between/into the metal strips). Put a hose clamp at about 1 to 1.25 inches from the tip of the metallic strips.

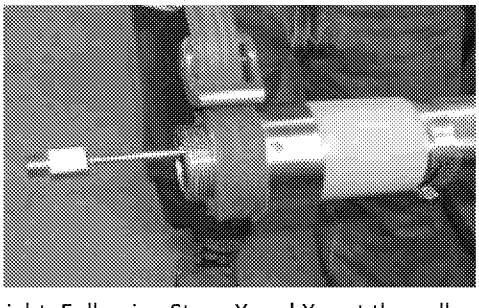


6. Tightly put electrical tape at each ed of the sheath to squeeze the rubber and metallic strips.
7. Put MOLYKOTE 33 LIGHT grease (extreme-low-temperature grease) on the probe's threads, on the electrical tape, on the inner wall of yellow vulcolan rings, and on the flat inner side of the brass knurled nut.

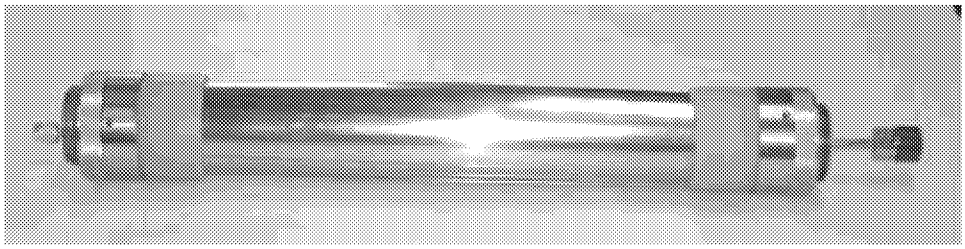


8. Push, by hand, the yellow ring in place over the probe. Put the brass knurled nut in place and screw it. This will push the yellow ring inward. Continue screwing until three threads can be seen.
9. Free the probe from the vice and from the vice adaptor, then put the other end of the probe in the vice.





10. Make sure that the metallic strips are still straight. Following Steps X and X, put the yellow ring and knurled nut on this end of the probe.
11. Using a strap wrench, keep tightening the knurled nut until 5 to 6 threads can be seen.
12. Free the probe from the vice and reinstall it so the original end placed in the vice is back in the vice. Tighten the knurled nut until 5 to 6 threads can be seen.



13. Installation completed.

K. Transport

1. The instrument can be transported full of water and saturated as long as the piston is in its lowermost position. It is imperative to bleed water when unit will be exposed to freezing temperatures.
2. Unscrew the knurled nut on the screw actuator.
3. Dismount the screw jack and its support columns and disconnect the tubing.
4. Place Valve 6 on "TEST" and install the control unit cover.

Always keep the two TEXAM carrying cases upright. Never tilt them on their side.

L. Use in Cold Weather

L.1. Antifreeze

In order to use the TEXAM at temperature below freezing (32°F), water must be replaced by an antifreeze solution. Braun Intertec uses an ethylene-glycol solution.

At low temperatures, ethylene glycol will significantly increase viscosity of the liquid, which means that time required for inflating and deflating the probe will significantly increase too. A 50-50 solution of water - ethylene glycol by volume will allow using the equipment at about -15°F, a 70-30 solution can be used down to about 15°F. When using ethylene-glycol, flush the unit with clean water at the end of every job to protect it and avoid deposits. Ethylene-glycol is not environment-friendly.

L.1.a. Other Antifreezes

Methanol-based antifreezes (regularly used in windshield washer liquid) offer the best protection for pressuremeters at temperatures below -15°F. Note that methanol can be corrosive for the equipment and requires flushing the TEXAM with clean water at the end of every job to protect it. Methanol is not environment-friendly and is inflammable.

Ethanol-based antifreezes are sometimes used. Note that ethanol can be corrosive for the equipment, depending on the brand. RocTest research has shown that it will be too viscous to use at or below about 5°F . Ethanol is environment-friendly, but is inflammable.

Propylene-glycol-based antifreeze is normally too viscous for use with pressuremeters.

L.2. Valve leakage

When the pressuremeter is used at low temperature, valve No. 6 may leak. This is caused by the differential thermal contraction of the brass ball valve and its spherical Teflon seat. To stop the leak, remove the valve handle

using a 3/32" Allen wrench and tighten the packing nut using the chrome plated packing nut tool provided with the instrument. Usually 1/8" of a turn will suffice to stop the leak.

M. Maintenance

1. Unscre the four screws of the mounting panel and lift panel.
2. The filter is mounted on the copper line connected to the Port No. 1.
3. Unscrew the brass nut on the copper tube of Port No.1 with a 9/16" open wrench.
4. Unscrew the 2 nuts on both sides of the filter and remove the filter from instrument.
5. Open filter housing by means of 2 ¾ " wrenches and remove filter cartridge.
6. Clean all parts with clean water and re-install filter, following the opposite procedure of the removal.

N. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

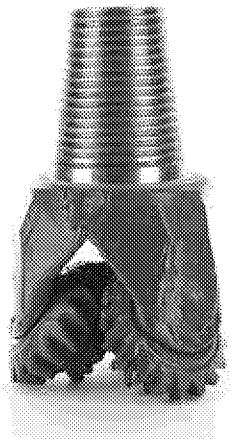
Use the TEXAM-Companion spreadsheet for data reduction. The spreadsheet is available through the Engineering Technical Practice Quality Site and contains instructions for use.

N.1. Quality Assurance/Quality Control

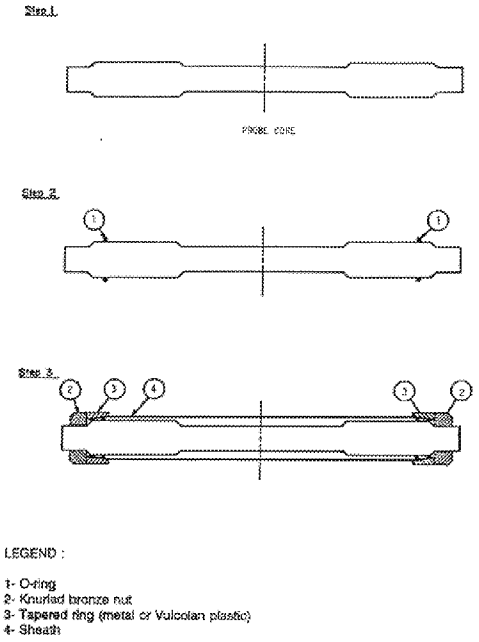
Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed. See the Roctest TEXAM instruction manual for supplemental information and photographs that assist with operation.

PAGE BREAK TO SEPARATE PHOTO PAGE

ED_014247_00001293-00054

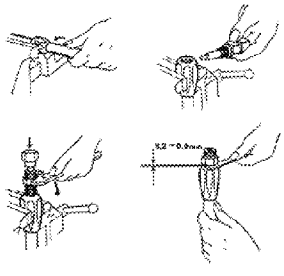


Photograph 1: Tricone drill bit (dense sands and gravels)



Photograph 2: Probe assembly and schematic drawing

1. Cut the tubing, at a right angle, cleanly.
2. Install a socket in a vice. Do not overtighten, do not misshape the socket
3. Screw the tubing into the socket thoroughly by rotating counterclockwise. Then, unscrew one quarter of a turn **(very important)**
4. Install the socket-fitted tubing vertically
5. Insert the coupling into the socket by pushing and screwing the coupling. Do not overtighten. Keep a 0.2 to 0.8 mm spacing between the socket and the coupling.



Photograph 3: Tecalan Tubing Splicing Method

	To Convert From	To	Multiply By
LENGTH	Microns	Inches	3.94E-05
	Millimeters	Inches	0.0394
	Meters	Feet	3.2808
AREA	Square millimeters	Square inches	0.0016
	Square meters	Square feet	10.7643
VOLUME	Cubic centimeters	Cubic inches	0.06101
	Cubic meters	Cubic feet	35.3357
	Liters	U.S. gallon	0.26420
	Liters	Can.-Br gallon	0.21997
MASS	Kilograms	Pounds	2.20459
	Kilograms	Short tons	0.00110
	Kilograms	Long tons	0.00098
FORCE	Newtons	Pounds-force	0.22482
	Newtons	Kilograms-force	0.10197
	Newtons	Kips	0.00023
PRESSURE AND STRESS	Kilopascals	Psi	0.14503
	Bars	Psi	14.4928
	Inches head of water*	Psi	0.03606
	Inches head of Hg	Psi	0.49116
	Pascal	Newton / square meter	1
	Kilopascals	Atmospheres	0.00987
	Kilopascals	Bars	0.01
	Kilopascals	Meters head of water*	0.10199
TEMPERATURE	Temp. in °F = (1.8 x Temp. in °C) + 32 Temp. in °C = (Temp. in °F - 32) / 1.8		

Photograph 4: Conversion Table

O. References

ASTM D4719-20 'Standard Test Methods for Prebored Pressuremeter Testing in Soils'

The Pressuremeter, Balkema, Briaud, J.-L., 1992

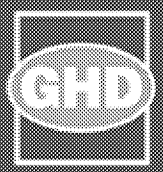
Attachments

Attachment A – ASTM D4719-20
Attachment B – Roctest TEXAM Pressuremeter Instruction Manual

Revision History

Revision No.	Date	Description
0	01/29/2021	Comments from M. Glisson
1	3/5/2021	Updated from comments, includes required follow up w/ Keith Alfonsi

ED_014247_00001293-00056



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Charles Munce
Charles.Munce@ghd.com
225.292.9007

Janie Smith
Janie.Smith@ghd.com
225.292.9007

www.ghd.com

11451 Katy Freeway, Suite 400
Houston, Texas 77079
United States
www.GHD.com

Our Ref.: 11215702-Howard-20

January 17, 2022

Ms. Ashley Howard
Environmental Protection Agency Remedial Project Manager
1201 Elm Street, Suite 500
Dallas, Texas 75270

Pre-Final (90%) Remedial Design - Northern Impoundment Staged Deliverables Submittal

Dear Ms. Howard:

GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents), hereby submits to the United States Environmental Protection Agency (EPA) four of the supporting deliverables of the Pre-Final (90%) Remedial Design - Northern Impoundment (Northern Impoundment 90% RD) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site, located in Harris County, Texas.

As required in the January 12, 2022, approval letter from the EPA to the Respondents' October 1, 2021, Request for Extension letter for the Northern Impoundment 90% RD, the following supporting deliverables are enclosed:

- Health and Safety Plan (HASP).
- Emergency Response Plan (ERP).
- Transportation and Off-Site Disposal Plan (TODP).
- Monitored Natural Recovery Plan (Operations & Maintenance [O&M] Plan).

These deliverables are being submitted in advance of the full Northern Impoundment 90% RD. Modifications to these deliverables may be required as the Northern Impoundment 90% RD is developed over the next six months. The Respondents therefore reserve the right to revise or update these deliverables as needed, as the design progresses. The Respondents plan to address any EPA comments on these deliverables in the Northern Impoundment 100% RD package.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (225) 292-9007.

Regards,

GHD

Charles W. Munce, P.E.

(832) 380-7655
Charles.Munce@GHD.com

Janie T. Smith

(225) 292-9007
Janie.Smith@GHD.com

KJ/jlf/20

Encl.: Health and Safety Plan (HASP)
Emergency Response Plan (ERP)
Transportation and Off-Site Disposal Plan (TODP)
Monitored Natural Recovery Plan (Operations & Maintenance [O&M]) Plan)

cc: Lauren Poulos, EPA
Katie Delbecq, Texas Commission on Environmental Quality (TCEQ)
Phil Slowiak, IPC
Brent Sasser, IPC
Judy Armour, MIMC

Health and Safety Plan (HASP)

Attachment 1 - Health and Safety Plan - Northern Impoundment

Provided as Part of Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company
McGinnes Industrial Maintenance Corporation

January 17, 2022

→ The Power of Commitment

Contents

1. Introduction **1**

1.1 Background 1

1.2 Purpose 1

1.3 Stop Work Authority 1

1.4 Personnel Requirements 2

1.5 Project Management and Safety Responsibilities 2

1.6 Site HASP Amendments 3

1.7 Training Requirements 4

1.7.1 Site-Specific Training 4

1.7.2 Safety Meeting/HASP Review 4

1.7.3 Medical Surveillance Program 4

2. Work Site Operations **5**

2.1 Scope of Work 5

3. Hazard Evaluation **5**

3.1 Chemical Hazards 5

3.1.1 Chemical Hazard Controls 6

3.1.2 Skin Contact and Absorption Contaminants 6

3.1.3 Hazard Communication/WHMIS 6

3.1.4 Flammable and Combustible Liquids 6

3.2 Physical Hazards 7

3.2.1 Heavy Equipment Safety 7

3.2.2 Noise 8

3.2.3 Utility Clearances 8

3.2.4 Vehicle Traffic and Control 8

3.2.5 Material Handling and Storage 8

3.2.6 Manual Lifting 9

3.2.7 Working Near Water 9

3.2.8 Boating Safety 10

3.2.9 Hoisting and Rigging 13

3.2.10 Cranes and Hoists 13

3.2.11 Hand and Power Tools 14

3.2.12 Electrical Hazards 14

3.2.13 Control of Hazardous Energy 15

3.2.14 Excavations 15

3.2.15 Slip/Trip/Hit/Fall 15

3.2.16 Heat Stress 16

3.2.17 Sun Exposure 16

3.2.18 Cold Stress 17

3.2.19 Adverse Weather Conditions 17

3.3 Biological Hazards 17

3.3.1 Vegetation Overgrowth 17

ED_014247_00001303-00005

Contents

3.3.2 Poisonous Plants 18
3.3.3 Insects 18
3.3.4 Poisonous Spiders 19
3.3.5 Threatening Dogs 20
3.3.6 Rodents 20
3.3.7 Snakes 20
3.3.8 Scorpions 21
3.3.9 Alligators 21
3.3.10 Bloodborne Pathogens 21

4. Personal Protective Equipment (PPE) 21
4.1 General 21
4.2 Levels of Protection 21
4.2.1 Reassessment of Protection Levels 22

5. Air Monitoring Program 22

6. Work Site Control 22
6.1 Communication 22
6.2 Work Site Security 22
6.2.1 Aggressive or Menacing Behavior 22
6.3 Decontamination 23
6.3.1 Personnel and Equipment Decontamination Procedures 23

7. Emergency Procedures 23
7.1 On-Site Emergencies 23
7.2 Incident, Injury, and Illness Reporting and Investigation 23
7.3 Emergency Equipment/First Aid 23
7.4 Site Evacuation 24
7.5 Spill and Release Contingencies 24

8. Recordkeeping 24

9. References 24

Table index

Table 1 Properties of Potential Site Contaminants

ED_014247_00001303-00006

Emergency Contact List

Emergency Information		
Contact	**Phone Number**	**Site Location, Hospital & Clinic Directions**
Local Police: Harris County Constable Baytown Police Department	911 (713) 637-0014 (281) 422-8371	Northern Impoundment: 18001 East Freeway Service Road Channelview, Texas 77530 (29.795230, -95.066734)
Local Fire Department: Channelview Fire Department	911 (281) 452-5782	
Ambulance	911	
Local Hospital: Houston Methodist Baytown Hospital Address: 4401 Garth Road Baytown, Texas 77521	(281) 420-8600	Hospital Directions: Get on I-10 East (1.4 mi) Keep right at fork to continue on TX-330 Spur South following signs for Baytown (1.6 mi) Take the Wade Rd/Baker Rd exit (0.2 mi) Merge onto Decker Dr. (1.1 mi) Turn left onto W Baker Rd (2.1 mi) Turn right (400 ft.) Turn right (351 ft.) Turn right at the 1st cross street (128 ft.) Destination will be on the right Driving Time: 14 minutes Driving Distance: 7.9 miles
Work Care Clinic: Occupational Healthcare Address: 610 S. Main Street Highlands, Texas 77562	(281) 843-2441	Occupational Healthcare Directions: Merge onto I-10 East (1.3 mi) Take exit 787 for Crosby - Lynchburg Rd (0.1 mi) Use any lane to turn left onto Crosby - Lynchburg Rd/S Main St Continue to follow S Main St and destination will be on the left Driving Time: 7 min Driving Distance: 3.9 miles
National Poison Center	(800) 222-1222	
National Response Center	(800) 424-8802	
State Emergency Response System	(512) 424-2138	
EPA Environmental Response Team	(201) 321-6600	
United State Coast Guard	(713) 578-3000	
Implementing Party(ies) Project Manager Work: Cell:		
Project Coordinator Work: Cell:		
Site Supervisor Work: Cell:		
On-Site Health and Safety Officer Work: Cell:		
Other Contacts Work: Cell:		
Person to verify hospital route:	Signature	

ED_014247_00001303-00007

1. Introduction

This Health and Safety Plan (HASP) was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site in Harris County, Texas (Site). This HASP was prepared pursuant to the requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design (AOC), Docket No. 06-02-18, with an effective date of April 11, 2018 (United States Environmental Protection Agency [EPA], 2018). The AOC includes a Statement of Work (SOW) which requires supporting deliverables to accompany the Pre-Final 90% Remedial Design for the Northern Impoundment (Northern Impoundment 90% RD) submittal to the EPA.

This HASP was developed to outline potential activities to be performed to protect site personnel from physical, chemical, and all other hazards that may be encountered during implementation of the remedial action (RA), which will be described in detail in the Northern Impoundment 90% RD. Prior to initiation of RA activities, each selected remedial contractor (RC) will either update this HASP or develop its own HASP to address the components outlined in this document. This HASP was prepared in accordance with the EPA Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 Code of Federal Regulations (CFR) 1910 and 1926, as specified in the SOW. References in this HASP to the "work site" are to the Northern Impoundment and references to "Implementing Party" are to the entity(ies) implementing the RA for the Northern Impoundment.

1.1 Background

The Site is located in Harris County, Texas, east of the City of Houston, between two unincorporated areas known as Channelview and Highlands. The Northern Impoundment is approximately 15 acres in size and is located on a small peninsula and includes surrounding in-water and upland areas of the San Jacinto River that extends north of Interstate Highway 10 (I-10).

The primary hazardous substances identified in the subsurface within the Northern Impoundment are polychlorinated dibenzodioxins and polychlorinated dibenzofurans.

1.2 Purpose

The purpose of this Site-specific HASP for the Northern Impoundment is to provide specific guidelines and establish procedures for the protection of personnel performing the activities described in Section 2. The HASP is a living document, in that it must continually evolve as work site conditions and knowledge of work activities develop. As previously stated, prior to initiation of Northern Impoundment RA activities, each RC will update this HASP or develop its own HASP to address the components outlined in this document.

1.3 Stop Work Authority

All employees will be empowered and expected to stop the work of co-workers, subcontractors, Implementing Party employees, or other contractors if any person's safety or the environment are at risk. No repercussions will result from such an action.

During the Northern Impoundment RA, the discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the removal of work site personnel from that area and re-evaluation of the hazard and the levels of protection.

ED_014247_00001303-00008

1.4 Personnel Requirements

All personnel conducting activities at the work site must conduct their activities in compliance with all applicable health, safety and environment (HSE) requirements at both state and federal levels to include, but not limited to, the Texas Administrative Code (TAC), 29 CFR 1910, 29 CFR 1926, and associated policies and procedures. OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standards (in general industry, 29 CFR 1910.120; and construction 29 CFR 1926.65) establish health and safety requirements for employers and require that employers follow specific work policies, practices, and procedures to protect their workers potential exposure to hazardous substances. The policies and practices, and procedures are incorporated into this document.

Project personnel must also be familiar with the procedures and requirements of the Site-specific HASP. In the event of conflicting safety procedures/requirements, personnel must implement those safety practices affording the highest level of safety and protection.

1.5 Project Management and Safety Responsibilities

The organizational structure of this HASP is consistent with OSHA requirements in 29 CFR 1910.120(b)(2) and, for purposes of the Northern Impoundment RA, outlines project management and safety responsibilities, as described below.

Project Coordinator

The Project Coordinator (PC) or the equivalent will be responsible for the overall implementation of the HASP, and for ensuring that all HSE responsibilities are carried out in conjunction with this project. These responsibilities may include, but will not be limited to, review and approval of the HASP, qualifying and directing subcontractors relative to HSE performance, coordinating all HSE submittals, and consultation with the Site Supervisor (SS) regarding appropriate changes to the HASP.

Site Supervisor

The SS or the equivalent is the person who, under the supervision of the PC, will be responsible for the communication of work site requirements to work site project personnel and subcontractors. These responsibilities may include, but will not be limited to, the following:

1. Conducting a daily safety meeting that communicates the work site-specific hazards for the operations that day and identifies proactive measures that will minimize the hazards.
2. Implementing procedures to confirm that all necessary clean-up and maintenance of safety equipment is conducted by project personnel.
3. Verifying that emergency phone numbers and information about emergency services, including hospital and clinic locations, is current.
4. Developing Job Safety Analysis (JSA) forms for all work tasks and revising them as appropriate.
5. Implementing procedures so that required forms are completed, filed, and submitted correctly, including those related daily safety meetings and completion of daily inspection checklists.
6. Requiring that a pre-entry briefing is conducted and documented, and serves to familiarize on-site personnel with the procedures, requirements, and provisions of the HASP.

Other duties may include responsibility for overall implementation of the HASP and for ensuring that all HSE responsibilities are carried out. These additional responsibilities may include, but will not be limited to, review and approval of the HASP, communication of work site requirements to subcontractor personnel, and consultation with the Implementing Party/work site representative regarding appropriate changes to the HASP.

The SS may also be assigned responsibility for enforcing safe work practices for project employees. In that role, the SS may watch for ill effects on personnel, especially those symptoms caused by cold/heat stress or chemical

ED_014247_00001303-00009

exposure and oversee the safety of visitors who enter the work site. The SS may also be assigned responsibility for communications with the Implementing Party/work site representative(s).

Other specific duties of the SS may include:

- Ordering the immediate shutdown and/or stop work of activities in the case of a medical emergency, unsafe condition, or unsafe practice.
- Providing the safety equipment, personal protective equipment (PPE), and other items necessary for employees.
- Enforcing the use of required safety equipment, PPE, and other items necessary for employee or community safety.
- Conducting work site inspections as a part of quality assurance for HSE.
- Reporting HSE concerns to work site and/or project management, as necessary.

Employee Safety Responsibility

Employees will be responsible for their own safety as well as the safety of those around them. Employees and subcontractors will be required to use any equipment that is provided in a safe and responsible manner, as directed by their supervisor.

Employees will be directed to take the following actions when appropriate:

- Suspend any operations that may cause an imminent health hazard to employees, subcontractors, or others.
- Assist in the development and revision of JSA forms that are appropriate to their current scope of work.
- Inspect tools and other equipment before each use or as manufacturer and/or OSHA dictates.
- Correct work site hazards, when possible, without endangering life or health.
- Report HSE concerns to the SS or PC.

Subcontractors

Subcontractors will each be responsible for the implementation of its own HASP and will be required to agree to comply with its contents. In the event of conflicting safety procedures or requirements, the subcontractor's personnel are to be required to implement those safety practices that afford the highest level of safety and protection. Subcontractors will be required to attend an initial work site orientation and subsequent safety meetings.

Equipment Operators

All equipment operators will be responsible for the safe operation of heavy equipment. This may include assigning operators will be assigned responsibility for inspecting equipment on a daily basis to ensure safe performance. Brakes, hydraulic lines, backup alarms, and fire extinguishers must be inspected routinely throughout the project. Equipment will be taken out of service if an unsafe condition occurs.

Authorized Visitors

Authorized visitors will be provided with all known information with respect to Northern Impoundment RA operations and hazards as applicable to the purpose of their visit and should be accompanied with personnel familiar with the work site's layout and procedures. All site visitors must comply with personal protective equipment (PPE) requirements as stated in Section 4.

1.6 Site HASP Amendments

During the Northern Impoundment RA, any change to the scope of work must be evaluated for its impact on the overall health and safety aspects of the project and on associated personnel and to determine if modifications to the then-applicable HASP are required. A minor change would be one that mitigates hazards that are already documented within the HASP and would not expose work site personnel to chemicals above exposure limits, such as the

ED_014247_00001303-00010

introduction of a new JSA or PPE that does not involve a change in respiratory protection. Amendments to the HASP are to be documented, in addition to notifying key personnel.

Significant changes to the scope of work may require a rewrite and review/approval of the HASP.

1.7 Training Requirements

All personnel conducting work at the work site are to be required to have completed the appropriate HSE training as applicable to their job tasks/duties. Training requirements are consistent with the requirements of 29 CFR 1910.120(e) and (q)(11) and are referenced throughout this HASP.

1.7.1 Site-Specific Training

It is recommended that an initial work Site-specific training session or briefing be conducted by the PC or SS prior to commencement of Northern Impoundment RA work activities. During this initial training session, employees may be instructed on the following topics:

- Personnel roles and responsibilities, in regard to HSE.
- Content and implementation of the HASP.
- Work site hazards and controls.
- Site-specific hazardous procedures.
- PPE requirements.
- Emergency information, including local emergency response team phone numbers, route to nearest hospital, incident reporting procedures, and emergency response procedures.
- Instruction in the completion of required inspections and forms.
- Location of safety equipment, such as portable eyewash, first aid kit, fire extinguishers, etc.

The meeting may include presentation of various components of this HASP, followed by an opportunity for attendees to ask questions. Personnel should not be permitted to enter or perform work at the work site until they have completed the Site-specific training session.

It is recommended that visitors be given a Site-specific briefing to provide information about Site hazards, the Site lay-out including work zones, emergency evacuation procedures, and other pertinent HSE requirements, as appropriate.

1.7.2 Safety Meeting/HASP Review

It is recommended that safety meetings take place each day prior to beginning the day's work and that all Site personnel should be required to attend these safety meetings, to be conducted by the SS or a designee. The safety meetings should cover specific HSE issues, including the appropriate JSAs, work site activities, changes in work site conditions, and a review of topics covered in the Site-specific pre-entry briefing. The safety meetings should be documented each day with written sign-in sheets containing a list of topics discussed.

1.7.3 Medical Surveillance Program

Medical surveillance requirements should be based on a worker's potential for exposure as determined by the Site characterization and job hazard analysis and as required by 29 CFR 1910.120(f)(2).

A work site medical surveillance program should be developed that provides that if a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substances or health hazards, medical examinations are provided to that worker, as soon as possible after the occurrence and as required by the attending physician.

ED_014247_00001303-00011

Medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to employees free of cost, without loss of pay, and at a reasonable time and place. The need to implement a more comprehensive medical surveillance program will be re-evaluated in the event of an over-exposure incident.

2. Work Site Operations

2.1 Scope of Work

The scope of work for the Northern Impoundment RA will be defined in the Northern Impoundment RD, as approved by the EPA pursuant to the AOC.

This HASP will cover the specific work site activities that are expected to be conducted by personnel and their subcontractors during the Northern Impoundment RA. These activities are expected at a minimum to include:

- Mobilization/demobilization of personnel, materials, and equipment to and from the work site.
- Northern Impoundment remediation activities.
- Over-water and near-water activities.
- Heavy equipment spotting.
- Surveying activities.
- Lifting and rigging activities.
- Equipment fueling.
- Soil sampling.
- Decontamination of personnel and equipment.
- Driving.

Upon selection of the RC, this HASP will be updated or one will be developed to address the scope of work in the approved Northern Impoundment RA and the specific hazards associated with that scope of work. The RC will also be expected to develop task specific JSAs for tasks involved in Northern Impoundment RA activities, which may include the activities listed above, in accordance with the job hazard analysis requirements of 29 CFR 1910.120(b)(4)(ii)(A) and the workplace hazard assessment requirements of 29 CFR 1910.132(d).

3. Hazard Evaluation

This section identifies and evaluates potential chemical, physical, and biological hazards that may be encountered during implementation of the Northern Impoundment RA, in compliance with 29 CFR 1910.120(b)(4)(ii)(A), 1910.120(c) and 1910.120(i). These hazards and any discussion regarding anticipated initial exposure levels are based on information developed in connection with the Northern Impoundment RD.

3.1 Chemical Hazards

The chemical hazards associated with conducting work site operations are expected to include the potential exposure to on-Site contaminants encountered during field activities such as removal and handling of cap materials, removal and handling of waste materials (via excavation or dredging), dewatering, sampling, decontamination of equipment, and the use of support products, such as fuel. The potential routes of exposure from these products during normal use may occur through inhalation of vapors and dusts, or direct contact or absorption with the materials.

ED_014247_00001303-00012

The chemical hazards of concern that may be encountered during the tasks identified in the project's scope of work are listed in Table 1, and include: dioxins, furans, and polychlorinated biphenyls (PCBs). Information about those chemical hazards is included in Table 1, which includes exposure limits, signs and symptoms of exposure, chemical properties, and physical characteristics.

3.1.1 Chemical Hazard Controls

It is recommended that exposure to potential on-Site contaminants/chemicals during implementation of the Northern Impoundment RA be controlled by:

- Monitoring air concentrations with appropriate equipment in the breathing zone.
- Revising JSAs to list chemical hazards and associated hazard controls on a task-specific basis.
- Employing dust control measures, such as wetting the immediate area.
- Using PPE, as appropriate, in areas known to have concentrations above the specified action level for each contaminant.

3.1.2 Skin Contact and Absorption Contaminants

Skin contact with chemicals may be controlled by use of the proper PPE and good housekeeping procedures. PPE (e.g., Tyvek®, gloves) as described in Section 4 may be required for all activities where contact with potentially harmful media or materials is anticipated. Any such requirements should utilize manufacturer data on permeation and degradation to minimize skin contact potential.

3.1.3 Hazard Communication/WHMIS

It is recommended that personnel required to handle or use hazardous materials, as part of their job duties be trained and educated in accordance with the Workplace Hazardous Materials Information System (WHMIS) standard as applicable. Such training may include instruction on the safe use and handling procedures of hazardous materials, how to read and access safety data sheets (SDSs), and the proper labeling requirements.

3.1.4 Flammable and Combustible Liquids

The storage, dispensing, and handling of flammable and combustible liquids should be handled in accordance with industry standards, such as National Fire Protection Agency (NFPA) guidelines. The specific flammable or combustible liquids to be used at the work site may include gasoline, diesel, kerosene, oils, and solvents. The following are requirements to be applied to the handling of such liquids.

Flammable and combustible liquids are classified according to flash point. This is the temperature at which the liquid gives off sufficient vapors to readily ignite. Flammable liquids have flash points below 100 degrees Fahrenheit (°F) (37.8 degrees Celsius [°C]). Combustible liquids have flash points above 100°F (37.8°C) and below 200°F (93.3°C).

Storage

Flammable and combustible liquids should be stored in designated areas. Such areas should be isolated from equipment and work activity that may produce flames, sparks, heat, or any form of ignition, including smoking. The most practical method is the use of one or more approved (commercially available) flammable/combustible liquid storage cabinets.

Cabinets must be labeled "Flammable - Keep Fire Away." Doors should be kept closed and labeled accordingly. Containers should be kept in the cabinet when not in use.

General Requirements

- Keep containers of flammable/combustible liquids closed when not in use.

ED_014247_00001303-00013

- Keep flammable/combustible liquids in designated areas and approved cabinets.
- Do not allow use of unapproved containers for transfer or storage. Use only approved safety cans (5-gallon maximum) with a spring closing lid and spout cover, designated to safely relieve internal pressure when exposed to heat or fire.
- Use only approved self-closing spigots, faucets, and manual pumps when drawing flammable/combustible liquids from larger containers/barrels.
- Use only approved metal waste cans with lids for disposal of shop towels/oily rags.
- Designate "Smoking" and "No Smoking" areas.
- Designate fueling areas.
- Observe all signs indicating "No Smoking," "No Flames," and "No Ignition."

Transferring Flammable/Combustible Liquids

This seemingly routine task can be hazardous if certain precautions are not followed. Grounding and bonding should be observed at all times to prevent the accumulation of static electricity when transferring containers/barrels one to another. Bonding is necessary between conductive containers (e.g., a barrel and a 5-gallon container).

3.2 Physical Hazards

Physical hazards that may be present during implementation of the Northern Impoundment RA are detailed below. In addition, personnel should be made aware that wearing PPE may limit dexterity and visibility and may increase the difficulty of performing some tasks.

3.2.1 Heavy Equipment Safety

Heavy Equipment

It is recommended that the following practices shall be adhered to by personnel operating heavy equipment and personnel working in the vicinity of heavy equipment:

- Heavy equipment is to be inspected when equipment is initially mobilized, delivered to the work site, or after it is repaired and returned to service, to ensure that it meets all manufacturer and OSHA specifications (e.g., fire extinguishers, backup alarms, etc.).
- Heavy equipment is to be inspected on a daily basis.
- Heavy equipment is only to be operated by authorized, competent operators.
- Seat belts are to be provided on heavy equipment that is not designed for stand-up operation.
- Equipment/vehicles whose payload is loaded by crane, excavator, loader, etc. will have a cab shield and/or canopy to protect the operator.
- Personnel will not be raised/lowered in buckets.
- Personnel will not ride on fender steps or any place outside the cab.
- Before leaving the equipment controls, operators are to ensure that the equipment is in its safe resting position.
- Before raising any booms, buckets, etc., personnel are to check for overhead obstructions.
- Personnel are to wear high visibility safety vests, steel-toed shoes, safety glasses, hearing protection, and hard hats during heavy equipment operations.
- When moving heavy equipment or when working within 10 feet of a stationary object or in tight quarters, a spotter will be used.

ED_014247_00001303-00014

3.2.2 Noise

Project activities that include working in close proximity to heavy equipment and/or drilling operations, or using power tools that generate noise levels exceeding the decibel range of 85 decibels measured on the A-weighted scale (dBA), should require the use of hearing protection with a Noise Reduction Rating (NRR) of at least 20. Hearing protection (earplugs/muffs) should be available to personnel and visitors requiring entry into these areas.

Noise monitoring should be conducted in accordance with the hearing conservation program. The hearing conservation program requires monitoring of noise exposure levels in a way that identifies employees exposed to noise at or above 85 decibels (dB) averaged over 8 working hours, or an 8-hour time-weighted average (TWA).

3.2.3 Utility Clearances

It is recommended that elevated superstructures (e.g., drill rigs, backhoes, scaffolding, ladders, cranes) be required to remain a distance of 10 feet away from utility lines (<50 kV) and 20 feet away from power lines (>50 kV). Underground utilities, if present, should be clearly marked and identified prior to commencement of work. Local/state/provincial regulations and Implementing Party requirements with regards to utility locating requirements (e.g., One-Call) should be followed.

If personnel must expose a line, state law requires contractors to protect and support the underground facility line while working at the work site. Refer to the *Texas Utilities Code, Title 5, Chapter 251, and TAC Title 16, Chapter 18* for additional guidance.

3.2.4 Vehicle Traffic and Control

It is recommended that the following safety measures be taken by personnel that have the potential to be exposed to vehicle traffic:

- A high visibility safety vest meeting American National Standards Institute (ANSI) Class II garment requirements is to be worn at all times.
- Cones and other visible markers will be used to demarcate a safe work zone around the active work zone(s).
- Appropriate signage will be posted as necessary, to inform roadway/parking lot users of any additional control measures necessary.
- A flagger may be required to alert roadway users of trucks entering or the roadway.

The journey planning process is a simple risk assessment to ensure that all identified hazards are understood and managed and that unnecessary trips or those presenting an unreasonable or uncertain risk are not taken. Journey Management Plans (JMPs) should be developed for routine travel and work site access.

Additionally, **when working on an active roadway or along the shoulder or side of the road is necessary**, project personnel should follow the requirements presented in the Manual on Uniform Traffic Control Devices (MUTCD), which is found at: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm.

A Temporary Traffic Control Plan (TTCP) may need to be developed. The RC will work with the Implementing Party, along with the local municipality (Harris County Engineering Department and the Texas Department of Transportation [TxDOT]), to determine if a TTCP is required.

3.2.5 Material Handling and Storage

Material handling and storage practices to be conducted at the work site may include manual lifting of materials. Mechanical means for lifting heavy loads should be used whenever possible.

ED_014247_00001303-00015

Special Precautions for Hazardous or Incompatible Materials Storage

Generally, materials are considered hazardous if they are ignitable, corrosive, reactive, or toxic. Manufacturers and suppliers of these materials should provide the recipient with SDSs, which describe their hazardous characteristics and give instructions for their safe handling and storage.

It is recommended that the following special precautions be followed regarding the storage of hazardous materials:

- Based on the information available on the SDSs, incompatible materials shall be kept in separate storage areas.
- Warning signs shall be conspicuously posted, as needed, in areas where hazardous materials are stored.

3.2.6 Manual Lifting

Proper lifting reduces the risk associated with moving heavy objects. It is recommended that the following be considered prior to a lift.

- Establish that you can lift the load safely.
- Use a mechanical lifting device, if available.
- Look for any obstructions or spills along route.
- Look for any sharp edges, slivers, or other things that may cause personal injury.
- Do not move any object that will obstruct your field of vision when transporting the load.

In addition, it is recommended that in any lift, the body should be positioned so that the weight of the body is centered over the feet (to provide a more powerful line of thrust and also ensures better balance) and that the lift be started with a thrust of the rear foot and to not twist.

3.2.7 Working Near Water

The Northern Impoundment RA will involve working in areas where there is the potential for slipping or falling into water that is greater than 3 feet in depth. In that instance, a "no entry zone" will be established between the work area and the water hazard. The no entry zone will be clearly defined and/or demarcated by the RC.

- When working at ground level, a 5-foot "no entry zone" may be established between the work area and the water hazard. The no entry zone is to be clearly defined and/or demarcated. Personnel will not be permitted to enter into this area unless the other provisions of this section are in place.
- Standard guardrails are required on any walking/working surface over or near water.
- Where guardrails are not practical due to impairment of work being performed, other types of safeguarding, such as safety harnesses, lifelines, and lanyards may be used (see Fall Protection Standard Operating Procedure [SOP]).
- If providing fall protection is not feasible due to the scope of work or location, personnel will be required to wear U.S. Coast Guard approved life jackets or buoyant work vests. Prior to each use and after each use, the buoyant work vests and life preservers must be inspected for defects that would affect strength and/or buoyancy. Any damaged or defective buoyant work vest or life preserver cannot be used.
- Call in or make prearranged contacts after each activity posing a drowning hazard is completed.
- If work on wet or slippery surfaces above water is necessary, non-slip tape or other methods are to be used to increase traction.
- Ring buoys with a minimum 90 feet of line must be readily available for emergency operations. The distance between buoys cannot exceed 200 feet.
- Due to the anticipated scope of work, a lifesaving skiff may be necessary. However, the SS in conjunction with the RSHM will evaluate current work site conditions to determine if a skiff is required.

ED_014247_00001303-00016

3.2.8 Boating Safety

Boating Safety

Safety precautions must be taken when project activities include working in or from a boat. It is a Texas requirement for operators of small boats or vessels to complete the Texas Parks and Wildlife Division (TPWD) Boater Education Course. This course can be taken online, and must be completed prior to operating a boat or vessel over 15 horsepower.

The following summarizes key guidelines for the safe operation of boats:

1. An approved Types I, II, III, or V personal flotation device (PFD) must be available onboard for each person on the boat. A PFD shall be worn when working in the smaller boats used for collecting samples from bodies of water.
2. Vessels longer than 16 feet in length shall also have an approved Type IV throwable ring buoy or buoyant cushion onboard.
3. No vessel shall be operated in a reckless or negligent manner. Examples of reckless or negligent operation include:
    a. Excessive speed in regulated or congested areas.
    b. Operating in a manner that may cause an accident.
    c. Operating in a swimming area with bathers present.
    d. Operating while under the influence of alcohol.
    e. Operation of a personal watercraft that endangers life or property.
    f. Every vessel shall display the lights and shapes required by the navigation rules.
    g. Accidents should be reported immediately to a law enforcement agency.
    h. It is a good idea for all vessels with a motor to have an approved, fully charged fire extinguisher onboard.

Operator's Responsibilities

1. Make sure the boat is in top operating condition and that there are no tripping hazards. The boat should be free of fire hazards and have clean bilges.
2. Ensure that safety equipment required by law is on board, equipment is maintained in good condition, and you know how to properly use these devices.
3. File a float plan with a co-worker who is ashore.
4. Have a complete knowledge of the operation and handling characteristics of your boat.
5. Know your position and know where you are going.
6. Maintain a safe speed at all times to avoid collision.
7. Keep an eye out for changing weather conditions and act accordingly.
8. Know and practice Navigational Rules.
9. Know and obey federal and state regulations and waterway markers.
10. Maintain a clear, unobstructed view forward at all times. Scan the water back and forth; avoid tunnel vision. Most boating collisions are caused by inattention.

Overloading

Never overload a boat with passengers and cargo beyond its safe carrying capacity. Too many people and/or gear will cause the boat to become unstable. Always balance the load so that the boat maintains proper trim. Here are some things to remember when loading a boat:

1. Distribute the load evenly fore and aft from side to side.

ED_014247_00001303-00017

2. Keep the load low.
3. Keep passengers seated (do not allow them to stand up in a small boat).
4. Fasten gear to prevent shifting.
5. Do not exceed the "U.S. Coast Guard Maximum Capacities" information label (commonly called the Capacity Plate). This plate displays three important items:
   a. The maximum weight of persons on board in pounds.
   b. The maximum carrying weight of the vessel in pounds.
   c. The maximum horsepower recommended for the boat.
6. If there is no capacity plate, use the following chart as a guide to determine the maximum number of persons you can safely carry in calm weather. The chart is applicable only to mono-hull boats less than 20 feet in length. A mono-hull is a boat that makes a single "footprint" in the water when loaded to its rated capacity. For example, a catamaran, trimaran, or a pontoon boat is not a mono-hull boat.

Boat Length (feet)	6	8	10	12	14	16	18	20

Alternatively, the following formula can be used to determine the safe loading capacity when a capacity plate is not available.

Formulas For Safe Loading			
Horsepower Capacity:		Person Capacity:	
For small, flat-bottom boats:		Average weight per person is 150 pounds (lbs).	
Multiply boat length (feet) times transom width (feet)			
If answer is:	Maximum HP is:		
35 or less	3	(Boat length X Boat width) 15	= Number of People
36 to 39	5		
40 to 42	7.5		
43 to 45	10		
46 to 52	15		
Note: For flat-bottom, hard chine boats, with an answer of 52 or less, reduce one increment (e.g., 5 to 3).		Boat length and width are measured in feet. Round fractions down to next lower number.	

Always check the capacity plate to make sure to not overload or over-power the vessel. A motor larger than recommended will make the stern too heavy and can cause the boat to flip. The transom will ride too low in the water and the boat could be swamped by its own wake or a passing boat's wake. The boat will not sit properly in the water and will be difficult to handle.

Too many people (and/or gear) will also cause the boat to become unstable. Always balance the load so that the vessel maintains proper trim. Too much weight to one side or the other will cause the boat to list and increase the chance of taking on water. Too much weight in the bow causes the vessel to plow through the water and too much weight in the stern will create a large wake. All of these situations make the vessel difficult to handle and susceptible to swamping.

Anchoring

Anchoring is done for two principal reasons to stop and stay in one location and to keep a vessel from running aground in bad weather, as a result of engine failure. Anchoring can be a simple task if the following guidelines are followed:

1. Make sure to have the proper type of anchor (Danforth/plow/mushroom).
2. A 3- to 6-foot length of galvanized chain should be attached to the anchor. The chain will stand up to the abrasion of sand, rock, or mud on the bottom much better than a fiber line.
3. A suitable length of nylon anchor line should be attached to the end of the chain (this combination is called the "Rode"). The nylon will stretch under heavy strain cushioning the impact of the waves or wind on the boat and the anchor.

ED_014247_00001303-00018

4. Determine depth of water and type of bottom (preferably sand or mud).
5. Calculate the amount of anchor line that will be needed. As a general rule, use five to seven times as much anchor line as the depth of water plus the distance from the water to where the anchor will attach to the bow. For example, if the water depth is 8 feet and it is 2 feet from the top of water to the bow cleat, you would multiply 10 feet by 5 to 7 to get the amount of anchor line to put out.
6. Secure the anchor line to the bow cleat at the point where it should stop.
7. Bring the bow of the vessel into the wind or current.
8. When the boat arrives where it should be anchored, place the engine in neutral.
9. When the boat comes to a stop, slowly lower the anchor. Do not throw the anchor over, as it could entangle the anchor line.
10. When all anchor line has been let out, back down on the anchor with engine in idle reverse to help set the anchor.
11. When the anchor is firmly set, use reference points (landmarks) in relation to the boat to make sure it is not drifting. Check these points frequently.

Restrictions

Do not anchor in the traveled portion of any river or channel so as to prevent, impede, or interfere with safe passage of any other boat through the same area.

Do Not Anchor by the Stern

Anchoring a small boat by the stern has caused many to capsize and sink. The transom is usually squared off and has less freeboard than the bow. In a current, the force of the water can pull the stern under. The boat is also vulnerable to swamping by wave action. The weight of a motor, fuel tank, or other gear in the stern increases the risk of swamping.

Fueling Precautions

Most fires and explosions happen during or after fueling of a boat. To prevent an accident, follow these rules:

1. Portable tanks should be refueled ashore.
2. Close all hatches and other openings before fueling.
3. Extinguish all smoking materials.
4. Turn off engines, all electrical equipment, radios, stoves, and other appliances.
5. Remove all passengers.
6. Keep the fill nozzle in contact with the tank and wipe up any spilled fuel.
7. Open all ports, hatches, and doors to ventilate.
8. Run the blower for at least 4 minutes.
9. Check the bilges for fuel vapors before starting the engine.
10. Do the “sniff test.” Sniff around to make sure there is no odor of gasoline anywhere in the boat.

Fuel Management

Practice the “One Third Rule” by using:

1. One third of the fuel going out.
2. One third to get back.
3. One third in reserve.

Weather

Never leave the dock without first checking the local weather forecast. You can get the weather information from the TV, radio, local newspaper, online, or from one of the weather channels on a very high frequency (VHF) radio.

ED_014247_00001303-00019

At certain times of the year, weather can change rapidly, therefore the operator should continually keep a "weather eye" out. While in a boat, here are a few signs that indicate an approaching weather change.

1. Weather changes generally come from the west. Scan the sky, especially to the west.
2. Watch for cloud build-up, especially rapid vertically rising clouds.
3. Sudden drop in temperature.
4. Sudden change in wind direction and/or speed.
5. If you have a barometer on your boat, check it every 2 to 3 hours. A rising barometer indicates fair weather and rise in wind velocity; a falling barometer indicates stormy or rainy weather.

What To Do in Severe Weather

1. Reduce speed, but keep just enough power to maintain headway.
2. Put on your PFD.
3. Turn on running lights.
4. Head for nearest shore that is safe to approach, if possible.
5. Head the bow of the boat into the waves at about a 45-degree angle.
6. Keep bilges free of water.
7. Seat passengers on the bottom of the boat near the centerline.
8. If the engine fails, trail a sea anchor on a line from the bow to keep the boat headed into the waves. A bucket will work as a sea anchor in an emergency.

Anchor the boat, if necessary.

3.2.9 Hoisting and Rigging

It is recommended that wire ropes, chains, ropes, and other rigging equipment be inspected prior to each use and as necessary during use to assure their safety. Defective rigging equipment should be immediately removed from service.

Rigging should not be used unless the weight of the load falls within the rigging's safe work operating range. This should be verified by the authorized rigger prior to any "pick" or lifting operation.

Only personnel trained in safe rigging procedures should be authorized to engage in rigging procedures. Additionally, the rigger should understand and use recognized crane signals.

3.2.10 Cranes and Hoists

The use of cranes may take place during project activities. If cranes are required during the Northern Impoundment RA, it is recommended that personnel ensure that the following safety practices are enforced:

- Each crane operator will provide a copy of the crane's annual inspection report to the SS prior to initiating operations.
- Operators of cranes and hoists will make visual and operational inspections of the equipment prior to use. Any discrepancies that would jeopardize the safe operation of the equipment will be corrected prior to use. These inspections are to be documented via a daily inspection checklist or equivalent.
- The posted capacity of the crane will be adhered to and overloading of the equipment will not be allowed.
- The accessible swing radius of the crane will be demarcated and/or barricaded to prevent employees from entering the area.
- A competent person will investigate the soil for stability and determine the necessary amount of "cribbing" to be placed under the outrigger pads or if crane mats are necessary.

ED_014247_00001303-00020

- No personnel will be permitted to work under a suspended load.
- Except for emergency communications, the operator will only recognize signs and signals from one designated signal person. This signal person will serve as the crane operator's eyes in areas that the crane operator cannot see. This person should be familiar with crane signals, operation of the crane, and safe methods of securing and handling a load.

3.2.11 Hand and Power Tools

The following precautions are recommended when using hand and power tools.

Hand Tools

- Hand tools should meet the manufacturer's safety standards.
- Hand tools should not be altered in any way.
- At a minimum, eye protection should be used when working with hand tools.
- Wrenches (including adjustable, pipe, end, and socket wrenches) should not be used when jaws are sprung to the point that slippage occurs.
- Impact tools (such as, drift pins, wedges, and chisels) should be kept free of mushroom heads.
- Wooden handles should be free of splinters or cracks and secured tightly to the tool.
- Any damaged or defective tools should be immediately removed from service and tagged for destruction.

Power Tools

- All power tools should be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities.
- Electric tools should not be used in areas subject to fire or explosion hazards, unless they are approved for that purpose.
- Portable electric tools should be connected to a Ground Fault Circuit Interrupter (GFCI) when working in wet areas.
- Proper eye protection should be used when working with power tools.
- Personnel should be trained in the proper use of each specific tool.
- Any damaged or defective power tools should be immediately tagged and removed from service.

3.2.12 Electrical Hazards

Only qualified individuals should be allowed to perform work on electrical circuits or perform electrical work on equipment. It is recommended that no employee be permitted to work on any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it or ensuring that it has been locked and tagged out. It is recommended that any necessary electrical work adhere to the following precautions:

- All electrical wiring and equipment shall be a type listed by Underwriters Laboratories (UL) or Factory Mutual (FM) for the specific application.
- All installations shall comply with the National Electric Code (NEC) and the National Electric Safety Code (NESC).
- All electrical circuits shall be grounded according to NEC and NESC Code. GFCIs shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- Generators and like equipment should be grounded in accordance with NEC, unless exempted by NEC 250-6.
- All live wiring or equipment shall be guarded to protect all persons or objects from harm.

ED_014247_00001303-00021

3.2.13 Control of Hazardous Energy

Hazardous energy sources may be encountered during the servicing and maintenance of machines and equipment, in which the unexpected energization or startup of the machines or equipment could cause injury to employees.

The minimum performance requirements to control hazardous energy require that employers develop and implement an energy control program.

It is recommended that project personnel who are required to conduct operations and maintenance activities that will require the isolation of an energy hazard using a lockout/tagout device follow a RC developed program and written procedures.

3.2.14 Excavations

All excavation and trenching operations shall be conducted in accordance and in compliance with OSHA's Standards for the Construction Industry. At a minimum, it is recommended that the following safety guidelines be adhered to while conducting excavation and trenching activities:

- Excavation and trenching operations require pre-planning to determine whether sloping or shoring systems are required, and to develop appropriate designs for such systems. In addition, the estimated location of all underground installations should be determined before digging/drilling begins. Necessary clearances should be observed.
- If there are any nearby buildings, walls, sidewalks, trees, or roads that may be threatened or undermined by the excavation, or where the stability of any of these items may be endangered by the excavation, they should be removed or supported by adequate shoring, bracing, or underpinning.
- Excavations may **not** go below the base of footings, foundations, or retaining walls unless they are adequately supported or a person who is registered as a Professional Engineer (P.E.) has determined that they will not be affected by the soil removal. Civil engineers or those with licenses in a related discipline and experience should be consulted in the design and use of sloping and shoring systems. P.E. qualifications should be documented in writing.

Daily Inspections

It is recommended that a designated competent person perform daily inspections of excavations, the adjacent areas, and all protective systems for situations that could potentially result in slope failure.

Additionally, the competent person should be aware of the potential for confined space situations and other hazardous work conditions.

The competent person will be required to inspect, evaluate, and complete the excavation checklist at the following intervals:

- Prior to the start of work, after each extended halt in work, and as needed throughout the shift, as new sections of the excavation or trench are opened.
- After every rainstorm and other natural or manmade event that may increase the load on the walls of the excavation, or otherwise affect their stability.

The competent person will be given the authority to immediately suspend work, if any unsafe condition is detected.

3.2.15 Slip/Trip/Hit/Fall

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. It is recommended that the following practices be implemented by work site personnel to minimize injuries:

- Spot check work areas to identify hazards.
- Establish and utilize a pathway free of slip and trip hazards.

ED_014247_00001303-00022

- Beware of trip hazards, such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads that you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-Site personnel.

3.2.16 Heat Stress

Recognition and Symptoms

Temperature stress is one of the most common illnesses faced by project personnel when working in elevated temperatures and/or humidity. Acclimatization and frequent rest periods must be established for conducting activities where temperature stress may occur. Below are listed signs and symptoms of heat stress along with recommended mitigation actions.

- *Heat Rash:* Redness of skin. Frequent rest and change of clothing are recommended.
- *Heat Cramps:* Painful muscle spasms in hands, feet, and/or abdomen. It is recommended to administer lightly salted water by mouth, unless there are medical restrictions.
- *Heat Exhaustion:* Clammy, moist, pale skin, along with dizziness, nausea, rapid pulse, fainting. It is recommended to move the affected personnel to a cooler area, administer fluids, and monitor.
- *Heat Stroke:* Hot dry skin; red, spotted, or bluish; high body temperature of 104°F; mental confusion; loss of consciousness; convulsions or coma. It is recommended to immediately cool the victim by immersion in cool water. Wrap with wet sheet and sponge with cool liquid while fanning; treat for shock. **Do not delay treatment. Cool body while awaiting ambulance.**

Work Practices

The RC will be asked to implement procedures, which may include the following, to reduce heat stress:

- Heat stress monitoring.
- Acclimatization.
- Work/rest regimes (schedule of breaks) - mandatory breaks scheduled in summer months or during high-risk activities for heat stress.
- Heat stress safety PPE (cool-vests, bandanas, etc.).
- Liquids that replace electrolytes, water, and salty foods available during rest.
- Use of buddy system.

3.2.17 Sun Exposure

Overexposure to sunlight is a common concern when conducting fieldwork. Overexposure can occur on clear, sunny days, as well as on overcast and cloudy days. Ultraviolet (UV) rays from the sun can cause skin damage or sunburn, but can also result in vision problems, allergic reactions, and other skin concerns. The RC will be asked to implement procedures, which may include the following steps, to protect against overexposure to sunlight:

- ***Always Use Sunscreen:*** Apply a broad-spectrum sunscreen with Sun Protection Factor (SPF) of at least 15 or higher liberally on exposed skin. Reapply every 2 hours or more. Even waterproof sunscreen can come off when you towel off or sweat.
- ***Cover-Up:*** Wearing tightly woven, loose-fitting, and full-length clothing is a good way to protect your skin from UV rays.
- ***Wear a Hat:*** A hat with a wide brim offers good sun protection to your eyes, ears, face, and the back of your neck - areas particularly prone to overexposure to the sun.

ED_014247_00001303-00023

- ***Wear Sunglasses That Block 99 to 100 Percent of UV Radiation:*** Sunglasses or tinted safety glasses that provide 99 to 100 percent UVA and UVB protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses.
- ***Seek Shade:*** Shade is a good source of protection, but keep in mind that shade structures (e.g., trees, umbrellas, canopies) do not offer complete sun protection.
- ***Limit Time in the Midday Sun:*** The sun's rays are strongest between 10:00 a.m. and 4:00 p.m. Whenever possible, limit exposure to the sun during these hours.

3.2.18 Cold Stress

Cold stress is similar to heat stress, in that it is caused by a number of interacting factors including environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual. Hypothermia, a condition in which the body's deep core temperature falls significantly below 98.6°F (37°C), can be life threatening. A drop in core temperature to 95°F (35°C) or lower must be prevented.

Air temperature is not sufficient to determine the cold hazard of the work environment. The wind chill must be considered as it contributes to the effective temperature and insulating capabilities of clothing. The equivalent wind chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the body's core temperature.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F (35°C). This should be taken as a sign of danger to the employees on-Site, and cold exposures should be immediately terminated for any employee when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Prevention of Cold Stress

A variety of measures can be implemented by the RC to prevent or reduce the likelihood of employees developing cold related ailments and disorders. These include acclimatization, fluid, and electrolyte replenishment, eating a well-balanced diet, wearing warm clothing, the provision of shelter from the cold, thermal insulation of metal surfaces, adjusting work schedules, and employee education.

3.2.19 Adverse Weather Conditions

The SS will be assigned responsibility to decide whether or not to continue work based on current and pending weather conditions and taking into account the provisions of the Emergency Response Plan for the Northern Impoundment RA (ERP). Electrical storms, heavy rains, hurricanes, tornado warnings, and sustained strong winds (approximately 40 mph) are examples of conditions that would call for the discontinuation of work and evacuation of the work site.

In addition, no work with elevated super structures (e.g., drilling, crane operations) will be permitted during any type of electrical storm, or during wind events that have wind speeds exceeding 40 mph, consistent with requirements of the ERP.

3.3 Biological Hazards

During the Northern Impoundment RA, on-Site personnel may encounter biological hazards, including bloodborne pathogens, insects, spiders, scorpions, rodents, snakes, and large predators. This section identifies precautions that is it recommended be taken if these hazards are encountered.

3.3.1 Vegetation Overgrowth

Overgrown weeds, bushes, trees, grass, and other vegetation are fire and safety hazards. A number of hidden hazards may not be immediately recognized due to the overgrowth of vegetation in areas where field activities may

ED_014247_00001303-00024

occur, including discarded junk, litter, and debris. Construction materials, such as boards, nails, concrete, and other debris may be hidden beneath tall grass, weeds, and bushes. Other hazards may include steep slopes, potholes, trenches, soft spots, dips, etc., all dangerously concealed from the view of individuals walking or operating motorized equipment in the area. Additionally, biological hazards such as snakes, ticks, chiggers, and mosquitoes may be present, as they breed in overgrowth conditions.

3.3.2 Poisonous Plants

Common poison ivy grows as a small plant, a vine, and a shrub. Poison ivy occurs in every state. The leaves always consist of three glossy leaflets.

Poison sumac grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction, referred to as "contact dermatitis."

The best form of prevention is to avoid contact. Wearing long sleeves and use of gloves and disposable clothing, such as Tyvek, are recommended in high-risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

3.3.3 Insects

Ticks

Ticks are blood feeding external parasites of mammals, birds, and reptiles throughout the world. Some human diseases of current interest in the United States caused by tick-borne pathogens include Lyme disease, ehrlichiosis, babesiosis, Rocky Mountain spotted fever, tularemia, and tick-borne relapsing fever.

Prevention

Preventative measures include wearing light-colored clothing, keeping clothing buttoned, tucking pant legs in socks, and keeping shirttails tucked in. Periodic checks for ticks should be made during the day, and especially at night. Hair should also be checked by parting it and combing through it to make sure that no ticks have attached to the scalp. Also, check clothing when it is first removed, before ticks have a chance to crawl off. A shower or bath should be taken, as soon as possible after leaving the work site for the day.

Bees, Wasps, and Yellow Jackets

Stinging insects are members of the order Hymenoptera of the class Insecta. There are two major subgroups: Apidae (honeybees and bumblebees) and vespids (wasps, yellow jackets, and hornets). Apidae are docile and usually do not sting unless provoked. The stinger of the honeybee has multiple barbs, which usually detach after a sting. Vespids have few barbs and can inflict multiple stings.

Types of stinging insects that might be encountered at this work site may include:

- Carpenter bees.
- Bumblebees.
- Mud dauber wasps.
- Africanized killer bees.
- Cicada killer wasps.
- Giant hornets.
- Honeybees.
- Paper wasps.
- Yellow jackets.

Symptoms

If a person is stung, three types of reactions are possible: a normal, a toxic, or an allergic reaction.

- *Normal Reaction:* Only lasts a few hours and consists of pain, redness, swelling, itching, and warmth near the sting area.
- *Toxic Reaction:* Will last for several days, results from multiple stings, and may cause cramps, headaches, fever, and drowsiness.

ED_014247_00001303-00025

– *Allergic Reaction:* Can cause hives, itching, swelling, tightness in the chest area, and a possibility of breathing difficulties, dizziness, unconsciousness, and cardiac arrest.

The stingers of many Hymenoptera may remain in the skin and should be removed, as quickly as possible without concern for the method of removal. An ice cube placed over the sting will reduce pain; aspirin may also be useful. Persons with known hypersensitivity to such stings should carry a kit containing epinephrine in a prefilled syringe. Antihistamines may help decrease hives and angioedema. Persons who have severe symptoms of anaphylaxis, have positive venom skin test results, and are at risk for subsequent stings should receive immunotherapy regardless of age or time since anaphylaxis.

Fire Ants

Fire ants are reddish-brown in color and range from 1/8 inch to 3/8 inch in length. When a fire ant stings an individual, the individual is rarely only stung once. Most fire ant stings result in a raised welt with a white pustule. If stung by a fire ant, continue to observe the welt, and try to prevent secondary infection by keeping the welt intact. However, some individuals may have an allergic reaction to a fire ant sting and require immediate medical attention. Pesticides and even hot water can be used to kill fire ant colonies. Fire ants are normally seen in the southern states.

Mosquitoes

Mosquitoes are common pests that can be found in any state and any work environment where warm, humid conditions exist. Mosquitoes can pass along diseases, such as West Nile virus and malaria. Several different methods can be used to control adult mosquito populations: repellants such as DEET, mosquito traps, foggers, and vegetation and water management.

3.3.4 Poisonous Spiders

Black Widow

Black Widow spiders are not usually deadly (especially to adults) and only the female is venomous. The female spider is shiny black, usually with a reddish hourglass shape on the underside of her spherical abdomen. Her body is about 1.5 inches long, while the adult male's is approximately half that. The spider's span ranges from 1 to 3 inches. The adult males are harmless, have longer legs, and usually have yellow and red bands and spots over their back, while the young black widows are colored orange and white. The bite of a black widow is often not painful and may go unnoticed. However, the poison injected by the spider's bite can cause severe reactions in certain individuals.

Symptoms

Symptoms include abdominal pain, profuse sweating, swelling of the eyelids, pains to muscles or the soles of the feet, salivation and dry-mouth (alternating), and paralysis of the diaphragm. If a person is bitten, they should seek immediate medical attention. Clean the area of the bite with soap and water. Apply a cool compress to the bite location. Keep affected limb elevated to about heart level. Ask a doctor if acetaminophen or aspirin can be taken to relieve minor symptoms. Additional information can be obtained from the Poison Center (1 (800) 222-1222). Black widows are found throughout the tropics, U.S., and Canada.

Brown Recluse

Brown recluse spiders are usually light brown in color, but in some instances they may be darker. Brown recluse spiders are highly venomous spiders, native to the United States, and found coast to coast. The brown recluse can vary in size, but some can obtain bodies of 5/8 inches in length with a leg span of 1 1/2 inches in diameter. They can be identified by their three pairs of eyes along the head area and their fiddle shaped markings on the back. Most brown recluse bites are defensive rather than offensive. They generally only bite when they feel threatened.

ED_014247_00001303-00026

Symptoms

If bitten by a brown recluse, an individual may experience open, ulcerated sores, which when left untreated may become infected and cause tissue necrosis. If an individual believes a spider has bitten them, they need to seek medical attention, as soon as possible. In order to minimize the occurrence of brown recluse bites, individuals should shake their clothing and shoes thoroughly, eliminate the presence of cluttered areas, and spray the building perimeters with pesticides. Brown recluse are found throughout the U.S., Mexico, and Canada.

3.3.5 Threatening Dogs

It is recommended that the following instructions be provided to work site personnel to address situations in which they are approached by a frightened or menacing dog:

- Do not attempt to run and do not turn your back.
- Stay quiet and remember to breathe.
- Be still, with arms at sides or folded over chest with hands in fists.
- Slowly walk away sideways.
- Do not stare a dog in the eyes, as this will be interpreted as a threat.
- Avoid eye contact.

Seek immediate medical attention if bitten by a dog.

3.3.6 Rodents

Rodentia: (rats, mice, beavers, squirrels, guinea pigs, capybaras, coypu)

Rodents, or Rodentia, are the most abundant order of mammals. There are hundreds of species of rats; the most common are the black and brown rat.

The **Brown Rat** has small ears, blunt nose, and short hair. It is approximately 14 to 18 inches long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, shops, and supermarkets; they also frequent any space with an easy meal and potential nesting sites.

The **Black Rat** can be identified by its tail, which is always longer than the combined length of the head and body. It is also slimmer and more agile than the Norwegian or Brown rat. Its size varies according to its environment and food supply.

The **House Mouse** has the amazing ability to adapt and now can frequently be found in human dwellings. In buildings, mice will live anywhere, and they are very difficult to keep out. Mice are also omnivorous and will eat anything.

Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

3.3.7 Snakes

Snakes may be found in any region of the country. While many snakes encountered are not venomous, a few are, so all snakes should be given a wide berth. If conducting work in heavy vegetation and underbrush, snake chaps can be worn to prevent snake bites. If a snake is observed, back away from it slowly and do not touch it. If someone is bitten, try to see and remember the color and shape of the snake, which can help with treatment of the snakebite.

Venomous snakes include the coral snake and pit vipers, such as the cottonmouth (water moccasin), copperhead, and rattlesnake. The venom of pit vipers is primarily *hematoxic* because it acts upon the victim's blood system. This venom breaks down blood cells and blood vessels and affects heart action. Bite victims experience severe burning pain,

ED_014247_00001303-00027

localized swelling, and discoloration for the first 3 to 30 minutes, followed by nausea, vomiting, occasional diarrhea, and usually shock. Seek immediate medical attention if bitten by a snake.

3.3.8 Scorpions

Forty different types of scorpions are found in the U.S. ***All the different types are located in the southern states.***

Wind scorpions, including sun scorpions, are easily recognized by the pair of large, pincer-like chelicerae on the head in front of the mouth and by the slight, waist-like constriction near the middle of the body. Unlike the broadly joined cephalothorax and abdomen of scorpions, wind scorpions have three distinct body regions - a segmented cephalothoracic area with two eyes at the front margin, a three-segmented thorax, and a ten-segmented abdomen.

Death by a scorpion sting, if it occurs, is the result of heart or respiratory failure some hours after the incident. Seek immediate medical attention if bitten by a scorpion.

3.3.9 Alligators

Similar to snakes, lizards, and other reptiles, alligators are cold-blooded (or ectothermic), meaning the air or water temperature around them determines their body temperature. The **American alligator** primarily ***inhabits the southeastern U.S.: Alabama, Arkansas, North and South Carolina, Florida, Georgia, Louisiana, Mississippi, Oklahoma, and Texas.*** They primarily live-in freshwater swamps and marshes, but also in rivers, lakes, and smaller bodies of water. Alligators are classified as a threatened species and thus enjoy the protection of state and federal law. State and federal law prohibits people from killing, harassing, molesting, or attempting to move alligators. The potential for being bitten or injured by a provoked alligator is high. Maintain a distance of at least 15 feet from any alligator.

Seek immediate medical attention if bitten by an alligator. Alligators harbor very infectious bacteria, and even minor bites may require special treatment.

3.3.10 Bloodborne Pathogens

Hepatitis and other communicable diseases are largely transmitted through exposure to bodily fluids containing the hepatitis virus, which could be found on refuse encountered in subsurface investigations.

Preventative measures include wearing appropriate PPE: work gloves, a long-sleeved shirt, and safety footwear.

4. Personal Protective Equipment (PPE)

4.1 General

The purpose of PPE is to shield or isolate individuals from the chemical and physical hazards that may be encountered during work activities.

The type of PPE required for a project will vary based on the level of protection required to protect the employee from physical, chemical, biological, and thermal hazards.

4.2 Levels of Protection

The level of protection should correspond to the level of hazard known or suspected in the specific work area. Prior to commencement of Northern Impoundment RA work, PPE will be selected by the RC with specific considerations to the hazards associated with work site activities.

ED_014247_00001303-00028

- All PPE should be disposed of and/or decontaminated at the conclusion of each workday. Decontamination procedures should follow the concept of decontaminating the most contaminated PPE first.
- All disposable equipment should be removed before meal breaks and at the conclusion of the workday, and replaced with new equipment prior to commencing work.

4.2.1 Reassessment of Protection Levels

It is recommended that protection levels provided by PPE selection be upgraded or downgraded by the RC, based upon a change in work site conditions or the review of the results of air monitoring.

5. Air Monitoring Program

Air monitoring should be performed while intrusive activities are taking place to detect the presence and relative level of any air contaminants that may be an inhalation hazard. The purpose of air monitoring is to identify and quantify airborne contaminants in order to determine the level of worker protection needed. Air monitoring requirements are outlined in the Site-Wide Monitoring Plan (SWMP).

6. Work Site Control

It is recommended that the RC adopt requirements governing work site control and work area demarcation, in compliance with 29 CFR 1910.120(b)(4)(ii)(F) and 29 CFR 1910.120(d), that include posting signage and placing barricades. All construction areas should have the appropriate signage posted. Barricades and warning signs should be placed to warn personnel of potential hazards. The RC may elect to utilize a standby person (spotter) may be utilized in place of barricades, where appropriate.

6.1 Communication

All work site personnel should be capable of communicating with other personnel at all times. It is recommended that different means of communications be utilized, including as appropriate using an air horn, walkie-talkie, cell phone, or hand signals.

6.2 Work Site Security

Work site security is necessary to prevent the exposure of unauthorized, unprotected people to work site hazards and to avoid interference with safe working procedures. Security should be maintained outside of the actual work area(s) as to prevent unauthorized entry into the work area(s).

It is recommended that a "No Trespassing Violators Will Be Prosecuted" sign should be maintained at the entrance to the work site, with only authorized personnel allowed in this area.

6.2.1 Aggressive or Menacing Behavior

The RC should adopt procedures for situations in which personnel are confronted by an individual whose behavior becomes aggressive or menacing. Those procedures may include instructing personnel to remain as calm, as possible and to avoid arguing with or physically confronting the individual, to attempt to distance yourself from the individual, and advising others in the area to leave the scene and request police assistance by having someone call 911.

ED_014247_00001303-00029

6.3 Decontamination

It is recommended that the SS be responsible for ensuring that all personnel and pieces of equipment leaving the work site are properly decontaminated according to the procedures outlined below.

6.3.1 Personnel and Equipment Decontamination Procedures

All PPE should be disposed of and/or decontaminated at the conclusion of each workday. Decontamination procedures should follow the concept of decontaminating the most contaminated PPE first, along with other requirements of 29 CFR 1910.120(k).

All disposable equipment should be removed before meal breaks and at the conclusion of the workday and should be replaced with new equipment prior to commencing work.

- All equipment and vehicles should be decontaminated or discarded upon exit. A temporary decontamination pad will be set up on-Site during project operations, as needed. All decontamination materials should be drummed for subsequent disposal. Decontamination wash water will be treated through the on-Site wastewater treatment system, as that system is described in the Northern Impoundment 90% RD.

7. Emergency Procedures

7.1 On-Site Emergencies

The PC or SS will likely be responsible for contacting local emergency services, if necessary, for specific emergency situations.

An Emergency Information Sheet containing the hospital location, directions, government agency phone numbers, and emergency phone numbers are located in at the front of this HASP. The contact information will need to be updated prior to commencement of Northern Impoundment RA activities.

7.2 Incident, Injury, and Illness Reporting and Investigation

Any work-related incident, injury, illness, exposure, or property loss will be required to be reported to the SS, and then to the PC and the Implementing Party. Motor vehicle accidents should also be reported through this system.

Occupational incidents resulting in employee injury or illness should be investigated by the SS. This investigation may be required to include determining the cause of the incident and modifying future work activities to eliminate the hazard.

7.3 Emergency Equipment/First Aid

It is recommended that safety equipment be made available for use by Site personnel and be located within 30 feet of the work area(s), and maintained at the work site. The safety equipment may include, but is not limited to, the following:

- First Aid kit (size dependent upon the number of personnel on-Site).
- Emergency eyewash bottles and/or an eyewash station.
- Emergency alarms as a means to alert all personnel instantaneously for an emergency.
- Fire extinguisher (at a minimum, a 2A/10BC should be on-Site).

ED_014247_00001303-00030

7.4 Site Evacuation

In the event of an emergency situation, such as fire, explosion, or significant release of toxic gases, personnel should follow the procedures outlined in the ERP. Prior to commencement of Northern Impoundment RA activities, the RC should develop and post relevant JMPs showing the routes to the nearest hospital, urgent care facility, and storm shelter.

7.5 Spill and Release Contingencies

If a spill has occurred, the first step is personal safety, then controlling the spread of contamination, if possible. Personnel should follow the procedures outlined in the ERP.

8. Recordkeeping

The SS may be assigned responsibility for establishing and maintaining records of all necessary monitoring activities. These records may include the items listed below:

- Name and job classification of the employees involved on specific tasks.
- Air monitoring/sampling results and instrument calibration logs.
- Records of training acknowledgment forms (work Site-specific training, safety meetings, etc.).
- Documentation of work site inspections, results of inspections, and corrective actions implemented.
- Emergency reports describing any incidents or accidents.

9. References

- EPA, 2018. Administrative Settlement Agreement and Order on Consent for Remedial Design. U.S. EPA Region 6, CERCLA Docket. No. 06-02-18. In the matter of: San Jacinto Waste Pits Superfund Site, Harris County, Texas. International Paper Company and McGinnes Industrial Maintenance Corporation, Respondents. April 2018.

ED_014247_00001303-00031

Table 1

Properties of Potential Site Contaminants
Health and Safety Plan
San Jacinto River Waste Pits Site
Harris County, Texas

Chemical Name (Synonyms)	Concentration at Site	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
2, 3, 7, 8-tetrachloro-dibenzo-p-dioxin Dioxine TCDBD TCDD 2, 3, 7, 8-TCDD CAS-1746-01-6		TLV: NE PEL: NE STEL: NE IDLH: NE	Inhalation Absorption Ingestion Eye/skin contact	ACUTE: Irritation to the eyes; allergic dermatitis; gastrointestinal disturbance; CHRONIC: Chloracne; Porphyria; possible reproductive and teratogenic effects; liver and kidney damage; hemorrhage. Potential occupational carcinogen.	(FP) NE (VP) 0.000002 mm (IP) NE (UEL) NE (LEL) NE	Colorless to white, crystalline solid. (Exposure may occur through contact at previously contaminated worksites
Furfuran Divinylene oxide CAS-110-00-9		TLV: NE PEL: NE STEL: NE IDLH: NE	Inhalation Absorption	ACUTE: Irritation of the respiratory tract. May cause lung oedema. CHRONIC: May be fatal if swallowed	(FP) -35 C (VP) NE (IP) NE (UEL) 14.3% (LEL) 2.3%	Clear, colorless liquid that turns brown upon standing with a characteristic odor.

Notes:

FP	FP - Flash Point	PEL	PEL - OSHA Permissible Exposure Limit
IDLH	IDLH - Immediately Dangerous to Life ord Health	STEL	STEL - Short Term Exposure Limit
IP	IP - Ionization Potential	TLV	TLV - ACGIH Threshold Limit Value
NE	NE - Not Established (Information Not Available)	VP	VP - Vapor Pressure
NA	NA - Not Applicable	C	C - Ceiling Exposure Limit
CNS	CNS - Central Nervous System	[skin]	[skin] - potential for dermal absorption
PNS	PNS - Peripheral Nervous System	mm	mm - millimeters Hg (mercury)
ppm	ppm - parts per million	eV	eV - electrovolts
mg/m3	mg/m3 - milligrams per cubic meter		

ED_014247_00001303-00032

GHD.com

The Power of Commitment

Emergency Response Plan (ERP)

Attachment 2 - Emergency Response Plan - Northern Impoundment

Provided as Part of Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company
McGinnes Industrial Maintenance Corporation

January 17, 2022

→ The Power of Commitment

Contents

1. Introduction **1**

2. Pre-Emergency Planning **1**

2.1 Coordination with Outside Parties 1

2.2 Initial Notification Procedures 2

2.3 Emergency Contacts 2

3. Emergency Recognition and Prevention **3**

3.1 Emergency Recognition 3

3.2 Release Prevention Measures 3

4. Personnel Roles **4**

4.1 Site Supervisor 4

4.2 Health and Safety Officer 5

4.3 On-Site Personnel 5

5. Severe Weather Preparation **6**

5.1 Re-Entry Procedure 7

5.2 Site Inspection 7

6. Evacuation Route and Procedures **7**

6.1 Minor Releases Requiring Limited Evacuation 8

6.2 Major Release Requiring Evacuation of the Work Site 8

6.3 Work Site Evacuation Route 8

6.4 Evacuation Procedures 8

7. Emergency Work Site Security and Control **9**

7.1 Delineation of Work Zones 9

7.2 Communication Systems 9

8. Emergency First Aid and Medical Treatment **10**

8.1 Emergency Medical Actions 10

8.2 First Aid 10

8.3 Emergency Numbers 10

9. Emergency Alerting and Response Procedures for On-Site Incidents **10**

9.1 Emergency Alerting Procedures 11

9.2 Emergency Response Procedures 11

10. Personal Protection and Emergency Equipment **12**

10.1 Personal Protective Equipment 12

10.2 Emergency Equipment 12

10.2.1 Air Monitoring Equipment 12

10.2.2 Emergency Response Clean-Up Equipment 12

10.2.3 Emergency Safety Equipment 12

ED_014247_00001303-00036

Contents

11. Response Follow-Up 12
12. References 13

ED_014247_00001303-00037

1. Introduction

This Emergency Response Plan (ERP) was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site in Harris County, Texas (Site). This ERP was prepared pursuant to the requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design (AOC), Docket No. 06-02-18, with an effective date of April 11, 2018, (United States Environmental Protection Agency [EPA], 2018), and in accordance with the EPA Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 Code of Federal Regulations (CFR) 1910 and 1926. The AOC includes a Statement of Work (SOW) which requires supporting deliverables to accompany the Pre-Final 90% Remedial Design for the Northern Impoundment (Northern Impoundment 90% RD) submittal to the EPA.

Major incidents that may require emergency response could include severe weather, fire, explosion, chemical reaction, truck rollovers, off-Site accidents involving transport vehicles, spills or other incidents that may pose a hazard to on-Site personnel and nearby residents and/or the environment. References in this ERP to the "work site" are to the Northern Impoundment and references to "Implementing Party" are to the entity(ies) implementing the remedial action (RA) for the Northern Impoundment. Prior to initiation of Northern Impoundment RA activities, this ERP should be updated by the selected Remedial Contractor (RC).

The Site is located in Harris County, Texas, east of the City of Houston, between two unincorporated areas known as Channelview and Highlands. The Northern Impoundment is approximately 15 acres in size and is located on a small peninsula and includes surrounding in-water and upland areas that extends north of Interstate Highway 10 (I-10)).

2. Pre-Emergency Planning

2.1 Coordination with Outside Parties

During any emergency events on-Site, personnel may coordinate and communicate with the following authorities (as necessary):

- EPA Region 6.
- Harris County Sheriff.
- Channelview Fire Department.
- National Response Center.
- Harris County Hazardous Materials Response Team (HCHMRT).
- Texas Commission on Environmental Quality (TCEQ).
- Texas Railroad Commission (TRRC).
- Texas Department of Transportation (TxDOT).
- United States Coast Guard (USCG).
- Port of Houston Authority (POHA).

A meeting with these authorities may be requested and conducted by the Implementing Party prior to the commencement of each phase of Northern Impoundment RA activities at the work site, in order to facilitate a coordinated, integrated, and timely response for any emergencies that may occur during intrusive field activities which

ED_014247_00001303-00038

represent a potential for release of hazardous substances. Topics that may be discussed/reviewed at the meeting may include the following:

- Site history/historical response actions.
- Nature and extent of contamination.
- Nature and duration of anticipated RA field activities.
- Contents of the Northern Impoundment Health and Safety Plan (HASP).
- ERP contents.
- Transportation routes.
- Emergency response support that can be provided by local emergency response authorities.

2.2 Initial Notification Procedures

To minimize hazards to human health and safety and/or the environment, in the event of a fire, explosion, spill, or release involving a hazardous substance including oil, raw materials and by-products, or hazardous waste, it will be the responsibility of on-Site personnel to immediately report any such releases to the Site Supervisor (whose role is defined in Section 4). The Site Supervisor will be responsible for implementing emergency procedures, if necessary, and for notification of appropriate project specific contacts and local emergency response authorities listed in the below Table 1.

2.3 Emergency Contacts

The emergency telephone numbers for the local emergency response authorities and other local, state, and federal authorities are presented in Table 1. The closest hospital to the work site is located approximately 9 miles east of the work site, in Baytown, Texas. The emergency telephone numbers and the emergency route to the hospital will be posted at the work site prior to commencement of Northern Impoundment RA activities at the work site and will be included in the Northern Impoundment HASP.

Table 1 Emergency Information

EMERGENCY INFORMATION		
Contact	**Phone Number**	**Site Location**
Local Police: Harris County Constable Baytown Police Department	911 (713) 637-0014 (281) 422-8371	Northern Impoundment: 18001 East Freeway Service Road Channelview, Texas 77530 (29.795230, -95.066734)
Local Fire Department: Channelview Fire Department	911 (281) 452-5782	
Ambulance	911	
Stakeholders		
EPA Region 6	(800) 887-6063 or (214) 665-2760	
National Response Center	(800) 424-8802	
Harris County Hazardous Materials Response Team 24-Hour Emergency Line	(800) 590-0005	
Texas Commission on Environmental Quality (TCEQ)	(713) 767-3500	
Texas State Emergency Response Commission	(800) 832-8224	
Texas Railroad Commission (TRRC)	(844) 773-0305 or (512) 463-6788	

ED_014247_00001303-00039

EMERGENCY INFORMATION		
Contact	**Phone Number**	**Site Location**
Texas Department of Transportation (TxDOT)	(800) 558-9368	
United States Coast Guard (USCG)	(504) 589-6225	
Port of Houston Emergency Dispatch Non-Emergency Dispatch	 (713) 670-3611 (713) 670-3620	

3. Emergency Recognition and Prevention

This section describes the methods and procedures that may be used to recognize and prevent or minimize the adverse effects of any releases of hazardous substances that may occur at the work site during implementation of the Northern Impoundment RA.

3.1 Emergency Recognition

Procedures will be put in place so that on-Site personnel will be prepared to recognize and report to the Site Supervisor any incident (e.g., fire, explosion) or releases of hazardous substances which may endanger human health and safety or the environment. Specifically, when personnel discover such an incident or release of a hazardous substance, the procedures that on-Site personnel would be instructed to follow would include the following:

- Report the incident/release to the Site Supervisor.
- The Site Supervisor will determine if the incident/release represents an emergency and, if so, will immediately notify a person to be designated by the Implementing Party or the RC as the project coordinator (or equivalent) for the Northern Impoundment RA (Project Coordinator) and local emergency response authorities, if necessary.

The procedures would also address plans so that personnel in the affected area(s) will immediately evacuate the area of release or the work site in accordance with the "Evacuation Procedures," presented in Section 6.

3.2 Release Prevention Measures

The following procedures/measures may be implemented at the work site to prevent potential releases of or minimize the impact of releases of hazardous substances during the Northern Impoundment RA:

- All potential hazardous substances (i.e., diesel fuel, etc.) will be stored in vessels with adequate secondary containment should a spill occur.
- All potential contaminated substances generated during activities (i.e., impacted soils, dewatering fluids, decontamination fluid, used Personal Protective Equipment (PPE), etc.) will be placed onto the appropriate staging pads or placed in compatible containers.
- The Site Supervisor will be accountable for hazardous substances spill/release prevention, and is responsible for properly instructing on-Site personnel in the operation and maintenance of equipment to prevent the discharges of hazardous substances.
- A supply of spill/release response materials and emergency safety equipment should be stored at the work site during activities to immediately respond to releases/emergencies.
- On-Site personnel will be trained, consistent with the level of their responsibilities and in accordance with 29 CFR 1910.120(q)(6), so that they are capable of providing immediate response in order to contain and/or mitigate spills and releases.

ED_014247_00001303-00040

– If necessary, a meeting is to be conducted with local emergency response authorities in order to facilitate a coordinated, integrated, and timely response for any emergencies that on-Site personnel are unable to contain and/or control.

4. Personnel Roles

This section of the ERP describes, for purposes of the Northern Impoundment RA, the various personnel roles, responsibilities, and the lines of authority that individuals may be assigned and communication procedures that may be followed by on-Site personnel involved in responses to incidents or emergencies.

4.1 Site Supervisor

The Site Supervisor (or equivalent) will be assigned responsibility for implementing on-Site emergency response procedures and directing the on-Site and emergency personnel. All on-Site personnel and their communications would be coordinated through the Site Supervisor. Specific duties of the Site Supervisor in the case of an incident may include the following:

– Initially identify the source and character of the incident and the type and quantity of any release (if applicable). Assess possible hazards to human health or the environment in consultation with the Health and Safety Officer (as defined in Section 4.2) that may result directly from the incident. See Table 2 in Section 6 of this document for details on release criteria and reporting requirements.
– If the incident may threaten human health or safety of on-Site personnel, immediately determine whether evacuation of the work site is necessary in consultation with the Project Coordinator and EPA Remedial Project Manager (RPM).
– If the incident does not threaten human health or safety of on-Site personnel or nearby residents or the environment, determine if on-Site personnel can contain or control the incident or release. If not, notify local emergency response authorities identified above in Table 1.
– Direct on-Site personnel to control the incident or release until, if necessary, outside emergency response help arrives. Specifically ensure that the location where the incident/release occurred and the surrounding area are evacuated and all operations in the vicinity of the incident are discontinued to ensure that fire, explosions, or spills do not spread. Direct work site personnel not involved in emergency response actions to avoid the area of the incident and leave emergency control procedures unobstructed and ensure protected personnel are on standby for emergency rescue, if necessary.
– Determine, in consultation with the Health and Safety Officer, when the emergency has passed and initiate an "all clear" signal to notify on-Site personnel of such.
– Ensure that all emergency equipment used is decontaminated, recharged, and/or fit for its intended use before work site operations are resumed.
– Record time, date, and details of the incident, and submit a written incident report to the EPA within applicable time periods required by any order under which the Northern Impoundment RA is being performed, if the release is at or above reportable quantities.
    - Per regulations developed under the CERCLA of 1980 (Superfund), a spill/release of one pound or more of any hazardous substance for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or Toxic Substances Control Act (TSCA), may require reporting.

ED_014247_00001303-00041

4.2 Health and Safety Officer

This individual will be responsible for identifying and evaluating actual and potential hazards and provide oversight of emergency response actions with respect to the safety of operations being conducted. The Health and Safety Officer will likely report directly to the Site Supervisor. Specific duties of the Health and Safety Officer may include:

- Conduct an initial assessment of the emergency situation to identify chemical(s) and potential physical hazard(s) of the emergency response actions.
- Perform necessary air monitoring to determine levels of exposure and necessary protective equipment for emergency personnel and evaluate the potential for off-Site migration of airborne contaminants.
- Present a safety briefing to on-Site personnel to inform them of the actual and potential hazards of the emergency response and required levels of personnel protective equipment.
- Identify use of any engineering controls, (e.g., ventilation, remote handling devices, etc.), to control overexposure of personnel to hazardous substances.
- Identify work zones to be established by on-Site personnel.
- Investigate any injuries or illnesses as a result of accidents occurring during an emergency response.
- Observe the safety of clean-up activities and ensure appropriate PPE requirements are being adhered to.
- Determine when it is safe for personnel to return to the affected area after emergency response actions are completed.
- Maintain a log of safety briefings, air monitoring, safety observations, and other important issues relevant to safety.

4.3 On-Site Personnel

The Site Supervisor will be responsible for directing the on-Site personnel in emergency response operations. Specific steps that the Site Supervisor may take in directing on-Site personnel are described below.

The on-Site personnel will be instructed to respond initially to all emergency incidents. Priorities of on-Site personnel will be to protect human health and safety of on-Site personnel and nearby residents, and then the environment. Concentration will be placed on preventing a spill/release from spreading to nearby areas. Specific duties of the on-Site personnel may be as follows:

- Clear the area of all personnel not actually involved in responding to the emergency, and remove any injured persons from the area, such that medical treatment can be administered by qualified first-aid trained personnel.
    - Prior to allowing treatment of injured persons by first-aid trained personnel, decontamination of the injured persons will be performed. On-Site personnel will be responsible for ensuring that the level of decontamination is consistent with the extent of injury and level of contamination.
- Establish appropriate work zones for emergency response as directed by the Health and Safety Officer.
- Control the incident or release at the direction of the Site Supervisor, until, if necessary, outside emergency response help arrives.

The Site Supervisor may appoint or designate, as necessary, on-Site personnel to assist in the following efforts:

- Notification of local emergency response authorities.
- Site evacuation and accounting of personnel and visitors.
- Assuring that personnel not involved in the emergency response and/or clean-up activities are kept a safe distance from the area and do not interfere with operations.
- Maintaining on-Site traffic lanes for emergency response vehicles.
- Sampling efforts to determine the extent of contamination and clean-up efforts, if appropriate.
- Proper containerization, labeling and staging of any recovered hazardous substances, if appropriate.

ED_014247_00001303-00042

- Assisting in decontaminating, recharging, or replacing all emergency equipment used during the emergency response.
- Assisting in returning personnel to their work areas after the "all clear" signal is given.

5. Severe Weather Preparation

The Site Supervisor will adopt procedures to monitor weather and river levels, which may include Hazardous Weather Outlooks for the surrounding areas; as defined by the Climate Prediction Center U.S. Hazard Outlook, a division of the National Oceanic and Atmospheric Administration (NOAA). The Site Supervisor will also adopt procedures to be followed in the event that a severe weather or tornado watch or warning is issued by the National Weather Service, which may include directing on-Site personnel to shelter areas, which will be determined prior to the Northern Impoundment RA. Routes to shelters will be included in the Northern Impoundment HASP.

As detailed in the Northern Impoundment 90% RD, it is anticipated that Northern Impoundment RA activities will be conducted in the months of the year with a lower likelihood for hurricanes and tropical storms, but there could be exceptions in which activities take place during the remaining months of the year. There would be defined preparation phases to address situations involving severe weather, a high-water event, a tropical depression, tropical storm, or a hurricane that is anticipated to make landfall in the general vicinity of the work site based on the National Hurricane Center advisories. Four phases and associated procedures that may be adopted to protect the work site and personnel in the event of severe weather are described below.

Phase I Preparation

Phase I preparations would be for expected severe weather events, including heavy rains or anticipated high-water events with potential localized flooding, in the southeast Texas vicinity and will affect the Channelview area within 96 hours. In the event of a Phase I scenario, the Site Supervisor would execute the following steps:

- Monitor the weather and San Jacinto River forecasts for updated predictions.
- Consider suspending all non-essential work site activities and deliveries and covering any open excavations.
- List all work necessary to control loose materials/equipment from potential damage (water or wind).
- Verify that all supplies needed to secure the work site are available.

Phase II Preparation

Phase II preparations would be for an expected tropical depression, tropical storm, or hurricane landfall in the southeast Texas vicinity which is predicted to have up to 50 miles per hour (mph) winds and will affect the Channelview area within 96 hours or an anticipated high-water event. In the event of a Phase II scenario, the Site Supervisor would execute the procedures outlined in Phase I and, in addition, execute the following:

- Suspend all non-essential work.
- Consider timing of a complete suspension of work and for covering of any open excavations.
- Secure or remove equipment that could be damaged by the storm (i.e., small totes, drums, vehicles, monitoring instruments, etc.).

Phase III Preparation

Phase III preparations would be for an expected tropical depression, tropical storm, or hurricane landfall in the southeast Texas vicinity which is predicted to have up to 50 mph winds and will affect the Channelview area within 84 hours or an anticipated high-water event. In the event of a Phase III scenario, the Site Supervisor would follow the procedures outlined in Phases I and II and, in addition, execute the following:

- Cancel all deliveries.

ED_014247_00001303-00043

- Suspend all work and shutdown and move equipment off-Site, as necessary.
- Take all records off-Site.
- Backfill any open excavations using available on-Site material or clean backfill.

Phase IV Preparation

Phase IV preparations would be for an expected tropical depression, tropical storm, or hurricane landfall in the vicinity of southeast Texas which is predicted to affect the Channelview area within 72 hours or an anticipated high-water event. In the event of a Phase IV scenario, the Site Supervisor would follow the procedures outlined in Phases I, II, and III and, in addition, execute the following:

- Evacuate all personnel from the work site.
- Suspend all work activities and move equipment off-Site, to the extent that has not already been done under Phase III, until the Site Supervisor, in coordination with the Project Coordinator and EPA RPM, determines the work site is safe for re-entry.

5.1 Re-Entry Procedure

The Health and Safety Officer, in coordination with the Project Coordinator and Implementing Party, will be responsible for determining the appropriate time for personnel to return to the work site. Work site personnel will not be permitted to access the work site until the Site Supervisor approves entry.

Federal, state, and local government agencies and law enforcement officials have agreed to recognize specific identification from critical infrastructure owners and operators, and their contractors, subcontractors, and assignees that seek access into a closed emergency area. Once identity has been verified, access is granted at the discretion of agency or official representatives (e.g., law enforcement, National Guard). A valid State Driver's License and/or employer-issued photo ID and/or Transportation Worker Identification Credential (TWIC) Card may be required to gain access at checkpoints.

Once the local authorities have granted access, the Site Supervisor, in coordination with the Implementing Party, can then determine the appropriate time for personnel to return to the work site.

5.2 Site Inspection

Once it is determined that the work site is safe to access, it is anticipated that specific personnel selected by the Site Supervisor will mobilize to the work site to complete a post-severe weather Site inspection. The Site Supervisor will be responsible for determining how such personnel should document work site conditions, including with photographs and field notes. In addition, the Site Supervisor may have such personnel note any damage or impact to materials or equipment, determine approximate high-water levels, and/or obtain relevant information from any local residents that may have stayed in the area during the storm. The Site Supervisor will also be responsible to, if necessary, direct personnel to prepare a Site inspection report for submittal to the EPA, as required by the terms of any order under which the Northern Impoundment RA is being performed.

6. Evacuation Route and Procedures

Emergencies require prompt and deliberate action. In the event of a hazardous substance spill/release, it will be necessary for the RC's personnel and other persons present at the work site to follow an established set of procedures consistent with OSHA requirements in 29 CFR 1910.120(b)(4)(ii)(J) and (j)(1)(viii). The procedures that are established should be followed as closely as possible, with the understanding that, in specific emergency situations, the Site Supervisor may deviate from the procedures to provide a more effective plan for bringing the situation under control. The Site Supervisor will be responsible for determining which situations require evacuation of the work site.

ED_014247_00001303-00044

This section describes procedures which may be employed to address potential exposures of on-Site personnel and persons in the vicinity of the work site to hazardous conditions arising out of spills/releases of hazardous substances at the work site. It is anticipated that no single defined route can be identified for evacuation or safe distances due to the nature of the work, and that safe distances will only be determined at the time of an emergency, based on a combination of work site and incident conditions. However, the following measures are provided to serve as general guidelines. Table 2 below addresses the criteria for releases.

Table 2 Criteria for Hazardous Substances Spill/Release Incidents

Release Classification	Criteria
Minor Release	– Low toxicity compound spill > 1 barrel (bbl) outside secondary containment, or ≥ 5 bbl inside secondary containment, unless it impacts or potentially impacts state or marine waters. – Single handheld detector with a lower explosive limit (LEL) reading ≥ 50 percent. – Smoke Investigation.
Major Release	– High toxicity compound spill impacting or potentially impacting state or marine waters. – Fire or Explosion. – Hazardous substances release with off-Site potential.

6.1 Minor Releases Requiring Limited Evacuation

As part of the procedures applicable in the event of minor releases (small spills of low toxicity) of hazardous substances, personnel may be directed to evacuate the immediate area and report to the Contaminant Reduction Zone (CRZ). The CRZ will be determined by the RC and Implementing Party prior to the Northern Impoundment RA. Low toxicity may be defined for this purpose as a compound having an Animal LD_{50} greater than 50 milligrams/ kilograms (mg/kg). A signal to evacuate a limited area in the case of a minor release will be established, such as one short blast using an air horn or verbal communication. Small spills or leaks from a container will require initial evacuation of an area, potentially at least 35 feet in all directions, to allow for clean-up and to prevent exposure.

After initial assessment of the extent of the release and potential hazards, the Site Supervisor, in consultation with the Health and Safety Officer, will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, or barricades would be used to secure the boundaries.

6.2 Major Release Requiring Evacuation of the Work Site

As part of the procedures applicable in the event of a major hazardous substance release (large spills of high toxicity), personnel may be directed to evacuate the work site. High toxicity may be defined for this purpose as a compound having an Animal LD_{50} less than 50 mg/kg. A signal to notify on-Site personnel to evacuate the work site in case of major releases requiring evacuation of the work site will be established prior to the Northern Impoundment RA. Site evacuation would be initiated by the Site Supervisor, in consultation to the extent practical, with the Project Coordinator, the Implementing Party, and the EPA RPM. However, if necessary, the Site Supervisor would initiate work site evacuation, as necessary, to protect the health and safety of on-Site personnel.

6.3 Work Site Evacuation Route

As part of the procedures governing evacuation of the work site, muster points and evacuation routes for the work site will be identified. The routes should be addressed during safety meetings, including any changes to such routes due to changing work site conditions, work activities, and weather factors. A secondary evacuation route would also be identified during the safety meeting.

6.4 Evacuation Procedures

As part of the procedures to be followed in the event work site evacuation is necessary, it is recommended that the following actions (or similar) be undertaken:

- The signal for work site evacuation should be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the work site should cease to allow safe exit of personnel and movement of emergency equipment.
- **ALL** personnel, visitors, and contractors should immediately leave through the identified primary or secondary evacuation route.
- No persons will remain or re-enter the work site unless to carry out their emergency duty procedures. Those within the work site area will normally only include emergency response personnel or other emergency teams (e.g., fire department).
- Immediately upon exit, **ALL** personnel, visitors, and contractors should be accounted for by the Site Supervisor or designee.
- The names of emergency response team members and/or other emergency team members involved in emergency response should be reported to the Site Supervisor.
- Re-entry into emergency areas, to find persons not accounted for should not be attempted.
- Re-entry into the work site will be made only after an "all clear" signal is given by the Site Supervisor. At his/her direction, a signal or other notification will be given for re-entry into the work site.

7. Emergency Work Site Security and Control

The Site Supervisor will put in place security measures to be followed in the event of an emergency. Implementation of security procedures should begin with the notification that an emergency has occurred. If it is necessary to evacuate personnel from the work site or an area within the work site, security measures would be implemented to safely remove personnel and to secure the area from re-entry, to prevent or minimize the exposure of unprotected personnel to work site hazards and avoiding interference with emergency response actions. As part of those measures, on-Site personnel should be instructed to immediately take steps to secure the incident area and establish safe boundaries (i.e., work zones). This may include, if necessary, establishing the following three work zones at the direction of the Health and Safety Officer:

- ***Support Zone (SZ)*** - The uncontaminated area where emergency response personnel should not be exposed to hazardous conditions.
- ***Contaminant-Reduction Zone (CRZ)*** - The area where decontamination takes place.
- ***Exclusion Zone (EZ)*** - The contaminated area/emergency response area.

7.1 Delineation of Work Zones

The location of these three zones would be pre-determined, based on, to the extent applicable, sampling and monitoring results, expected work activities, and potential routes and extent of contamination dispersion in the event of a release. Procedures should be adopted to minimize movement of personnel and equipment among these zones, to restrict access to control points to prevent cross contamination from contaminated areas to clean areas, and to clearly mark work zones, including by lines, placards, hazard tape, construction cones and/or signs, or enclosed by physical barriers such as fences or ropes.

7.2 Communication Systems

A system of communication should be established at the hazardous substance spill/release scene. The communication system would address both internal communication among on-Site personnel and external communication between on-Site and off-Site personnel.

ED_014247_00001303-00046

The Site Supervisor will be responsible for determining the proper methods of communication at the work site. The Site Supervisor will also be responsible for instructing all on-Site personnel on the use of the selected communication methods.

8. Emergency First Aid and Medical Treatment

During the Northern Impoundment RA, it is anticipated that any personnel requiring emergency medical attention would be evacuated immediately from EZs and CRZs and that personnel will be instructed not enter any such area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation in such a situation will be based on the type and severity of the illness or injury and the nature of the contaminant. Personnel would be instructed that if decontamination does not interfere with essential treatment, it should be performed.

8.1 Emergency Medical Actions

If actual or suspected serious injury occurs, it is recommended that these steps be followed:

- Remove the exposed or injured person(s) from immediate danger.
- First aid to be rendered at on-Site personnel discretion. Decontaminate affected personnel after critical first aid is given.
- Notify Site Supervisor and Health and Safety Officer of the incident.
- Obtain emergency medical services or ambulance transport to the hospital. Routes to the nearest hospital and urgent care facility will be included in the HASP and posted on the work site.
- Other personnel in the work area will be evacuated to a safe distance until the Health and Safety Officer determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard-control issues are resolved.

8.2 First Aid

Qualified personnel may give first aid at their discretion and stabilize an individual needing assistance. Professional medical assistance should be obtained at the earliest possible opportunity.

8.3 Emergency Numbers

In the event of an emergency medical incident the telephone numbers provided in Table 1 should be available to be used to summon assistance.

9. Emergency Alerting and Response Procedures for On-Site Incidents

In the event of an emergency involving an on-Site hazardous substance spill or release, the general procedures that may be used for rapid and safe response and control of the situation may include those identified below.

ED_014247_00001303-00047

9.1 Emergency Alerting Procedures

If on-Site personnel discover a chemical spill or a vapor or substance release, they should immediately notify the Site Supervisor. When contacted, the Site Supervisor should obtain information pertaining to the following, to the extent applicable:

- The substance spilled or released.
- Location of the release or spillage of hazardous substance.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill/release or vapor or smoke release is heading.
- Any injuries involved.
- Fire explosion or chemical reaction or possibility of these events.
- The area and substances involved and the intensity of the fire or explosion.

This information will then be used by the Site Supervisor to assess the magnitude and potential severity of the spill or release.

9.2 Emergency Response Procedures

The initial response to any emergency should be to protect human health and safety, and then the environment. Other steps, such as identification, containment, treatment, and disposal assessment, should be considered, as part of the secondary response.

Emergency response procedures may include the measures described below:

- If a spill/release occurred that was not contained within a dike or sump area (e.g., drum staging area or decontamination pad), an area of isolation should be established around the spill/release. The size of the area should be established depending on the size of the spill/release and the substances involved.
- If the spill/release results in the formation of a toxic vapor cloud (by outbreak of fire or other), further evacuation may be required, based on isolation directions that have been established prior to the initiation of work activities for Northern Impoundment RA. A decision may be made to modify the scope of the evacuation based on air monitoring performed by the Health and Safety Officer.
- If the control and clean-up of a spill or release is determined to be within the capabilities of the on-Site personnel and to not threaten human health or safety of on-Site personnel or nearby residents, local emergency response authorities may not be notified. A decision on notifications to local emergency authorities would be made by the Site Supervisor, and in consultation with the Implementing Party and EPA RPM, if practicable.
- Any release occurring from drums or other containers containing solid wastes should be placed into approved containers and should be labeled as to its contents and transferred to the on-Site staging area pending treatment and/or off-Site disposal.
- In the event of spilled liquid, the spilled liquids should be confined to the immediate area of the spill and the liquids may be pumped, with the use of a portable hand pump, into an overpack drum or tank (or similar container) or absorbed with an inert absorbent. The spilled liquids should be confined by implementing steps, such as diking around the spill with native material or with an inert absorbent. Containers containing such materials should be appropriately labeled as to contents and transferred to an on-Site drum staging area pending treatment and/or off-Site disposal. In some situations, such as if the spilled liquid consisted of non-aqueous phase liquids (NAPL) or decontamination water, additional steps may be required to address the spilled substance and visibly affected soils.
- The Site Supervisor has designated responsibility for determining whether spill or release is not within the capabilities of the on-Site personnel or for other reasons should be immediately reported to the 911 dispatcher. In that situation, the Site Supervisor will have responsibility for initiating evacuation of potentially affected work site areas.

ED_014247_00001303-00048

10. Personal Protection and Emergency Equipment

10.1 Personal Protective Equipment

Emergency response personnel entering an EZ for emergency spill/release response should, depending on the task and exposure potential, be required to wear an appropriate protection level as determined by the RC and Implementing Party and as directed by the Health and Safety Officer.

10.2 Emergency Equipment

Emergency equipment will need to be available for deployment during emergencies/releases of hazardous substances if needed. That emergency equipment may include the equipment discussed below.

10.2.1 Air Monitoring Equipment

The RC will determine which direct reading instrumentation will be used in emergency situations to assess the degree of environmental hazard prior to the Northern Impoundment RA. The equipment to be used for air monitoring is further discussed in the Northern Impoundment RD Site-Wide Monitoring Plan.

10.2.2 Emergency Response Clean-Up Equipment

A sufficient supply of emergency response clean-up equipment should be maintained at the work site to be used for spill/release control. The RC will determine which emergency response clean-up equipment should be used in for spill/release control prior to the commencement of activities at the work site as part of the Northern Impoundment RA.

10.2.3 Emergency Safety Equipment

It is recommended that the following equipment, at a minimum, be staged at the work site, during active Northern Impoundment RA activities, to provide for safety and first aid:

- Air horn.
- Additional PPE equipment.
- Potable water.
- OSHA approved first aid kit sized for a minimum of ten people.
- Portable emergency eyewash.
- 20-pound ABC type dry chemical fire extinguishers (one per each piece of heavy equipment).

11. Response Follow-Up

Following all emergency response actions and activation of this ERP, it is recommended that the Site Supervisor adopt response follow-up procedures that include conducting a debriefing session for all key individuals involved to evaluate the response and revisions to ERP, if necessary. The follow-up procedures may address the need for and responsibility for preparation of an incident report.

ED_014247_00001303-00049

12. References

– EPA, 2018. Administrative Settlement Agreement and Order on Consent for Remedial Design. U.S. EPA Region 6, CERCLA Docket. No. 06-02-18. In the matter of: San Jacinto Waste Pits Superfund Site, Harris County, Texas. International Paper Company and McGinnes Industrial Maintenance Corporation, Respondents. April 2018.

ED_014247_00001303-00050

GHD.com

→ The Power of Commitment

Transportation and Off-Site Disposal Plan (TODP)

Attachment 8 - Transportation and Off-Site Disposal Plan - Northern Impoundment

Provided as Part of Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company
McGinnes Industrial Maintenance Corporation

January 17, 2022

→ The Power of Commitment

Contents

1. Introduction **1**
1.1 Relationship to Supporting Plans 1
2. Roles and Responsibilities **1**
3. Compliance with Off-Site Disposal Rule **2**
4. Waste Classification Procedures **2**
4.1 Waste Stream Categories and Disposal Options 2
4.2 Waste Sampling and Classification 3
5. On-Site Management and Loading **3**
5.1 Transportation Truck/Container Requirements 3
5.2 Truck Staging and Loading Requirements 3
5.2.1 Lining Trucks and Securing Loads 3
5.2.2 Control and Mitigation of Tracking Waste Beyond Work Areas 4
6. Transportation **4**
7. Document and Reporting **4**
7.1 Waste Profiles 4
7.2 Manifests 4
7.3 Waste Reporting 4
8. References **5**

Figure index

Figure 1 Transportation Routes

ED_014247_00001303-00054

1. Introduction

This Transportation and Off-Site Disposal Plan (TODP) was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site in Harris County, Texas (Site). This TODP was prepared pursuant to the requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design (AOC), Docket No. 06-02-18, with an effective date of April 11, 2018 (United States Environmental Protection Agency [EPA], 2018). The AOC includes a Statement of Work (SOW) which requires supporting deliverables to accompany the Pre-Final 90% Remedial Design for the Northern Impoundment (Northern Impoundment 90% RD) submittal to the United States Environmental Protection Agency (EPA).

This TODP provides the procedures for on-Site management and loading of excavated material to be disposed of off-Site during the Northern Impoundment RA, the transportation routes for off-Site shipments from the Northern Impoundment, and measures to be implemented, if needed to protect communities that may be affected by the shipments. It also addresses the management of other wastes generated during implementation of the Northern Impoundment RA (collectively, Wastes). References in this TODP to the "work site" are to the Northern Impoundment and references to "Implementing Party" are to the entity(ies) implementing the RA for the Northern Impoundment. Prior to initiation of Northern Impoundment RA activities, each selected remedial contractor (RC) will either update this TODP or develop its own TODP to address the components outlined in this document.

1.1 Relationship to Supporting Plans

The TODP should be considered in combination with the other supporting plans. The Construction Quality Assurance/Quality Control Plan (CQA/QCP) describes the procedures to verify that the excavation objectives are achieved during implementation. The Site-Wide Monitoring Plan (SWMP) describes the procedures for ongoing monitoring during the RA (i.e., dust, stormwater, odor, and turbidity). The field and analytical quality procedures are described in the Quality Assurance Project Plan (QAPP). The Field Sampling Plan (FSP) provides the procedures for collection of samples during the RA (i.e., treated effluent water, post-confirmation samples, off-Site backfill samples, and waste profile samples).

2. Roles and Responsibilities

Roles and responsibilities of those involved in activities addressed by this TODP should be defined in the plan to be developed by the RC, but are expected to include the following:

- ***Generator*** - The Implementing Party or some other party involved in the Northern Impoundment RD will be the generator of the Wastes. The Generator will be responsible for signing the waste profiles and the manifests. The Generator's signatory authority may be delegated to another representative on-Site.
- ***Engineer or Implementing Party's Representative*** - The Engineer or Implementing Party's Representative will be responsible for inspecting and documenting the work for conformance with the specifications and other contract documents, including the loading and transportation of excavated materials for disposal off-Site. This role may include a waste coordinator to track Waste-related activities and prepare the documentation of the kind described in Section 7.0.
- ***Remedial Contractor (RC)*** - The RC will be responsible for managing and loading the excavated materials for transportation to the disposal facility and management and disposal of other Wastes generated during the Northern Impoundment RA.

ED_014247_00001303-00055

- ***Transporter*** - A Transporter will have responsibility for transporting Waste to the selected Disposal Facility(ies). The Transporter will sign the waste manifests as the Transporter.
- ***Disposal Facility*** - A Disposal Facility will be responsible for approving waste profiles, receiving the waste shipments, documenting the weight/volume, and disposing of the Waste properly according to its permits. A Disposal Facility will sign the waste manifests as the Disposal Facility and return the completed manifest to the Generator.

3. Compliance with Off-Site Disposal Rule

Section 121(d)(3) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) applies to any CERCLA response action involving the off-Site transfer of any hazardous substance, pollutant, or contaminant (CERCLA wastes). That section requires that CERCLA wastes may only be placed in a facility operating in compliance with Resource Conservation and Recovery Act (RCRA) or other applicable Federal or State requirements. It further prohibits the transfer of CERCLA wastes to a land disposal facility that is releasing contaminants into the environment, and requires that any releases from other waste management units must be controlled. These principles are the basis for the Off-Site Rule (OSR), set forth in the National Contingency Plan (NCP), at 40 Code of Federal Regulations (CFR) 300.440.

The OSR establishes the criteria and procedures for determining whether facilities are acceptable for the receipt of CERCLA wastes from response actions authorized or funded under CERCLA. The OSR establishes compliance criteria and release criteria, and establishes a process for determining whether facilities are acceptable based on those criteria. The OSR also establishes procedures for notification of unacceptability, reconsideration of unacceptability determinations, and re-evaluation of unacceptability determinations.

It is anticipated that , the Implementing Party will be required to obtain the EPA's certification that a proposed Disposal Facility is operating in compliance with CERCLA OSR requirements before shipping any hazardous substances, pollutants, or contaminants to it. The Implementing Party will contact the EPA Region 6 regional off-Site contact (ROC) to inquire about the status of each selected Disposal Facility. Confirmation that a Disposal Facility is able to receive CERCLA waste will be documented in a correspondence sent to the EPA Remedial Project Manager (RPM) prior to shipping material to the Disposal Facility.

4. Waste Classification Procedures

The Northern Impoundment 90% RD describes the waste determination process for Impacted Material (as defined below). Prior to off-Site disposal, the plan to be developed by the RC will identify in more detail waste classification procedures and the disposal options with respect to the different waste streams to be managed during the Northern Impoundment RA. The different waste categories and procedures that may be included are described below.

4.1 Waste Stream Categories and Disposal Options

It is anticipated that the following waste categories may be generated during the Northern Impoundment RA:

- ***Impacted Material*** - Impacted material that is excavated (other than Potentially-Impacted Remediation Debris, described below) will be solidified, as necessary, and transported to an off-Site Disposal Facility. The excavated materials will be characterized as described in the Northern Impoundment 90% RD.
- ***Potentially Impacted Remediation Debris*** - Excavated Materials could include buried debris that, because of its contact with other materials, may have to be characterized for disposal. This also may include tarps, plastic,

ED_014247_00001303-00056

wood, discarded treatment filters, discarded personal protective equipment (PPE), and other spent construction materials that may have come into contact with excavated materials.

- ***Non-Impacted Remediation Debris*** - Non-impacted remediation debris could include any cleared vegetation, Site preparation debris, and/or other debris encountered at the surface. These materials may be managed as Class 3 non-hazardous waste under the regulations governing classification of non-hazardous industrial solid waste in Texas (30 Texas Administrative Code [TAC] §335.505, §335.506, and §335.508), or can be managed with the excavated materials as Class 2 non-hazardous waste.
- ***Spent Media from Water Treatment System*** - The spent carbon and other spent media from any wastewater treatment system may be transferred to a vendor for recycling or regeneration. If the spent carbon or other spent media cannot be recycled/regenerated for other uses, the material would be characterized and transported off-Site for disposal. The media will need to be characterized at the time it is generated, but is expected to be a Class 2 non-hazardous waste.
- ***General Trash and Sanitary Sewage*** - General trash and sanitary sewage will need to be handled through service companies that specialize and are licensed for these activities or through some other means adopted by the RC.

The applicable waste classifications will be updated during the Northern Impoundment RA.

4.2 Waste Sampling and Classification

The plan developed by the RC will define characterization procedures to be used to profile Waste. Excavated materials (other than those classified as Potentially Impacted Remediation Debris) will be further characterized utilizing the guidance provided in Chapter Nine "Sampling Plan" of the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 1986) and in *RCRA Waste Sampling Draft Technical Guidance* (EPA, 2002) during the Northern Impoundment RA. The applicable sampling and analytical methods are addressed in the FSP and in the QAPP.

5. On-Site Management and Loading

The plan to be developed by the RC will identify procedures for on-Site management of the Impacted Material and other Wastes and their transportation off-Site for disposal. The RC's plan is expected to address the elements below.

5.1 Transportation Truck/Container Requirements

Trucks, such as 20-ton end-dump trucks, or roll-off containers that will be loaded onto trucks are expected to be used to transport materials off-Site for disposal. The RC's plan will include requirements for inspection of trucks and containers used for this purpose.

5.2 Truck Staging and Loading Requirements

5.2.1 Lining Trucks and Securing Loads

The trucks beds and containers will be required to have a liner. Procedures will be required to address any free liquids observed after loading, such as the addition of solidification agents. Tarps or other coverings will be required to be placed over the loads and secured prior to trucks leaving the Northern Impoundment.

5.2.2 Control and Mitigation of Tracking Waste Beyond Work Areas

Procedures will be established to prevent any tracking of waste or mud beyond the limits of the Northern Impoundment. This may include an inspection/cleaning station at a location where all trucks are required to pass before leaving the loading area, at which trucks will be inspected and if necessary, cleaned. Cleaning techniques may include dry or wet decontamination methods.

6. Transportation

The plan to be developed by the RC will be required to address safety procedures to be followed to control access and egress to the work site by vehicles, including signage and the use of flaggers, if appropriate. A preliminary map showing the route from the Northern Impoundment to Interstate Highway 10 (I-10) is also provided as Figure 1. It is anticipated that the RC will put in place a transportation plan with each Transporter that will confirm the truck routes to the selected Disposal Facility, and describe the safety procedures that will be employed to protect the public. The plan developed by the RC would include measures for communicating with neighboring businesses regarding the timing and volume of track traffic leaving the work site, and all required coordination with the Texas Department of Transportation (TxDOT) and if applicable, Harris County regarding permitting, signage, and the timing and volume of truck traffic.

7. Document and Reporting

The plan to be developed by the RC will address documentation requirements related to the management of the Wastes, and may include the elements identified below.

7.1 Waste Profiles

Waste profiles will be developed and maintained on-Site by the RC for the different waste types listed in Section 4.0 and for the different Disposal Facilities designated to receive the waste. Profiles will also be developed for any additional waste streams that are identified during the Northern Impoundment RA. The waste profiles will describe the waste and provide the Disposal Facility with the information it needs to ensure the waste can be managed at its facility under that profile. Waste profiles should also include waste codes and other information consistent with RCRA (40 CFR Parts 261and 268) and TAC Chapter 335, Subchapter R. Copies of the profiles will be maintained on-Site and any changes to a profile will require the approval by both the Generator and the Disposal Facility, after which the profile will be updated to reflect the approved changes.

7.2 Manifests

If any hazardous waste as defined in 40 CFR Part 261, is generated during the Northern Impoundment RA, it will be managed and disposed of in accordance with RCRA regulations. Most Disposal Facilities have a non-hazardous waste manifest or shipping document to track waste custody, quantities (wet tons), and to document that the waste was received and disposed of at the facility. The quantity and type of waste will be logged and tracked during the Northern Impoundment RA utilizing whatever mechanism is required by the Disposal Facility.

7.3 Waste Reporting

The plan developed by the RC will be required to track information about Impacted Material and Wastes generated and shipped off-Site as part of the Northern Impoundment RA. In addition, the plan developed by the RC will address

ED_014247_00001303-00058

any required regulatory filings, including those under 30 TAC §335.9(a)(2). The waste tracking for each load transported off-Site may include:

- Transporter Name.
- Date of Shipment.
- Load No. - Internal Sequential Load number.
- Truck No. - Number that uniquely identifies the truck (such as the license number).
- Manifest Tracking Number - preprinted number on waste manifest.
- Waste Type - Either Waste Profile Number or other unique waste identifier.
- Disposal Facility.
- Quantity - Typically weight, but some waste may be tracked as volume.
- Date Received at Disposal Facility.

8. References

- EPA, 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Updates I to V. SW-846. NTIS Publication No. PB97-156111 or GPO Publication No. 955-001-00000-1. Office of Solid Waste. September 1986 (with all subsequent revisions).
- EPA, 2002. RCRA Waste Sampling Draft Technical Guidance - Planning, Implementation, and Assessment. EPA530-D-02-002. Office of Solid Waste. August 2002.
- EPA, 2018. Administrative Settlement Agreement and Order on Consent for Remedial Design. U.S. EPA Region 6, CERCLA Docket. No. 06-02-18. In the matter of: San Jacinto Waste Pits Superfund Site, Harris County, Texas. International Paper Company and McGinnes Industrial Maintenance Corporation, Respondents. April 2018.

Source: Google Earth Imagery: 12/1/2019

0 175 350
Feet

Coordinate System:
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS
PRE-FINAL 90% REMEDIAL DESIGN – NORTHERN IMPOUNDMENT
TRANSPORTATION AND OFFSITE DISPOSAL PLAN

TRANSPORTATION ROUTES

11215702
Dec 10, 2021

FIGURE 1

GIS File: \\ghdnet\ghd\US\Baton Rouge\Projects\562\11215131\GIS\Maps\Deliverables\MISC001\11215131_202007_MISC001_GIS004.mxd

GHD

GHD.com

→ The Power of Commitment

Monitored Natural Recovery Plan (Operations & Maintenance [O&M]) Plan)

Attachment 9 - Monitored Natural Recovery Plan - Sand Separation Area

Provided as Part of Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site Harris County, Texas

International Paper Company
McGinnes Industrial Maintenance Corporation

January 17, 2022

→ The Power of Commitment

Contents

1.	**Introduction**		**1**
	1.1	Background	1
	1.2	Purpose	1
	1.3	Relationship to Supporting Plans	1
2.	**Roles and Responsibilities**		**1**
3.	**Regulatory Framework**		**2**
4.	**Monitored Natural Recovery**		**2**
	4.1	Overview	2
	4.2	Physical Processes	2
	4.3	Chemical Processes	2
	4.4	Biological Processes	3
5.	**Considerations in Developing the Monitoring Program**		**3**
	5.1	Record of Decision	3
	5.2	Remedial Investigation	3
	5.3	Second Phase Pre-Design Investigation	4
	5.4	Case Studies	4
	5.5	Chemical Properties of Dioxins and Furans	5
	5.6	Receptors at Risk	5
	5.7	Source Control	5
	5.8	Potential for Disturbance and Perturbation	5
6.	**Monitoring Program**		**6**
	6.1	Sampling Locations and Depth Intervals	6
	6.2	Parameters	6
	6.3	Sampling Frequency	6
	6.4	Data Evaluation	6
	6.5	Decision Rule	7
	6.6	Sampling Duration	7
7.	**Adaptive Management**		**7**
8.	**Reporting**		**8**
9.	**References**		**8**

ED_014247_00001303-00064

Acronyms

AOC	Administrative Settlement Agreement and Order on Consent
BAZ	Biologically Active Zone
BERA	Baseline Ecological Risk Assessment
cm	Centimeters
COC	Contaminant of Concern
^{137}Cs	Cesium-137
DF,M	Dioxins/Furans, Mammals
DOD	Department of Defense
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ESTCP	Environmental Security Technology Certification Program
f_{oc}	Fraction Organic Carbon
GHD	GHD Services Inc.
K_d	Adsorption-Desorption Distribution Coefficient
kg	Kilogram
K_{oc}	Organic Carbon-Water Partition Coefficient
IPC	International Paper Company
MIMC	McGinnes Industrial Maintenance Corporation
MNR	Monitored Natural Recovery
ng	Nanogram
O&M	Operations and Maintenance
OMMP	Operations, Maintenance, and Monitoring Plan
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbons
^{210}Pb	Lead-210
PCL	Protective Concentration Level
PDI-2	Second Phase Pre-Design Investigation
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SOW	Statement of Work
SSA	Sand Separation Area
TCDD	2,3,7,8-Tetrachlorodibenzo-p-Dioxin
TEF	Toxicity Equivalency Factor
TEQ	Toxic Equivalents
TOC	Total Organic Carbon
UCL	Upper Confidence Limit
UTL	Upper Trophic Level

ED_014247_00001303-00065

1. Introduction

This Monitored Natural Recovery Plan (MNR Plan) is for the Sand Separation Area (SSA) of the San Jacinto River Waste Pits Superfund Site in Harris County, Texas (Site). The MNR Plan was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents). This MNR Plan was prepared pursuant to the requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design (AOC), Docket No. 06-02-18, with an effective date of April 11, 2018 (United States Environmental Protection Agency [EPA], 2018).

1.1 Background

The Record of Decision (ROD) issued by the EPA, Region 6 in October 2017 identified Monitored Natural Recovery (MNR) as the remedy for sediment in the SSA (Selected Remedy). EPA selected MNR as a remedy for the SSA that would protect the aquatic environment based on the relatively low concentrations of dioxins and furans in sediment in the SSA, low potential for risk to human and ecological receptors, and evidence of net deposition of sediment. The AOC includes a Statement of Work (SOW), which requires that an Operations and Maintenance Plan (O&M Plan) be provided as part of the Remedial Design (RD) for the Northern Impoundment. This MNR Plan serves as the O&M Plan for the SSA.

1.2 Purpose

The purpose of this MNR Plan is to discuss the technical basis of MNR; identify the parameters to be monitored, the number and locations at which data are to be collected, and the frequency and duration of monitoring; describe the methods for data evaluation; and define the decision rule for evaluating the effectiveness of MNR.

1.3 Relationship to Supporting Plans

Supporting plans relevant to this MNR Plan are the Emergency Response Plan (Attachment 2), Field Sampling Plan (Attachment 3), Quality Assurance Project Plan (Attachment 4), Site-Wide Monitoring Plan (Attachment 5), and Institutional Controls Implementation and Assurance Plan (Attachment 8).

2. Roles and Responsibilities

Personnel responsible for implementation of the MNR Plan include the following:

- ***Project Manager:*** To be determined. The Project Manager will be responsible for the overall execution of the MNR program.
- ***Project Administrator:*** To be determined. The Project Administrator will be responsible for management and coordination of activities identified in the MNR Plan.
- ***MNR Lead:*** To be determined. The MNR Lead will be responsible for ensuring the monitoring program is implemented in accordance with the MNR Plan, review of data, senior technical review of technical memoranda and reports, and technical guidance throughout the MNR program.
- ***Project Scientist:*** To be determined. The Project Scientist will be responsible for evaluation of data, preparation of technical memoranda and reports, and assisting the MNR Lead.
- ***Field Lead:*** To be determined. The Field Lead will be responsible for scheduling and implementing sampling activities.

ED_014247_00001303-00066

- ***Project Chemist:*** To be determined. The Project Chemist will be responsible for Quality Assurance/Quality Control (QA/QC) and data validation.
- ***Database Manager:*** To be determined. The Database Manager will be responsible for entering baseline data and data collected throughout the monitoring program into a database and managing the database.

3. Regulatory Framework

Currently, there are no regulations specific to MNR or which establish performance criteria for MNR. There are, however, guidance documents that provide a framework for developing MNR plans. In preparing this MNR Plan, the following guidance documents were consulted:

- Environmental Security Technology Certification Program (ESTCP). 2009. Technical Guide. Monitored Natural Recovery at Contaminated Sediment Sites. ESTCP Project ER-0622. May 2009.
- EPA. 2002. Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites. OSWER Directive 9285.6-08. February 12, 2002.
- EPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012. OSWER 9355.0-85. December 2005.

4. Monitored Natural Recovery

4.1 Overview

MNR occurs through physical, chemical, and biological processes that transform, immobilize, isolate, and/or remove contaminants in sediment until they no longer pose risk to human and/or ecological receptors. Reduction or management of risk is achieved through a decrease in the concentration of contaminants, reduction in bioavailability, elimination of a complete exposure pathway, and/or reduction in toxicity.

4.2 Physical Processes

Deposition of sediment from uncontaminated sources is the primary physical process contributing to MNR. The highest potential for risk occurs in the biologically active zone (BAZ), generally the upper 15 centimeters (cm) of the sediment profile, where benthic organisms can be exposed. In addition to risk posed by direct contact, dioxins and furans have a high potential to bioaccumulate in fish and shellfish, which can be consumed by humans and upper trophic level (UTL) ecological receptors. Deposition of uncontaminated sediment creates a new BAZ, which isolates benthic organisms and other receptors from contaminants of concern. (COCs). Deposition is expected to be the primary process for MNR for the SSA.

Dispersion is another physical process that contributes to MNR. Dispersion occurs when contaminated sediment is eroded and transported downstream. Dispersion is expected to be a minor MNR process in the SSA.

4.3 Chemical Processes

For dioxins and furans, adsorption is the primary chemical process of MNR. Adsorption is the partitioning of the dissolved form of a contaminant onto the surface of a solid phase (i.e., sediment particle). Adsorption reduces the bioavailability, and thus, toxicity by removing hydrophobic contaminants from pore water, the exposure medium for benthic organisms. Adsorption is a function of the chemical properties of the contaminant and fraction of organic carbon (f_{oc}) in sediment. The contaminant-specific adsorption-desorption distribution coefficient (K_d) is the ratio of the

ED_014247_00001303-00067

concentration of the contaminant adsorbed to sediment to the concentration dissolved in pore water at equilibrium. For organic compounds, K_d is normalized for f_{oc} to produce the organic carbon-water partition coefficient (K_{oc}). Given the high hydrophobicity of dioxins and furans, adsorption is expected to be a significant contributing process of MNR to reduce bioavailability in the SSA.

Persistent organic compounds, such as dioxins and furans, are stable in the environment and resistant to chemical degradation. However, some chemical transformations can potentially occur through processes such as electrophilic substitution and oxidation/reduction. Chemical transformation is not expected to be a contributing process for MNR in the SSA.

4.4 Biological Processes

Degradation of dioxins and furans through microbiological transformation can occur if the community of benthic organisms includes microorganisms that use dioxins and furans as a source of energy. If present, biological degradation to less toxic forms can occur as mineralization. In addition to the presence of an appropriate microbial community, factors that can influence biological degradation include oxygen availability, pH, and specific conductivity. Biological degradation is not expected to be a significant process for MNR in the SSA.

5. Considerations in Developing the Monitoring Program

5.1 Record of Decision

The ROD identified MNR as the Selected Remedy for the SSA. MNR, as well as the Selected Remedy for other areas of the Site, is identified as compliant with all applicable or relevant and appropriate requirements (ARARs), reducing risks within a reasonable time frame, providing for long-term reliability, and minimizing reliance on institutional controls.

The rationale for MNR as the Selected Remedy for the SSA is that, due to substantially lower concentrations of dioxins and furans in the SSA than in the Northern Impoundment and data indicating that the SSA is subject to sediment deposition, MNR is more cost-effective than excavation. The ROD identifies MNR as protective of the aquatic environment of the SSA. The clean-up level for the Northern Impoundment is 30 nanograms per kilogram (ng/kg) 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalent for mammals ($TEQ_{DF,M}$), which was selected to be protective of a youth recreational fisher.

The ROD does not specifically identify a clean-up level for the SSA. In the absence of a specific value, a clean-up level for the aquatic environment of 30 ng/kg $TEQ_{DF,M}$ will be assumed. This is the clean-up level for sediment for the Northern Impoundment, which the ROD identifies as being protective of both human and ecological receptors. Achievement of an arithmetic mean of 30 ng/kg $TEQ_{DF,M}$ for samples collected throughout the SSA will be considered to be protective.

5.2 Remedial Investigation

The Remedial Investigation (RI) presents results of chemical analysis of sediment collected from the SSA and a summary of the baseline ecological risk assessment (BERA).

Ten sediment samples were collected from Beach Area B/C, which is adjacent to the SSA. Dioxins and furans were detected in all 10 samples. The maximum concentration was 10.9 ng/kg $TEQ_{DF,M}$. The 95 percent upper confidence limit (UCL) was 6.36 ng/kg $TEQ_{DF,M}$. The 95 percent UCL, which is an upper estimate of the true mean, was the exposure point concentration (EPC) for the risk assessments and development of protective concentration levels

ED_014247_00001303-00068

(PCLs). Both the maximum and 95 percent UCL concentrations for the SSA are well below the clean-up level of 30 ng/kg $TEQ_{DF,M}$.

The BERA evaluated risk to benthic invertebrates (mollusks and clams), fish, reptiles, birds, and mammals. The assessment endpoints for the BERA were those protective of ecological populations. The mean $TEQ_{DF,M}$ for the area within EPA's Preliminary Site Perimeter was reported as 12.5 ng/kg $TEQ_{DF,M}$. Although concentrations of $TEQ_{DF,M}$ at some locations outside of the Northern Impoundment exceeded 30 ng/kg $TEQ_{DF,M}$, the BERA concluded that, on a Site-wide basis, baseline concentrations of $TEQ_{DF,M}$ in sediment were protective of populations of all receptor groups.

5.3 Second Phase Pre-Design Investigation

Sampling of sediment in the SSA to establish baseline conditions was conducted in 2019 as part of the Second Phase Pre-Design Investigation (PDI-2). Data specific to establishing a baseline for MNR consisted of concentrations of dioxins and furans, cesium-137 (^{137}Cs), and lead-210 (^{210}Pb) at nine sample locations.

Sediment for analysis of dioxins and furans was collected at depth intervals of 0-30 cm (0-12 inches), 30 to 60 cm (12-24 inches), 60 to 120 cm (24-48 inches), and 120 to 180 cm (48 to 72 inches) below the sediment/surface water interface. Samples were analyzed for 17 dioxins and furans and percent solids. Toxic equivalents were calculated using toxicity equivalency factors (TEF) for mammalian receptors ($TEQ_{DF,M}$).

Samples for analysis of ^{137}Cs and ^{210}Pb were collected at depth intervals of 2.5 cm from the sediment/surface water interface to a depth of 82.5 cm. Eleven intervals were sampled. ^{137}Cs was released into the environment as a result of atmospheric testing of nuclear devices beginning in 1954 with a peak in 1963. Because natural occurrence is extremely rare and its presence can be related to a specific period of time, ^{137}Cs is useful in dating sediments. ^{210}Pb is naturally occurring and radioactivity of ^{210}Pb is used to estimate relative time and rates of sediment deposition.

Radioactivity of ^{137}Cs was below detection limits at all depths at all sample locations, which suggests that sediment in the depth intervals sampled (82.5 cm) has been deposited since the mid-1960s. Accumulation of 82.5 cm of sediment over the period from 1963 to 2019 (56 years) indicates an overall deposition rate of 1.5 cm per year (cm/year). Radioactivity of ^{210}Pb indicates that deposition is occurring in areas of the SSA away from the shore, whereas little, if any, deposition is occurring along the shoreline. Estimated deposition rates range from 0.77 cm/year to 3.5 cm/year. Radioactivity of ^{210}Pb suggests that some areas may be erosional rather than depositional.

Data for $TEQ_{DF,M}$ indicate that, with the exception of one near shore sample location, concentrations of $TEQ_{DF,M}$ are below the clean-up level of 30 ng/kg $TEQ_{DF,M}$ at depth intervals at which exposure pathways are complete (0 to 30 cm). The near shore location with concentrations of $TEQ_{DF,M}$ higher than 30 ng/kg $TEQ_{DF,M}$ does not appear to be a depositional area. However, mean $TEQ_{DF,M}$ concentrations for the 0 to 30 cm and 30 to 60 depth intervals are 22.9 ng/kg $TEQ_{DF,M}$ and 20.6 ng/kg $TEQ_{DF,M}$, respectively. As exposure of ecological receptors in aquatic environments is primarily in the upper 15 cm (BAZ), erosion is not expected to result in EPCs that pose risk to human and ecological receptors.

5.4 Case Studies

The United States Department of Defense (DOD), ESTCP funded and published a technical guide on MNR at contaminated sediment sites (ESTCP, 2009). In addition to providing guidance considered in developing this MNR Plan, the publication presents case studies for 13 sites throughout the United States where MNR was the Selected Remedy for at least some areas of the Site. Of the 13 case studies, the results of MNR were mixed for only one Site in South Carolina. The case studies for the other 12 sites indicated that MNR has been effective.

One of the 13 case studies is the Lacava Bay Superfund Site (Lacava Bay) in Point Comfort, Texas. Physical isolation (i.e., deposition) is identified as the primary process of MNR. Modeling identified deposition rates of 0.30 to 2.0 cm/year in the areas of MNR. In comparison, data collected for PDI-2 identified sedimentation rates of 0.77 cm/year to 3.5 cm/year for the SSA, with an overall deposition rate of 1.5 cm/year. The deposition rates for the SSA are within, and for some locations, higher than the deposition rates for Lacava Bay. MNR was determined to be effective at Lavaca Bay.

ED_014247_00001303-00069

The Operations, Maintenance, and Monitoring Plan (OMMP) for Lavaca Bay stated that monitoring could be discontinued if remedial levels for mercury and polycyclic aromatic hydrocarbons (PAHs) were achieved for two consecutive years. This MNR Plan includes the same provision. Monitoring of the SSA will be discontinued if the mean concentration of samples collected in the SSA is below 30 ng/kg TEQ for two consecutive years after submission of the Remedial Action Completion Report for the Northern Impoundment. Current data suggest that monitoring could be discontinued after two monitoring events. The maximum concentration of 10.9 ng/kg $TEQ_{DF,M}$ for Beach Area B/C reported in the RI and the mean concentration of 22.9 ng/kg $TEQ_{DF,M}$ for the samples collected during PDI-2, which characterizes baseline, are both below 30 ng/kg $TEQ_{DF,M}$.

5.5 Chemical Properties of Dioxins and Furans

Of the processes of MNR discussed in Section 4, physical deposition and dispersal and chemical absorption are expected to be the primary processes in the SSA. Chemical and biological degradation are not expected to be significant processes of MNR.

5.6 Receptors at Risk

The RI included baseline human health and ecological risk assessments. Both risk assessments concluded that, excluding the Northern Impoundment, Site-wide concentrations of dioxins and furans in sediment pose negligible risk to human health and the aquatic environment. Human receptors evaluated included recreational fishers, subsistence fishers, and recreational visitors. Ecological receptors evaluated included benthic invertebrate populations and communities and populations of benthic omnivorous fish, benthic insectivorous fish, benthic piscivorous fish, wading birds, diving birds, mammals, and reptiles. MNR for the SSA is the Selected Remedy for protection of the aquatic environment. Because risk in the SSA is negligible for all groups of ecological receptors, monitoring of dioxins and furans in tissue is not necessary. If concentrations of dioxins and furans in sediment do not exceed the clean-up level of 30 ng/kg $TEQ_{DF,M}$, concentrations in tissue will also remain below protective concentrations.

5.7 Source Control

The presence of dioxins and furans in sediment of the SSA addressed by the Selected Remedy is associated with historical sand mining and dredging activities, conducted by Mega Sand and entities associated with the adjacent property (which is now owned by Houston Fleeting Services, LLC). Those activities ended approximately 20 years ago and no longer act as a source of dioxins and furans in sediment of the SSA. The Selected Remedy for the Site includes excavation and off-Site disposal of waste containing dioxins and furans from the Northern Impoundment in and adjacent to the San Jacinto River and institutional controls to prevent disturbance of remediated areas. Any dioxins and furans associated with those areas will be eliminated as potential sources of dioxins and furans in the SSA. Therefore, MNR is expected to effectively maintain concentrations of dioxins and furans in the SSA below concentrations protective of human health and the aquatic environment. It is recognized, however, that dioxins and furans may be present in the San Jacinto River and/or adjacent upland areas from background and sources other than those areas that are to be remediated.

5.8 Potential for Disturbance and Perturbation

Propeller wash from boat traffic in the San Jacinto River and in the vicinity of the SSA could potentially disturb sediments during the monitoring period. Hurricanes and high-energy storm events are natural events that could perturb sediment of SSA. These anthropogenic and natural sources of disturbances and perturbation could deposit sediment contaminated with dioxins and furans from off-Site sources and/or scour surface sediment to depths that expose deeper sediment with elevated concentrations of dioxins and furans. These types of events will be considered in evaluating data collected during the monitoring period.

ED_014247_00001303-00070

6. Monitoring Program

6.1 Sampling Locations and Depth Intervals

Sediment samples will be collected at the nine locations (polygons) identified on Figure 6-1. These are the same locations sampled in 2019 during PDI-2. Samples will be collected at four depth intervals: 0 to 15 cm, 15 to 30 cm, 30 to 45 cm, and 45 to 60 cm below the sediment/surface water interface.

The 0 to 15 cm interval represents the primary BAZ where benthic organisms are consumed by fish, UTL ecological receptors, and human consumers of aquatic biota can bioaccumulate dioxins and furans. Biological activity potentially occurs in the 15 to 30 cm interval, as well. Sampling at 30 to 45 cm and 45 to 60 cm is proposed to account for disturbances and perturbances that could expose deeper sediments in the SSA.

For each of the nine polygons, samples will be collected at each depth interval at five locations within the boundaries of the polygon and composited into a single sample for analysis. Composite samples are proposed as they will provide an EPC more representative of the polygon than a single discrete sample.

6.2 Parameters

Samples will be analyzed for 17 dioxins and furans, total organic carbon (TOC), percent solids, and grain size distribution. For each sample, $TEQ_{DF,M}$ will be calculated. As dioxins and furans are highly hydrophobic and preferentially adsorb to organic matter, TOC and percent solids will be used to estimate bioavailability. Grain size distribution will provide information on changes in sediment characteristics indicative of deposition or erosion.

Analysis of ^{137}Cs and ^{210}Pb is not proposed. ^{137}Cs was not detected during the PDI-2 sampling event, which suggests that sediment in the SSA at the depths sampled has been deposited since the mid-1960s. Additional analysis of ^{137}Cs is likely to produce the same result. Radioactivity of ^{210}Pb for PDI-2 samples was useful in documenting that deposition is occurring in a major portion of the SSA. With one exception, concentrations of $TEQ_{DF,M}$ in areas where deposition is not occurring are below concentrations protective of human health and the aquatic environment. Because concentrations of $TEQ_{DF,M}$ in the upper depth intervals are currently protective of human and ecological receptors, with the exception of one near shore sample location, the focus of monitoring MNR is documenting that concentrations of $TEQ_{DF,M}$ remain below protection concentrations. Collection of additional data to monitor deposition rates is not necessary at this time.

6.3 Sampling Frequency

Sampling conducted in 2019 during PDI-2 established baseline for the SSA. Two sampling events following submission of the Remedial Action Completion Report for the Northern Impoundment are proposed. The first event will be conducted one year after submission of the Remedial Action Completion Report for the Northern Impoundment and the second event the following year. This will allow time for recovery of the SSA from potential effects of the Remedial Action (RA) for the Northern Impoundment on the parameters monitored. The second event will be conducted the following year.

6.4 Data Evaluation

For each monitoring event, the arithmetic mean of the nine composite samples will be calculated for each of the four depth intervals. The mean $TEQ_{DF,M}$ from each depth interval will be compared to the clean-up level of 30 ng/kg $TEQ_{DF,M}$, which the ROD identified as protective of both human health and the aquatic environment. Concentrations will also be carbon-normalized to assess bioavailability.

As discussed in Section 6.1, the 0 to 15 cm depth interval is the primary BAZ, whereas the 15 to 30 cm interval potentially supports ecological receptors. Although the RI and PDI-2 indicated that the majority of the SSA is

ED_014247_00001303-00071

depositional, the 30 to 45 cm and 45 to 60 cm intervals are sampled to represent EPCs in the event that significant erosion was to occur.

Data on grain size distribution for the two post-remediation monitoring events will be evaluated to identify changes indicative of deposition or erosion.

6.5 Decision Rule

The decision rule for MNR is:

– Mean concentrations of dioxins and furans below 30 ng/kg $TEQ_{DF,M}$ for the 0 to 15 cm, 15 to 30 cm, 30 to 45 cm, and 45 to 60 cm depth intervals of the sediment profile of the SSA for two consecutive years following submission of the Remedial Action Completion Report for the Northern Impoundment.

Five years is recommended by ESTCP (2009) as the minimum amount of time to document long-term stability of MNR as a remedy. As discussed in Sections 5.2 and 5.3, data from the RI and PDI-2 indicate that mean $TEQ_{DF,M}$ concentrations in the SSA have been below the clean-up level of 30 ng/kg $TEQ_{DF,M}$ since 2010. With the current schedule for the Northern Impoundment RA, post-remediation monitoring is not expected to begin until approximately 2030. The two post-remediation monitoring events will provide over 20 years of sediment data for the SSA.

Little biological activity is expected below 30 cm of the sediment/surface water interface. Establishing 60 cm as the bottom depth for the decision rule accounts for erosion or disturbances that could expose deeper sediment.

6.6 Sampling Duration

This MNR Plan proposes two monitoring events - the first event one year after submission of the Remedial Action Completion Report for the Northern Impoundment and the second the following year. With 2010 RI data and 2019 PDI-2 identifying concentrations of $TEQ_{DF,M}$ as protective of human health and aquatic environment, four datasets spanning a minimum of 20 years (assuming Northern Impoundment remedial activities are completed by 2030) will be available to assess the effectiveness of MNR.

The decision rule for success of MNR at Lavaca Bay, which is also in EPA Region 6, was achievement of clean-up levels for two consecutive years. Consistent with the Lacava Bay decision rule, monitoring of the SSA will be discontinued if mean concentrations at all four depth intervals are below 30 ng/kg $TEQ_{DF,M}$ for the two post-remediation monitoring events. Consistent with the rationale for MNR as the Selected Remedy for the SSA, 20 plus years of mean $TEQ_{DF,M}$ concentrations below the clean-up level of 30 ng/kg $TEQ_{DF,M}$ is a reasonable time frame to rely upon to conclude that MNR has been successful in reducing risk to human health and the aquatic environment.

If the clean-up level is not achieved at all depth intervals for both post-remediation monitoring events, the MNR program will be reviewed and modified, as appropriate.

7. Adaptive Management

Adaptive management is a systematic approach to risk management that incorporates data and information gained throughout the life of a project and defines a pathway forward. Results of the two post-remediation monitoring events could potentially indicate that modifications to the monitoring program could more effectively assess the effectiveness of MNR. Based on data from the RI and PDI-2, monitoring could justifiably be discontinued after the two post-remediation events, and future monitoring with modifications would not be required. If required, modifications could include:

– Adding or deleting sample locations and/or depth intervals.

ED_014247_00001303-00072

- Employing enhanced MNR.
- Applying sequestering agents to reduce bioavailability.
- Replacing MNR with alternative remedies.

8. Reporting

Technical memoranda will be submitted to EPA upon completion of each monitoring event. The memoranda will describe the methods and present the results of the analysis for dioxins and furans, TOC, and grain size distribution. The memorandum for the second post-remediation monitoring event will provide a comprehensive evaluation of the data for the RI, PDI-2, and the two post-remediation monitoring events; assess the effectiveness of MNR; and present recommendations for discontinuing or extending monitoring.

9. References

- Environmental Security Technology Certification Program. 2009. Technical Guide. Monitored Natural Recovery at Contaminated Sediment Sites. ESTCP Project ER-0622. May 2009.
- United States Environmental Protection Agency. 2002. Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites. OSWER Directive 9285.6-08. February 12, 2002.
- United States Environmental Protection Agency. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012. OSWER 9355.0-85. December 2005.

ED_014247_00001303-00073

GHD.com

The Power of Commitment

Pre-Final 90% Remedial Design - Northern Impoundment

San Jacinto River Waste Pits Site
Harris County, Texas

International Paper Company &
McGinnes Industrial Maintenance Corporation

June 27, 2022

→ The Power of Commitment

Contents

1. Introduction 1

1.1 Background 1

1.2 Remedial Design Approach 2

1.3 Objective 4

1.4 Document Organization and Supporting Deliverables 4

2. Design Investigations 5

2.1 First Phase Pre-Design Investigation (PDI-1) 5

2.1.1 PDI-1 Drilling Methodology 6

2.1.2 PDI-1 Analytical Sampling 6

2.1.3 PDI-1 Geotechnical Sampling 7

2.1.4 PDI-1 Waste Characterization Sampling 7

2.1.5 PDI-1 Aquifer Testing 7

2.1.6 Summary of PDI-1 Results 7

2.1.6.1 PDI-1 Analytical Results 7

2.1.6.2 PDI-1 Geotechnical Results 8

2.1.6.3 PDI-1 Waste Characterization Results 8

2.1.6.4 PDI-1 Aquifer Testing Results 8

2.2 Second Phase Pre-Design Investigation (PDI-2) 8

2.2.1 Drilling Methodology 9

2.2.2 PDI-2 Analytical Sampling 10

2.2.3 PDI-2 Geotechnical Sampling 11

2.2.4 Sand Separation Area Sampling 11

2.2.5 Transducer Installation 11

2.2.6 PDI-2 Topographic, Bathymetric, and Utility Survey 11

2.2.7 Summary of PDI-2 Results 12

2.2.7.1 PDI-2 Analytical Results 12

2.2.7.2 PDI-2 Geotechnical Results 12

2.2.7.3 Transducer Results 12

2.3 Supplemental Design Investigation (SDI) 12

2.3.1 SDI Drilling Methodology 13

2.3.2 SDI Analytical Sampling 14

2.3.3 SDI Geotechnical Sampling 14

2.3.4 Waste Characterization Sampling 15

2.3.5 Supplemental Data Collection 15

2.3.5.1 Sediment and Rock Thickness 16

2.3.5.2 Surficial Sediments Geotechnical Properties 16

2.3.5.3 Water Velocity and Turbidity Measurements 16

2.3.6 Piezometer Installation 16

2.3.7 Summary of SDI Results 17

2.3.7.1 SDI Analytical Results 17

2.3.7.2 SDI Waste Characterization Sampling 17

2.3.7.3 SDI Geotechnical and Hydrogeological Sampling 18

2.3.7.4 SDI Surficial Sediments Geotechnical Properties Sampling 18

2.4 PDI and SDI Conclusions and Recommendations 18

ED_014247_00001351-00002

Contents

3. Treatability Studies **19**

3.1 2019 Treatability Study Overview 19

3.2 2019 Treatability Study Objectives 20

3.3 2019 Waste Material Treatability Testing 20

3.3.1 Treatability Testing Sample Collection 20

3.3.2 Baseline Characterization 21

3.3.3 Waste Material Treatability Results and Conclusions 21

3.3.4 Waste Characterization Conclusions 21

3.3.4.1 Listed Waste Evaluation 22

3.3.4.2 Characteristic Waste Evaluation 22

3.3.5 Solidification Testing 23

3.3.5.1 Solidification Testing Methodology 23

3.3.5.2 Solidification Results and Conclusions 23

3.4 2019 Water Treatability Testing 24

3.4.1 Water Discharge Criteria 24

3.4.1.1 Compliance with the Texas Surface Water Quality Standard - Dioxins and Furans 25

3.4.2 Contact Water Pilot Testing 25

3.4.2.1 Contact Water Creation 25

3.4.2.2 Pilot Test Overview 25

3.4.2.3 Filtration Pilot Test Water Samples 26

3.4.2.4 Thermal Evaporation Pilot Test 27

3.4.3 GHD Treatability Bench-Scale Testing 28

3.4.3.1 Contact Water Filtration Testing 28

3.4.3.2 Focused Filtration Testing 28

3.4.3.3 Clarifier Underflow Solids Testing 29

3.5 2019 Armored Cap Material Treatability Testing 30

3.6 Additional Treatability Testing 30

3.6.1 Field Filtration Testing 31

3.6.1.1 Field Filtration Testing Process 31

3.6.1.2 Field Filtration Test Results 32

3.6.1.3 Field Filtration Testing Conclusions 32

3.6.2 Approach B Water Filtration Testing 32

3.6.2.1 Approach B Water Filtration Testing Process 32

3.6.2.2 Approach B Water Filtration Testing Results 33

3.6.2.3 Approach B Water Filtration Testing Conclusions 33

3.6.3 Additional WTS Treatability Testing 34

3.6.3.1 Additional WTS Treatability Testing Process 34

3.6.3.2 Additional WTS Treatability Testing Results 34

3.6.3.3 Additional WTS Treatability Testing Conclusions 35

3.7 Treatability Study Conclusions 35

4. Applicable or Relevant and Appropriate Requirements (ARARs) **36**

5. Remedial Design **36**

5.1 Remedial Design Background 37

5.2 Remedial Approach 39

ED_014247_00001351-00003

Contents

5.3 Basis of Design 46
5.3.1 Historic River Level Evaluation 46
5.3.2 Excavation Season and BMP Height 47
5.3.3 Geotechnical Conditions 47
5.3.4 Excavation Extent and BMP Alignment 48
5.4 Pre-RA Activities 50
5.4.1 Property Access 50
5.4.2 Northern Impoundment Preparation and Layout 50
5.5 BMP Wall 51
5.5.1 Structural Definitions 51
5.5.2 Material 52
5.5.3 Design Loads 52
5.5.3.1 In-Situ Soil 52
5.5.3.2 River Water 52
5.5.3.3 River Flooding 52
5.5.3.4 Scour 53
5.5.3.5 Wind 53
5.5.3.6 Barge Impact 53
5.5.4 Load Combinations 55
5.5.5 Design Criteria 56
5.5.5.1 Failure Modes 56
5.5.5.2 Safety Factors 56
5.5.5.3 Deflection 58
5.5.5.4 Corrosion Protection & Maintenance 58
5.5.6 BMP Wall Analysis 59
5.5.6.1 Cross-Section C2 60
5.5.6.2 Cross-Sections C6 and C7 60
5.5.7 Barge Impact 61
5.5.8 Summary of Results 62
5.5.9 Pile Driveability and Vibration Analysis 62
5.6 Excavation Procedures 63
5.6.1 Excavation Sequencing 63
5.6.2 Excavation Methodology 63
5.6.2.1 Cell Dewatering 63
5.6.2.2 TCRA Armored Cap Removal 63
5.6.2.3 Excavation Procedures 63
5.6.2.4 Excavation Season Production Rates 64
5.6.3 Solidification and Load-Out 64
5.6.4 Post-Excavation Confirmation Sampling 64
5.6.5 Excavation Area Restoration 65
5.7 Characterization, Loading, Transportation, and Disposal 65
5.7.1 Waste Characterization 65
5.7.2 Loading, Transportation, and Disposal 66
5.8 Water Management 67
5.8.1 WTS Basis of Design 67

ED_014247_00001351-00004

Contents

5.8.1.1 Contact Water Characterization 67
5.8.1.2 Parameters Requiring Treatment 67
5.8.1.3 Treatment Process 68
5.8.1.4 Water Volume and Storage 68
5.8.2 Treatment System Design 70
5.8.2.1 Major Equipment List and Sizing Basis 71
5.8.2.2 Water Treatment Equipment Layout 71
5.8.2.3 Specification and Equipment Data Sheet List 71
5.8.3 Operations and Maintenance Requirements 71
5.8.3.1 Consumables 71
5.8.3.2 Power 72
5.8.3.3 Labor 72
5.8.3.4 Residuals 72
5.8.4 Compliance Monitoring 73
5.9 Monitoring and Controls 73
5.9.1 Dust Control 74
5.9.2 Stormwater Pollution Prevention Plan and Controls (SWPPP) and BMPs 74
5.9.3 Odors 74
5.9.4 Turbidity Controls and Monitoring 74
5.10 Site Restoration 75
5.10.1 Removal of the BMP 75
5.10.2 TxDOT Access Road 76
5.11 Uncertainties Associated with Design and Implementation 76
5.11.1 Technical Uncertainties 76
5.11.1.1 Use of the TxDOT ROW 76
5.11.1.2 Excavation Limits 79
5.11.2 BMP 81
5.11.2.1 Water Treatment 83
5.11.3 Other Uncertainties 83
5.11.3.1 Stakeholders 83
5.11.3.2 Cost 84
6. Sand Separation Area (SSA) 84
6.1 2019 Sediment Sampling Program 84
6.1.1 SSA Analytical Sampling 85
6.1.2 SSA Isotope Sampling 85
6.1.3 SSA Investigation Results 85
6.1.3.1 SSA Analytical Results 85
6.1.3.2 SSA Isotope Results 85
6.1.4 SSA Conclusions 85
6.2 Monitored Natural Recovery 86
7. Environmental Footprint (Greener Clean-Ups) 86
8. Drawings and Specifications 87
8.1 Design Drawings 87
8.2 Technical Specifications 89

ED_014247_00001351-00005

Contents

9. Supporting Deliverables **90**

9.1 Health and Safety Plan 90

9.2 Emergency Response Plan 90

9.3 Field Sampling Plan 90

9.4 Quality Assurance Project Plan 90

9.5 Site-Wide Monitoring Plan 91

9.6 Construction Quality Assurance/Quality Control Plan 91

9.7 Institutional Controls Implementation and Assurance Plan 91

9.8 Transportation and Off-Site Disposal Plan 91

9.9 Monitored Natural Recovery Plan (Operations & Maintenance Plan) 91

9.10 Operations & Maintenance Manual 91

10. References **91**

Table index

Table 3-A Solidification Testing Parameter Matrix 23

Table 5-A 95th Percentile Velocity - Hydrodynamic Model 55

Table 5-B Safety Factors for Passive Pressures - EM 1110-2-2504 57

Table 5-C Allowable Stresses for Sheet Piles - EM 1110-2-2504 57

Table 5-D Allowable Stresses for Sheet Piles - EM 1110-2-2504 57

Table 5-E Overstrength Factor for Walers - AISC 360 58

Table 5-F Loss of Thickness due to Corrosion 59

Table 5-G Barge Impact Analysis Output 62

Table 5-H Summary of Analysis Results 62

Table 5-I Summary of Maximum Expected Contact Water Generated 69

Table 5-J Monitoring Frequencies and Sample Type 73

Table 1-1 Response to EPA Comments on 30% Remedial Design

Table 2-1 First Phase Pre-Design Investigation Analytical Results

Table 2-2 First Phase Pre-Design Investigation Waste Characterization Results

Table 2-3 Second Phase Pre-Design Investigation Analytical Results

Table 2-4 Supplemental Design Investigation Analytical Results

Table 2-5 Supplemental Design Investigation Waste Characterization Results

Table 2-6 RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary

Table 3-1 Treatability Waste Material Characterization Results

Table 3-2 Pilot Test Effluent Characterization Results

Table 3-3 Bench-Scale Contact Water Filtration Results

Table 3-4 Focused Filtration Testing Results

Table 3-5 Armored Cap Material Test Results

Table 3-6 Analytical Results from 2020 Field Filtration Testing

Table 3-7 Results from Filtrate Generated from Particle Size Analysis - Approach B Filtration Testing

Table 3-8 Constituent Concentrations throughout Treatment Process - Additional WTS Treatability Testing

ED_014247_00001351-00006

Table 4-1 ARAR Requirements
Table 5-1 Area-Based Average Concentration Calculations
Table 5-2 Rationale for Excavation Elevations
Table 5-3 Water Treatment Basis of Sizing
Table 6-1 Sand Separation Area Results

Figure index

Figure 5-A Risk of Hydraulic Heave 39
Figure 5-B BMP Alignment and Excavation Extent 40
Figure 5-C BMP Alignment and Excavation Extent 41
Figure 5-D Conceptual Project Sequencing 42
Figure 5-E Hydraulic Heave Sensitivity 44
Figure 5-F Conceptual Excavation Methodology 45
Figure 5-G Navigational Waterway - Northern Impoundment 54
Figure 5-H Typical Thickness Loss - Nucor Skyline Catalog, Ports & Marine Construction 58
Figure 5-I BMP - Limits of Cross-Sections C1 to C7 60
Figure 5-J South BMP Wall Alignment 78
Figure 5-K Comparison of Hydraulic Heave Risk 81
Figure 1-1 Vicinity Map
Figure 1-2 Northern Impoundment and Sand Separation Area
Figure 2-1 First Phase Pre-Design Investigation Boring Locations
Figure 2-2 First Phase Pre-Design Investigation Results
Figure 2-3 Second Phase Pre-Design Investigation Boring Locations
Figure 2-4 Sand Separation Area Sample Locations
Figure 2-5 Second Phase Pre-Design Investigation Results
Figure 2-6 Supplemental Design Investigation Boring Locations
Figure 2-7 Supplemental Design Investigation Results
Figure 2-8 Velocity Monitors and Ambient Turbidity Measurement Locations
Figure 2-9 RI, PDI-1, PDI-2, and SDI Results
Figure 3-1 Treatability Waste Material Sample Locations
Figure 3-2 Pilot Test Process Flow Diagram
Figure 3-3 Pilot Test Effluent Turbidity
Figure 3-4 Filtration Testing Results
Figure 3-5 Armored Cap Material Sample Locations
Figure 3-6 Flow and Differential Pressure Over Time - Field Filtration Testing
Figure 3-7 Actual Versus Expected (Calculated) TSS Values - Approach B Filtration Testing
Figure 5-1 Historical River Elevations - Sheldon Gage
Figure 5-2 Hindcasted Water Surface Elevations - Year Round
Figure 5-3 Hindcasted Water Surface Elevations - November to April

ED_014247_00001351-00007

Appendices

Appendix A	Pre-Design and Supplemental Design Investigation Supporting Documents
Appendix B	Geotechnical Engineering Report
Appendix C	Treatability Testing Supporting Documents
Appendix D	ARAR Supporting Documents
Appendix E	Use of Area-Based Average Concentration to Meet Clean-Up Level
Appendix F	Hydrodynamic Modelling Report
Appendix G	Design Drawing Package
Appendix H	Design Specifications
Appendix I	BMP Structural Design Report
Appendix J	Supporting Deliverables
Appendix K	Sand Separation Area Supporting Documents

ED_014247_00001351-00008

List of Acronyms

AASHTO	-	American Association of State Highway and Transportation Officials
ACBM	-	Articulated Concrete Block Mat
AISC	-	American Institute of Steel Construction
AMSL	-	Average Mean Sea Level
AOC	-	Administrative Settlement Agreement and Order on Consent for Remedial Design
ARAR	-	Applicable or Relevant and Appropriate Requirements
ASCE	-	American Society of Civil Engineers
ASTM	-	American Society for Testing and Materials
BBL	-	Barrel, measurement unit for barges, equivalent to 42 gallons of liquid
bgs	-	Below Ground Surface
BHHRA	-	Baseline Human Health Risk Assessment
BMP	-	Best Management Practice
^{137}Cs	-	Cesium-137
CFR	-	Code of Federal Regulations
cm	-	Centimeter
cm/s	-	Centimeters per Second
cm/year	-	Centimeters per Year
CME	-	Central Mine Equipment
COD	-	Chemical Oxygen Demand
COPC	-	Constituent of Potential Concern
CPT	-	Cone Penetrometer Test
CQA/QCP	-	Construction Quality Assurance/Quality Control Plan
CU	-	Consolidated Undrained
CWA	-	Coastal Water Authority
CY	-	Cubic Yard
D	-	Dead Load
DI	-	Deionized
DPT	-	Direct Push Technology
DU	-	Decision Unit
EM	-	Engineer Manual by United States Army Corps of Engineers
EPA	-	Environmental Protection Agency
ERP	-	Emergency Response Plan
FSP	-	Field Sampling Plan
Evoqua	-	Evoqua Water Technologies LLC
F	-	Fluid Load
FEMA	-	Federal Emergency Management Agency
FS	-	Feasibility Study
ft	-	Feet, measurement unit for length, height, or distance
ft^2	-	Square Feet
ft^3	-	Cubic Feet
ft/day	-	Feet per Day
ft/s	-	Feet per Second
F_y	-	Yield Stress
GAC	-	Granular Activated Carbon
GCV	-	Generalized Cross Validation
GHD	-	GHD Services Inc.

ED_014247_00001351-00009

GHG	-	Greenhouse Gas
gpd	-	Gallons per Day
gpm	-	Gallons per Minute
GPS	-	Global Positioning System
H	-	Lateral Earth Pressure
HASP	-	Health and Safety Plan
HCFCD	-	Harris County Flood Control District
HDPE	-	High-Density Polyethylene
I	-	Barge Impact
I-10	-	Interstate Highway-10
IBC	-	Intermediate Bulk Containers
IC	-	Institutional Control
ICIAP	-	Institutional Controls Implementation and Assurance Plan
IPC	-	International Paper Company
K_d	-	Wind Directionality
K_e	-	Ground Elevation Factor
kip	-	Kilopound
kip/ft	-	Kilopound per Foot
ksi	-	Kilopound per Square Inch
K_z	-	Velocity Pressure Exposure Coefficient
K_{zt}	-	Topographic Factor
lb	-	Pound
lb/ft^2	-	Pounds per Square Foot
lb/ft^3	-	Pounds per Cubic Foot
LC	-	Load Combination
$L_{SH,t}$	-	Rising or Falling Limb of the Hydrograph at the Sheldon Gage at Time, t
MARS	-	Multivariate Adaptive Regression Splines
MIMC	-	McGinnes Industrial Maintenance Corporation
mg/L	-	Milligrams per Liter
ML	-	Minimum Level
MNR	-	Monitored Natural Recovery
mph	-	Miles per Hour
MRI	-	Maximum Recurrence Interval
N	-	Number of Observations
N_e	-	Effective Number of Parameters
NAVD88	-	North American Vertical Datum of 1988
ng/kg	-	Nanograms per Kilogram
NTU	-	Nephelometric Turbidity Units
O&M	-	Operations and Maintenance
Pa	-	Pascal
^{210}Pb	-	Lead-210
PBR	-	Permit By Rule
PCBs	-	Polychlorinated Biphenyls
PCF	-	Pounds per Cubic Foot
PDI	-	Pre-Design Investigation
PDI-1	-	First Phase Pre-Design Investigation
PDI-2	-	Second Phase Pre-Design Investigation
PFD	-	Process Flow Diagram

ED_014247_00001351-00010

pg/L	-	Picograms per Liter
PMT	-	Pressuremeter Test
POHA	-	Port of Houston Authority
psi	-	Pounds per Square Inch
PTW	-	Principal Threat Waste
PVC	-	Polyvinyl Chloride
QAPP	-	Quality Assurance Project Plan
q_z	-	Velocity Pressure
RA	-	Remedial Action
RAO	-	Remedial Action Objective
RC	-	Remedial Contractor
RCRA	-	Resource Conservation and Recovery Act
RD	-	Remedial Design
RDWP	-	Remedial Design Work Plan
RI	-	Remedial Investigation
RI/FS	-	Remedial Investigation/Feasibility Study
ROD	-	Record of Decision
ROW	-	Right-of-Way
RPD	-	Relative Percent Difference
RSS	-	Residual Sum of Squares
SSA	-	Sand Separation Area
SDI	-	Supplemental Design Investigation
SF	-	Safety Factor
SM	-	Standard Method
SOW	-	Statement of Work
SPT	-	Standard Penetration Test
SVOC	-	Semi-volatile Organic Compound
SWMP	-	Site Wide Monitoring Plan
SWPPP	-	Stormwater Pollution Prevention Plan
TAC	-	Texas Administrative Code
TCDD	-	2,3,7,8-tetrachlorinated dibenzo-p-dioxin
TCEQ	-	Texas Commission on Environmental Quality
TCLP	-	Toxicity Characteristic Leaching Procedure
TCRA	-	Time Critical Removal Action
TDS	-	Total Dissolved Solids
$TEQ_{DF,M}$	-	TCDD Toxicity Equivalent for Mammals
TexTox	-	Texas Toxicity Screening
TOC	-	Total Organic Carbon
TODP	-	Transportation and Off-Site Disposal Plan
TSS	-	Total Suspended Solids
TSWP	-	Treatability Study Work Plan
TSWQS	-	Texas Surface Water Quality Standard
TWG	-	Technical Working Group
TxDOT	-	Texas Department of Transportation
USACE	-	United States Army Corps of Engineers
UCS	-	Unconfined Compressive Strength
USGS	-	United States Geological Survey
USCS	-	Unified Soil Classification System

UU	-	Unconsolidated Undrained
V_{100}	-	Design wind velocity with MRI of 100 years
V_{3000}	-	Design wind velocity with MRI of 3000 years
VOC	-	Volatile Organic Compound
WQBEL	-	Water Quality-Based Effluent Limitation
W	-	Wind Load
W_e	-	Wind Load, Exterior
W_i	-	Wind Load, Interior
$WSE_{SH,t}$	-	Water Surface Elevation at the Sheldon Gage at Time, t
$WSE_{SJ,t}$	-	Water Surface Elevation at the Northern Impoundment at Time, t
WTS	-	Water Treatment System
µm	-	Micron
µg/L	-	Micrograms per Liter

ED_014247_00001351-00012

1. Introduction

GHD Services Inc. (GHD), on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to herein as the Respondents), submits to the United States Environmental Protection Agency (EPA) this *Pre-Final 90% Remedial Design - Northern Impoundment* (90% RD) for the San Jacinto River Waste Pits Site in Harris County, Texas (Site). This 90% RD was prepared pursuant to the requirements of the Administrative Settlement Agreement and Order on Consent for Remedial Design (AOC), Docket No. 06-02-18, with an effective date of April 11, 2018 (EPA, 2018a). The AOC includes a Statement of Work (SOW) that provides for a Pre-Final 90% RD for the Northern Impoundment to be submitted to the EPA. The *Preliminary 30% Remedial Design - Northern Impoundment* (30% RD) was submitted on May 28, 2020 (GHD, 2020b). Comments on the 30% RD (Comments) were received on July 16, 2020 (EPA, 2020g), and have been addressed in this 90% RD.

This 90% RD is being submitted following an additional investigation of conditions at the Northern Impoundment completed subsequent to submission of the 30% RD and in light of other developments related to the RD which are described in a letter from the Respondents dated March 24, 2022, to the Administrator and Superfund Division Chief for Region 6 (March 24 Letter; IPC and MIMC, 2022a). In the March 24 Letter, the Respondents requested that the EPA pursuant to 40 Code of Federal Regulations (CFR) §300.825 consider the need for modifications to the remedy selected by the EPA for the Northern Impoundment in the Record of Decision (ROD) (EPA, 2017), in light of: (1) significant increases in the volume), lateral extent and total average depth of impacted materials; (2) significantly increased complexity, risk, duration and cost of implementing the selected remedy as a result of the increased volume and depth; (3) implementability issues with the required engineered barrier using a best management practice (referred to herein as the best management practices [("BMP")] wall); (4) an inability to meet the ROD's requirement to excavate the waste material in certain areas "in the dry" (including in the portion of the Northern Impoundment referred to as the "northwest corner") or to satisfy the ROD's requirement for "no discharges"; and (5) implementability issues and design changes necessitated by the Texas Department of Transportation (TxDOT) plans to replace and widen the Interstate Highway-10 (1-10) Bridge, which call into question fundamental assumptions underlying the RD related to access, the design of the BMP, and schedule. The March 24 Letter requested a pause in the schedule for submission of the 90% RD until such issues had been evaluated by the EPA.

In an April 15, 2022, letter (April 15 Letter; EPA, 2022b) written in response to the March 24 Letter, the EPA Region 6 Administrator stated that Respondents should proceed with the submission of this 90% RD for EPA review and comment "even if select portions of the design may later require revision." It further stated that "[t]o the extent there are uncertainties about design issues, including access, that are still unresolved in June 2022, or even the need for a partial re-design of parts of the best management practices in light of additional information, the EPA would expect these to be noted in the submittal" and that "[t]o the extent appropriate, we will evaluate the adequacy of the 90% design submittal in light of any valid issues, uncertainties, and additional information identified by Respondents and the EPA."

The Respondents are submitting this 90% RD on the basis of the April 15 Letter, and have addressed below and in particular in Section 5.11, the "issues, uncertainties, and additional information" referenced above. Respondents have in addition submitted a letter to EPA dated June 21, 2022 (IPC and MIMC, 2022b), requesting an extension with respect to the northwest corner of the Northern Impoundment. The letter proposed a meeting to take place following EPA review of this 90% RD to discuss a path forward with respect to completing the RD.

1.1 Background

The Site is located in Harris County, Texas, east of the City of Houston, between two unincorporated areas known as Channelview and Highlands. The vicinity of the Site is shown on Figure 1-1. In 1965 and 1966, pulp and paper mill waste was reportedly transported by barge from the Champion Paper, Inc. paper mill in Pasadena, Texas, and deposited in the Northern Impoundment. The Preliminary Site Perimeter established by EPA for the remedial

ED_014247_00001351-00013

investigation (RI) encompasses this impoundment and the surrounding in-water and upland areas of the San Jacinto River and is depicted on Figure 1-1. The Northern Impoundment is located immediately north of the I-10 Bridge over the San Jacinto River. An area referred to in the AOC as the Sand Separation Area (SSA; Figure 1-2) is located to the northwest of the Northern Impoundment.

The Northern Impoundment is shown on Figure 1-2. Beginning in 2010, a Time Critical Removal Action (TCRA) was implemented by the Respondents under an Administrative Order on Consent with EPA (Docket No. 06-12-10, April 2010; EPA, 2010). Construction elements of the TCRA included placement of a stabilizing geotextile barrier over the eastern side of the Northern Impoundment, construction of a low-permeability geomembrane and geotextile barrier on the western side of the Northern Impoundment, and placement of armored cap material over the entire Northern Impoundment. Additional background information regarding the Northern Impoundment is contained in the *Remedial Investigation Report* (RI Report; Integral and Anchor QEA, 2013b). In June 2019, approximately 40,000 square feet of articulated concrete block mat (ACBM) were installed along the northwestern submerged slope of the armored cap, as described in the *Northwest Slope Enhancement Completion Report*, submitted to the EPA on August 13, 2019 (Integral and Anchor QEA, 2019).

The remedy selected by the EPA for the Northern Impoundment described in the ROD (EPA, 2017) includes the following:

- Removal of a portion of the existing armored cap material installed as part of the TCRA armored cap.
- Removal of approximately 162,000 cubic yards (CY) of waste material exceeding the clean-up level of 30 nanograms per kilogram (ng/kg) 2,3,7,8-tetrachlorinated dibenzo-*p*-dioxin (TCDD) toxicity equivalent ($TEQ_{DF,M}$) that is located beneath the armored cap and its stabilization, as necessary to meet the appropriate requirements for acceptance at a permitted disposal facility.

The ROD also specifies that Institutional Controls (ICs) will be used to prevent disturbance (dredging and anchoring) in the SSA and that monitored natural recovery (MNR) will be the remedy used for the SSA.

The Remedial Action Objectives (RAOs) for the Site, as identified in the ROD, include:

RAO 1: Prevent releases of dioxins and furans above clean-up levels from the former waste impoundments to sediments and surface water of the San Jacinto River.

RAO 2: Reduce human exposure to dioxins and furans from ingestion of fish by remediating sediments to appropriate clean-up levels.

RAO 3: Reduce human exposure to dioxins and furans from direct contact with or ingestion of paper mill waste, soil, and sediment by remediating affected media to appropriate clean-up levels.

RAO 4: Reduce exposures of benthic invertebrates, birds, and mammals to paper mill waste derived dioxins and furans by remediating affected media to appropriate clean-up levels.

The potential exposure of a future young recreational fisher to dioxin and dioxin-like compounds in sediment, as detailed in the *Baseline Human Health Risk Assessment* (BHHRA; Integral and Anchor QEA, 2013a), was considered in selecting a risk-based clean-up level for the Northern Impoundment. The BHHRA assumed that the young recreational fisher could be exposed through chronic (39 days per year for 6 years) incidental ingestion and dermal contact of impacted sediment and through ingestion of fish collected in areas with impacted sediment. The risk-based clean-up level for the Northern Impoundment was calculated to be 30 ng/kg $TEQ_{DF,M}$.

1.2 Remedial Design Approach

In accordance with the AOC, the remedial design (RD) process includes the use of a Technical Working Group (TWG) to provide technical expertise in the development and evaluation of the RD plans. The TWG has considered the pre-design investigation (PDI), Supplemental Design Investigation (SDI), Treatability Study results, and Northern Impoundment RD elements presented in this document. The TWG consists of representatives from the EPA, Texas Commission on Environmental Quality (TCEQ), the United States Army Corps of Engineers (USACE), GHD, and other technical subject matter experts, as needed. TWG Meetings have been conducted a total of 25 times since the RD

ED_014247_00001351-00014

was initiated, including on April 30, 2018, May 14 to 15, 2018, May 30, 2018, June 13, 2018, May 3, 2019, December 17, 2019, January 27 to 28, 2020, February 19, 2020, March 25, 2020, April 22, 2020, July 29, 2020, November 12, 2020, December 15, 2020, February 4, 2021, March 10, 2021, April 19, 2021, June 4, 2021, August 5, 2021, August 30, 2021, October 19, 2021, November 16, 2021, December 14, 2021, March 10, 2022, March 25, 2022, and April 14, 2022.

In addition, representatives from GHD and EPA conduct weekly meetings to discuss the ongoing design progress, key technical items, and decisions associated with these items.

With the exception of Monthly Progress Reports, a summary of the deliverables associated with the RD to date are listed below:

- On June 8, 2018, the *Draft First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018a) was submitted to the EPA. The EPA provided comments and the *First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018b) was submitted to the EPA on August 24, 2018. It was approved by the EPA on September 12, 2018 (EPA, 2018b). An Addendum to the First Phase Pre-Design Investigation Work Plan (Integral and Anchor QEA, 2018d) was submitted on October 18, 2018.
- On September 10, 2018, the *Draft Remedial Design Work Plan* (RDWP, Integral and Anchor QEA, 2018c) was submitted to the EPA and outlined plans for implementing the RD activities identified in the SOW. The EPA provided comments on the Draft RDWP on October 24, 2018. The *Remedial Design Work Plan* (Integral and Anchor QEA, 2018e) was submitted to the EPA on December 24, 2018.
- On December 7, 2018, a letter was submitted to the EPA (GHD, 2018) requesting a 48-day extension of the deadline for submittal of the *Draft Second Phase Pre-Design Investigation Work Plan* to allow time for the results from the First Phase Pre-Design Investigation (PDI-1) to be evaluated and incorporated. This extension request was approved by the EPA on December 18, 2018 (EPA, 2018c), effectively extending the date for all subsequent RD submittals.
- On February 11, 2019, the *Draft Second Phase Pre-Design Investigation Work Plan* (GHD, 2019a) was submitted to the EPA. The EPA provided comments to the work plan on April 18, 2019 (EPA, 2019a). On June 3, 2019, the *Final Second Phase Pre-Design Investigation Work Plan* (GHD, 2019d) was submitted to the EPA and approved by the EPA in written correspondence dated August 8, 2019 (EPA, 2019c).
- On February 11, 2019, the *Draft Treatability Study Work Plan* (GHD, 2019b) was submitted to the EPA. The EPA provided comments to the work plan on April 18, 2019 (EPA, 2019b). On May 20, 2019, the *Final Treatability Study Work Plan,* (GHD, 2019c) was submitted to the EPA and approved in written correspondence dated August 27, 2019 (EPA, 2019d).
- On September 27, 2019, a letter was submitted to the EPA (GHD, 2019e) requesting an extension to the deadline for both the 30% RD for the Northern and Southern Impoundments in response to a *force majeure* event caused by Tropical Storm Imelda, which caused significant flooding at the Northern Impoundment and the surrounding area beginning on September 17, 2019, and delayed the completion of field work related to the Second Phase PDI (PDI-2) from September 17 to October 7, 2019. In a letter dated October 30, 2019 (EPA, 2019f), the EPA approved a 24-day delay due to the *force majeure* event and an extension to the deadlines for submittal of the 30% RD for both the Northern Impoundment and the Southern Impoundment.
- On May 28, 2020, the 30% RD was submitted to the EPA. The EPA provided Comments on July 16, 2020 (EPA, 2020f). Responses to these Comments are summarized in Table 1-1 and the Comments have been addressed throughout this 90% RD.
- On August 21, 2020, a letter was submitted to the EPA (GHD, 2020e) requesting a 160-day extension of the November 13, 2020, deadline for submitting the 90% RD to April 22, 2021, to allow time to determine if significant constructability concerns raised in the 30% RD could be resolved and to obtain additional information about plans being developed by other agencies. The extension was approved by the EPA in a letter dated September 10, 2020 (EPA, 2020g).
- On February 3, 2021, a letter was submitted to the EPA (GHD, 2021a) requesting a 270-day extension of the deadline for the 90% RD to January 17, 2022, to allow time to conduct the SDI to better delineate the extent of

ED_014247_00001351-00015

the impacted material for removal and to better understand geotechnical conditions to support the design. The extension was approved by the EPA in a letter dated March 29, 2021 (EPA, 2021a).

- On February 19, 2021, the *Supplemental Design Investigation Sampling Plan* (SDI Work Plan) (GHD, 2021b) was submitted to the EPA. EPA provided comments on the SDI Work Plan on March 29, 2021 (EPA, 2021b). On May 21, 2021, the *Supplemental Design Investigation Sampling Plan - Rev. 1* (Revised SDI Work Plan) (GHD, 2021c) was submitted to the EPA and approved by the EPA in written correspondence dated June 4, 2021 (EPA, 2021c).
- On October 1, 2021, a letter was submitted to the EPA (GHD, 2021f) requesting a 160-day extension of the deadline for the 90% RD to June 26, 2022, to allow for receipt, evaluation, and incorporation of the analytical, geotechnical, and supporting data from the SDI. As requested in an e-mail from the EPA dated October 28, 2021, a Request for Northern Impoundment Schedule Extension - Addendum (GHD, 2021h) was submitted on November 9, 2021, that included a revised schedule that provided for the staged submittal of all RD components required by the SOW to be included in the 90% RD. This extension request was approved by the EPA in a letter dated January 12, 2022 (EPA, 2022a). A further extension request specifically with respect to the northwest corner was submitted to the EPA on June 21, 2022 (IPC and MIMC, 2022b).

1.3 Objective

The objective of this 90% RD is to present a summary, consistent with the SOW, of the RD for the Northern Impoundment, with the exception of that portion of the Northern Impoundment, commonly referred to as the northwest corner. It also identifies "issues, uncertainties and additional information" related to the RD and the selected remedy, per the April 15 Letter.

This 90% RD includes a summary of the results from the PDI-1, PDI-2, SDI, and Treatability Studies. This 90% RD also includes a description of the primary design elements for the remedy selected in the ROD for the Northern Impoundment, including those related to the design and installation of the BMP wall, waste material removal methodology, and water treatment, but not including detailed design elements with respect to waste material removal methodology and water treatment for the northwest corner. Associated design drawings, specifications, and supplemental plans are also included in this 90% RD.

1.4 Document Organization and Supporting Deliverables

The remaining sections of this 90% RD are organized as follows:

- ***Section 2*** includes descriptions of the phased PDI and SDI for the Northern Impoundment that were performed and a summary of the results and conclusions from these events.
- ***Section 3*** includes a description of Treatability Studies performed for the Northern Impoundment and results.
- ***Section 4*** addresses the Applicable or Relevant and Appropriate Requirements (ARARs) that may be applicable to the Northern Impoundment remedial action (RA) work.
- ***Section 5*** details the design criteria assumptions that are the basis for the current BMP wall design, waste material removal and solidification methodology, transportation and disposal, and water treatment process elements of the Northern Impoundment RD.
- ***Section 6*** includes a description of the investigation activities conducted in the SSA during PDI-2 and the implications of the results of that investigation for MNR.
- ***Section 7*** includes a description of how the RA for the Northern Impoundment may be implemented in a manner that minimizes environmental impacts in accordance with the EPA's *Principles for Greener Clean-Ups* (EPA, 2009).
- ***Section 8*** includes a list of the drawings and associated technical specifications developed to date for this 90% RD.

ED_014247_00001351-00016

- ***Section 9*** includes descriptions of the supporting deliverables identified in the SOW: Health and Safety Plan (HASP), Emergency Response Plan (ERP), Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), Site Wide Monitoring Plan (SWMP), Construction Quality Assurance/Quality Control Plan (CQA/QCP), Institutional Controls Implementation and Assurance Plan (ICIAP), Transportation and Off-Site Disposal Plan (TODP), and Monitored Natural Recovery (MNR) Plan.
- ***Section 10*** includes references to cited reports, correspondences and other documents.

This 90% RD includes supporting figures and tables that are referenced throughout the document. This 90% RD also includes the following appendices:

- **Appendix A** - PDI and SDI Supporting Documents (including aquifer test results for the PDI-1, and analytical laboratory reports, data validation reports, and a photographic log for PDI-1, PDI-2, and SDI).
- **Appendix B** - Geotechnical Engineering Report, including a SDI Geotechnical Data Report and the December 9, 2021 Hydraulic Heave Analysis Report (GHD, 2021i).
- **Appendix C** - Treatability Testing Supporting Documents (including water and waste material analytical laboratory reports, data validation reports, and a photographic log).
- **Appendix D** - ARAR Support Documents.
- **Appendix E** - Use of Area-Based Average Concentration to Meet Clean-Up Level.
- **Appendix F** - Hydrodynamic Modelling Report.
- **Appendix G** - Design Drawing Package.
- **Appendix H** - Design Specifications.
- **Appendix I** - BMP Structural Design Report.
- **Appendix J** - Supporting Deliverables (including HASP, ERP, FSP, QAPP, SWMP, CQA/QCP, ICIAP, TODP, and MNR Plan).
- **Appendix K** - SSA Supporting Documents (including analytical lab reports and data validation reports).

2. Design Investigations

In March 2011 and May 2012, the Respondents completed investigations at the Northern Impoundment as part of the RI. A summary and results of these investigations are included in the RI Report. The RI included installation of eight borings to total depths ranging from 7.5 to 12.5 feet (ft) below ground surface (bgs) to characterize waste material chemistry, the results of which provided the basis for the remedial alternative selected in the ROD.

The main objective of the Northern Impoundment PDI and the SDI was to delineate and refine the depth and volume of materials likely requiring removal, as well as to obtain site-specific geotechnical data to inform the design of the BMP, specified in the ROD.

The PDI for the Northern Impoundment was conducted in two phases (in 2018 and 2019) and the SDI was conducted in 2021, as described below.

2.1 First Phase Pre-Design Investigation (PDI-1)

PDI-1 activities in the Northern Impoundment were completed by Integral Consulting and Anchor QEA between November 5 and December 9, 2018, in accordance with the *First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018b), dated August 24, 2018, and approved by the EPA on September 12, 2018 (EPA, 2018b), and the *Addendum to the First Phase Pre-Design Investigation Work Plan*, dated October 18, 2018 (Integral and Anchor QEA, 2018d).

The purpose of the PDI-1 for the Northern Impoundment was to:

ED_014247_00001351-00017

- Characterize the waste material in the Northern Impoundment that contains concentrations of dioxins and furans greater than 30 ng/kg $TEQ_{DF,M}$.
- Evaluate the concentrations of dioxins and furans within the historic central berm separating the eastern and western sides of the Northern Impoundment, as well as the perimeter berm located at the southern edge of the Northern Impoundment.
- Evaluate geotechnical characteristics of the material contained within the Northern Impoundment to inform RD engineering controls.
- Assess the specific yield of the waste material in the Northern Impoundment and hydraulic conductivity and specific yield of the unconsolidated riverine deposits below the Northern Impoundment and above the Beaumont Clay formation, in order to evaluate permeability of the soils and the expected infiltration/seepage of water during excavation activities.

Northern Impoundment PDI-1 field activities included waste material sampling for chemistry, waste characterization, and geotechnical analyses at 17 boring locations (Figure 2-1). Soil borings were advanced from the surface to 18 ft bgs for dioxins and furans analysis, from the surface to 10 ft bgs for waste characterization analysis, and from the surface to the Beaumont Clay (to a maximum depth of 62 ft bgs) for geotechnical sampling and testing. Four monitoring wells were also installed and an aquifer test was conducted.

Upland soil borings were installed from November 5 to 19, 2018 at 10 locations (SJSB028 to SJSB037), at which analytical, geotechnical, and waste characterization samples were collected. Four of these borings were completed as monitoring wells to utilize for aquifer testing. Six geotechnical borings (SJGB018 to SJGB023) were installed outside the perimeter of the armored cap from November 28 to December 5, 2018. Finally, on December 9, 2018, boring SJSB038 was installed for analytical, geotechnical, and waste characterization sampling.

A photographic log documenting the PDI-1 field event is included as part of Appendix A.

2.1.1 PDI-1 Drilling Methodology

PDI-1 boring locations were placed in areas that could be accessed from either a barge secured outside the extent of the armored cap or from a land-based drilling rig.

A roto-sonic drilling rig was utilized to install the 17 geotechnical borings. Six geotechnical boring locations (SJGB018, SJGB019, SJGB020, SJGB021, SJGB022, and SJGB023) were located under water, outside the extent of the armored cap. For these locations, a barge-mounted roto-sonic drilling rig was used. A track-mounted Direct Push Technology (DPT) drilling rig was utilized for the analytical borings. All analytical borings were located on the upland portions of the Northern Impoundment. Boring SJSB038 was located in an area of the Northern Impoundment that is covered with water that fluctuates from 0 to 2 ft of water, depending upon the season and the tide. To ensure that the boring at this location could be completed with the terrestrial drilling equipment, road-base aggregate was brought in and placed to establish access to the boring location.

At locations accessible by standard terrestrial equipment, armored cap material was removed, and the geotextile and/or geomembrane liner was cut prior to drilling activities. At the conclusion of drilling, the borings were grouted to the top, the geotextile and/or geomembrane liner was repaired, and the armored cap material was replaced.

2.1.2 PDI-1 Analytical Sampling

A total of 11 borings were installed at locations in the Northern Impoundment for chemical sampling to fill in data gaps from the RI, as shown on Figure 2-1. Borings were generally installed to a depth of 18 ft bgs, with three borings (SJSB036, SJSB037, and SJSB038) installed to maximum depth of 12 to 13 ft bgs.

Discrete waste material samples were collected via DPT methodology and submitted for analysis consistent with the *First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018b), with the exception of boring location SJS038 which was sampled with the use of a 7-inch diameter sonic core method, due to low recovery with the DPT methodology. With the exception of boring locations SJSB036, SJSB037, and SJSB038, all samples were

ED_014247_00001351-00018

collected in two-foot intervals. Borings SJSB036, SJSB037, and SJSB038 were used to determine a potential contact point differentiating waste from underlying soil. Samples for these borings were collected above and below the identified waste contact point.

All samples were analyzed by ALS Laboratories for dioxins and furans using EPA approved Method 1613B. Sample data validation was completed by a third-party validation firm (EcoChem, Inc.).

2.1.3 PDI-1 Geotechnical Sampling

A total of 17 geotechnical borings were installed in the Northern Impoundment to total depths ranging from 22 to 62 ft bgs to fill data gaps from the RI and to evaluate the geotechnical properties of the soil around the perimeter of the Northern Impoundment. PDI-1 geotechnical boring locations are shown on Figure 2-1. Disturbed samples were collected from standard penetration test (SPT) split-spoon samplers and analyzed for moisture content, plasticity (Atterberg limits), specific gravity, and grain size distribution. Undisturbed samples were collected using Shelby tube samplers and analyzed for consolidated undrained (CU) triaxial shear strength, direct shear strength testing, one-dimensional consolidation testing, and bulk density. All tests were performed in a laboratory setting, with the exception of blow counts that were conducted in the field. Geotechnical samples were analyzed by GeoTesting Express.

2.1.4 PDI-1 Waste Characterization Sampling

To support waste disposal planning, three composite samples were collected for waste characterization sampling, as depicted on Figure 2-1. Samples were collected from depths of 0 to 10 ft bgs. Samples were analyzed by ALS Laboratories for toxicity characteristic leaching procedure (TCLP) parameters (EPA Method 1311 [SW-846]), ignitability (Flashpoint - SW-846 1010A), corrosivity (pH - EPA 9040), and reactivity (Reactive cyanide - SW-846 7.3.3.2 and Reactive sulfides - SW-846 9034).

2.1.5 PDI-1 Aquifer Testing

As part of PDI-1 field activities, four 4-inch diameter temporary monitoring wells (SJTW014, SJTW015, SJTW016, and SJTW017) were installed to total depths ranging from 36 to 42 ft bgs and screened from 10 to 15 ft bgs to total depth. Locations of the monitoring wells are shown on Figure 2-1. The monitoring wells were developed and utilized for an *in-situ* hydraulic aquifer test (i.e., constant rate discharge pumping tests).

Aquifer testing was conducted on each monitoring well from December 4 through December 7, 2018. Each test was run for approximately 3 hours, with a downhole transducer in the pumping well and periodic water level gauging at the other three monitoring wells being used as observation wells. Monitoring wells SJTW-015, SJTW-016, and SJTW-017 all yielded high pumping rates ranging from 16 to 26 gallons per minute (gpm). Each well had a relatively stable drawdown ranging from 7 to 11 ft from the starting water level. After each test, recovery water level readings were collected and each well displayed a relatively rapid well recovery. Only well SJTW-014, in the southeast corner, exhibited slow recovery and supported a pumping rate of 0.2 gpm.

2.1.6 Summary of PDI-1 Results

2.1.6.1 PDI-1 Analytical Results

Of the 11 borings analyzed, 5 borings (SJSB029, SJSB030, SJSB031, SJSB034, and SJSB035) had dioxin and furan concentrations below 30 ng/kg $TEQ_{DF,M}$, in all intervals as seen on Figure 2-2. These borings were located within the historic central berm separating the eastern and western sides of the Northern Impoundment, as well as the berm located at the southern edge of the Northern Impoundment. This is consistent with the understood construction of the historic impoundment whereby native soil was used to create the central and southern berms.

Six boring locations (SJSB028, SJSB032, SJSB033, SJSB036, SJSB037, and SJSB038) had concentrations greater than 30 ng/kg $TEQ_{DF,M}$ in one or more intervals. Boring location SJSB028, installed on the far eastern edge of the

ED_014247_00001351-00019

southern berm, had concentrations above 30 ng/kg $TEQ_{DF,M}$, at a maximum depth of 6 ft bgs. Boring locations SJSB032 and SJSB033 were installed to 18 ft bgs along the western edge of the Northern Impoundment. Results from these boring locations indicated concentrations above 30 ng/kg $TEQ_{DF,M}$, to depths of 10 and 12 ft bgs, respectively. Borings SJSB036 and SJSB037 were installed to terminal depths of approximately 13 ft bgs. Concentrations above 30 ng/kg $TEQ_{DF,M}$, at these locations near the center of the western side were identified at a maximum depth of approximately 11 ft bgs at both borings. Boring SJSB038 on the eastern side of the Northern Impoundment was installed to a depth of 12 ft bgs and showed concentrations above 30 ng/kg $TEQ_{DF,M}$ at a depth of 11 ft bgs.

PDI-1 analytical results are shown on Figure 2-2. The validated analytical data, shown in Table 2-1, provides quality assurance that the data collected are usable. The analytical laboratory reports and data validation report are included as part of Appendix A.

2.1.6.2 PDI-1 Geotechnical Results

The PDI-1 geotechnical results identified the presence of interbedded clay, silt, and sand in the areas of the Northern Impoundment in which the geotechnical samples were collected. Soils down to 6 to 10 ft bgs have a high moisture content, with moisture content decreasing as depth increases. Atterberg classification of clay soils indicated that most of the clays are high plasticity, fat clays, with a slightly fewer number of samples classified as low plasticity, lean clays. Interspersed within these clays were samples showing high gravel/sand content. The PDI-1 geotechnical results are included in Appendix B and are further discussed in Section 5.3.3, as they relate to the Northern Impoundment RD.

2.1.6.3 PDI-1 Waste Characterization Results

Waste characterization results indicate that the Northern Impoundment waste material did not exhibit any of the four characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity) and are not Listed Wastes, as defined in Title 40 of the Code of Federal Regulations (CFR) Part 261, Subpart C. As a non-hazardous waste, the waste material would meet the definition of Class I or Class II industrial waste under the regulations governing classification of non-hazardous industrial solid waste in Texas (30 Texas Administrative Code [TAC] §335.505, 335.506, and 335.508).

Validated waste characterization data, shown in Table 2-2, provides quality assurance that the data collected are usable. The analytical laboratory reports and data validation report are included as part of Appendix A.

Additional waste characterization testing of Northern Impoundment waste material was performed as part of the 2019 Treatability Study, conducted concurrently with PDI-2, and as part of the 2021 SDI activities. See Section 3.3 for a summary of the Treatability Study waste characterization results. See Section 2.3.7.2 for a summary of the SDI waste characterization results.

2.1.6.4 PDI-1 Aquifer Testing Results

Analysis of the transducer and gauging data from the PDI-1 aquifer tests indicated that there was no meaningful connectivity between the observation wells and the temporary monitoring wells (SJTW014, SJTW015, SJTW016, and SJTW017) and that there is no influence on the water levels of nearby wells that is not also matched by the tidal fluctuations of the river. Results indicated that there is a strong hydrological connection between the river and the shallow sand/silt layer underlying the Northern Impoundment. The data show that the shallow groundwater system is controlled by the hydrological influence of the river. The BMP included in the design will cut off the interconnection between the shallow groundwater and the river within the areas of removal. The only groundwater infiltration to be considered in the design is local seepage of stored groundwater near the excavations. Aquifer test results are included as part of Appendix A.

2.2 Second Phase Pre-Design Investigation (PDI-2)

The PDI-2 fieldwork on the Northern Impoundment was conducted by GHD from September 4 through December 13, 2019, in accordance with the *Final Second Phase Pre-Design Investigation Work Plan* (PDI-2 Work

ED_014247_00001351-00020

Plan; GHD, 2019d), dated June 3, 2019, and approved by the EPA on August 8, 2019 (EPA, 2019c). On September 17, 2019, Tropical Storm Imelda caused significant flooding at the Northern Impoundment, forcing all field activities to be suspended from September 17 to October 7, 2019. This event resulted in a *force majeure* event that delayed the completion of PDI-2 field activities. EPA approved a 24-day schedule extension due to the *force majeure* event on October 30, 2019 (EPA, 2019f),

The purpose of the PDI-2 was to:

- Fill data gaps identified in PDI-1 by refining the horizontal and vertical extent of the waste material with a $TEQ_{DF,M}$ greater than 30 ng/kg to quantify the volume of waste material requiring removal, and to inform the alignment of the BMP during removal activities.
- Fill geotechnical data gaps identified in PDI-1 by collecting geotechnical data to support evaluation of slope stability and inform the BMP design.
- Conduct topographic, bathymetric, and utility surveys to support design of access, staging, and excavation.
- Collect hydrographic data to inform engineering of the BMP.

The Northern Impoundment PDI-2 field activities included installation of 25 analytical sample borings and 9 geotechnical borings at a total of 29 locations, as shown on Figure 2-3. Cuttings from the geotechnical borings were also collected as composite samples for treatability testing, further discussed in Section 3. Borings were advanced from the surface to a maximum depth of either 18 or 30 ft bgs for analytical borings, and to a maximum depth ranging from 20 to 100 ft bgs for geotechnical borings.

A photographic log documenting the Northern Impoundment PDI-2 field event is included in Appendix A.

2.2.1 Drilling Methodology

Due to the location of the Northern Impoundment, portions of the impoundment are heavily influenced by tides and inclement weather. The water level across the Northern Impoundment can vary several feet in the course of one day, providing unique challenges to the use of the drilling methodologies implemented during the PDI-2. Boring installation and sampling were conducted by one of the following methodologies:

- Track mounted drilling rig (DPT and hollow-stem auger).
- Airboat-mounted drilling rig (DPT).
- Barge-mounted drilling rig (hollow stem auger).

Of the 29 boring locations selected for PDI-2, all but six were located in areas that were under water. The appropriate drilling equipment and methodology was selected specifically for each boring location as required by the Site conditions and water level of the San Jacinto River at the time each boring was advanced. PDI-2 boring locations are shown on Figure 2-3.

At locations accessible by standard terrestrial equipment, a mini-excavator was used to remove armored cap rock, then the geotextile and/or geomembrane liner was cut prior to drilling activities. At boring locations that were submerged under water, accessible only by airboat or barge-mounted drilling equipment, certified divers hand cleared the cap rock from each boring location, precisely cut the geotextile and/or geomembrane liner, and then installed a short surface casing (4 feet diameter High-Density Polyethylene [HDPE] pipe or 18-inch diameter steel pipe) to protect against sloughing of the surrounding surface cap materials during drilling. For underwater borings, a wider-diameter casing was first pushed through the extent of the impacted material (approximately 18 to 20 ft bgs) and then the drill rod was advanced through the casing to prevent the potential release of any impacted material to the river during drilling activities.

At the conclusion of drilling at all boring locations, the borings were grouted, the casing was pushed to the mudline (for underwater borings), the geotextile and/or geomembrane liner was repaired, and the armored cap rock was replaced.

ED_014247_00001351-00021

2.2.2 PDI-2 Analytical Sampling

In accordance with the PDI-2 Work Plan (GHD, 2019d), the sampling program was designed to better define the placement of the outer BMP. To that end, 14 non-contingent, analytical borings (SJSB045 to SJSB058) were initially installed primarily along the outer perimeter of the Northern Impoundment, just inside the limits of the armored cap. Samples from these locations were analyzed and if the concentrations of dioxins and furans in a boring were found to be below 30 ng/kg $TEQ_{DF,M}$, the associated contingent boring location (located interior to the non-contingent boring) was installed and sampled. This methodology was repeated until a boring was found to have concentrations above 30 ng/kg $TEQ_{DF,M}$.

Nine contingent sample locations (SJSB046-C1, SJSB047-C1, SJSB049-C1, SJSB050-C1, SJSB052-C1, SJSB055-C1, SJSB055-C2, SJSB056-C1, and SJSB057-C1) were originally planned, as seen on Figure 2-3, but based upon the results of the 14 non-contingent analytical borings, only six out of the nine contingent borings (SJSB046-C1, SJSB047-C1, SJSB050-C1, SJSB052-C1, SJSB055-C1, SJSB056-C1) were installed and sampled. All borings were installed using DPT methodology to a depth of 18 ft bgs and samples were collected on two-foot intervals.

Several modifications were made to the original PDI-2 scope of work based upon field conditions and analytical data results. A *Work Plan Refinement Notice* (GHD, 2019f) was submitted to the EPA on October 11, 2019, and approved on October 22, 2019 (EPA, 2019e). Per this notice, sample location SJSB050-C1 was relocated approximately 100 ft to the east to better delineate the horizontal and vertical extent of the waste material on the eastern boundary of the Northern Impoundment. Also, per this notice, sample location SJSB058 was moved approximately 60 ft to the southeast to allow the boring to be completed as a land-based boring.

There were several instances where one of the perimeter non-contingent borings had results below the clean-up level, and the next interior boring location from that clean boring had results that exceeded the clean-up level at, or almost at, total depth. To better delineate the horizontal and vertical extent of waste material, borings were added between the clean boring and the impacted boring. An *Additional Work Plan Refinement Notice* (GHD, 2019g) was submitted to the EPA on November 1, 2019, and was approved on November 8, 2019 (EPA, 2019g). Per this notice, three borings (SJSB045-C1, SJSB048-C1, and SJSB053-C1) were added between clean and impacted borings as described above. In addition, two samples were taken at locations SJSB070 and SJSB071 along the southern boundary of the ACBM panels on the western side of the Northern Impoundment (see Figure 2-3). The five additional borings were sampled and analyzed at two-foot intervals from zero to 18 ft bgs.

A *Fourth Work Plan Refinement Notice* (GHD, 2019h) was submitted to the EPA on December 4, 2019, requesting to relocate boring location SJSB046-C1 approximately 45 ft to the north to better delineate the horizontal and vertical extent of waste material on the eastern side of the Northern Impoundment. The request was approved by the EPA on December 9, 2019 (EPA, 2019h).

Analytical results obtained during the initial PDI-2 sample data analysis indicated concentrations of dioxins and furans greater than 30 ng/kg $TEQ_{DF,M}$, at the terminal depth of 18 ft bgs at 3 locations (SJSB046, SJSB058, and SJSB048-C1). To fully delineate the vertical extent of impacted material, duplicate borings were installed directly adjacent to the original borings at these locations, as outlined in the *Additional Work Plan Refinement Notice* (GHD, 2019f) and the *Fourth Work Plan Refinement Notice* (GHD, 2019h). Each duplicate boring was installed directly adjacent to the original borings to a depth of 30 ft bgs. Discrete samples were collected for every two-foot interval between 18 and 30 ft bgs, for a total of six samples per boring. The 18 to 20 ft bgs interval at each duplicate boring was analyzed, while the remaining five samples were held by the lab pending results of the first depth interval. Analytical results indicated that concentrations of dioxins and furans were below 30 ng/kg $TEQ_{DF,M}$ at the 18 to 20 ft bgs depth interval for all three locations; thus, the remaining samples for subsequent depth intervals were not analyzed.

In summary, 25 analytical borings were completed. Three were completed as land-based borings and 22 were completed as water-based borings. Three of the 25 borings were drilled to 30 ft bgs. All others were drilled to 18 ft bgs.

ED_014247_00001351-00022

All analytical samples were analyzed by Eurofins TestAmerica Laboratory for dioxins and furans using EPA Method 1613B and percent moisture using Standard Method (SM) 2540G. Data validation was completed by GHD.

2.2.3 PDI-2 Geotechnical Sampling

Upon review of the geotechnical data obtained during the PDI-1, data gaps were identified and documented in the PDI-2 Work Plan (GHD, 2019d). Additional geotechnical data was needed on the interior of the Northern Impoundment boundary on the eastern side of the central berm to inform the design of possible internal BMPs (being considered at the time) for a multi-cell remediation approach. The geotechnical analyses performed during the RI and PDI-1 were determined to be insufficient to inform BMP design. Specifically, there was no unconsolidated-undrained (UU) triaxial compression data to evaluate shear strength. As such, a total of nine geotechnical borings (SJGB024 through SJGB027, SJSB047, SJSB050, SJSB053, SJSB057, and SJSB058) were installed during the PDI-2. The geotechnical boring locations are shown on Figure 2-3.

Geotechnical borings were installed using a Central Mine Equipment (CME) mud-rotary drilling rig. Samples were collected and analyzed for moisture content (per American Society for Testing and Materials [ASTM] D2216), grain size with hydrometer (per ASTM D6913 and ASTM D7928), plasticity (Atterberg limits; per ASTM D4318), torvane shear (per ASTM D2537), and UU triaxial shear strength (per ASTM D2850) to depths ranging from 20 to 100 ft bgs. Geotechnical samples were sent to Tolunay-Wong Engineers, Inc. for analysis.

2.2.4 Sand Separation Area Sampling

Samples were collected during the PDI-2 sampling event to establish current conditions in the SSA. The samples were collected from nine locations shown on Figure 2-4 using Vibracore sampling devices and a dive team. At each location, samples were collected at depth intervals of 0 to 1 foot, 1 to 2 ft, 2 to 4 ft, and 4 to 6 ft below the sediment/surface water interface and analyzed for dioxins and furans. Eurofins TestAmerica analyzed the samples by EPA Method 8290 and percent solids. Samples were also collected at depth intervals of 2.5 centimeters (cm) (0.98 inches) from the sediment/surface water interface to a depth of 82.5 cm (32.5 inches) and analyzed for cesium-137 (^{137}Cs) and lead-210 (^{210}Pb) using EPA Method 901.1 by Teledyne Brown Engineering, Inc.

A detailed summary of sampling activities and results is included in Section 6.

2.2.5 Transducer Installation

On July 22, 2019, two transducers were installed on the west side of the Northern Impoundment to evaluate the hydrological conductivity of the shallow sand and silt zone beneath the Northern Impoundment and the river. One transducer was installed in monitoring well SJTW-016 and the other was installed in a piezometer that was manually driven into the river sediment just off the shore to the west of SJTW-016. Each was fitted with a telemetry device and transmits data that can be remotely accessed. The locations of the transducers are shown on Figure 2-3.

2.2.6 PDI-2 Topographic, Bathymetric, and Utility Survey

To support design elements related to access, staging, and excavation, a topographic and bathymetric survey was completed on the Northern Impoundment from July 8 through August 2, 2019. The survey was conducted by a surveyor (Morrison Surveying, Inc.) licensed in the state of Texas. Field data were collected using conventional surveying equipment, including a Trimble R8 GNSS, Trimble R10 global positioning system (GPS), and Geometrics 882 marine magnetometer using Hypack software to collect geophysical data, CEE Scope Fathometer using Hypack software to collect bathymetric data, and a Trimble SX10 scan station to collect topographic data. Surveying was completed on a 50-feet grid over the Northern Impoundment boundaries. Above-ground utilities were also noted during survey activities. Survey data was utilized to develop a topographical digital elevation map of the Northern Impoundment. This surface and all identified above and below-ground utilities have been incorporated into the design drawings.

ED_014247_00001351-00023

2.2.7 Summary of PDI-2 Results

2.2.7.1 PDI-2 Analytical Results

A total of 25 analytical borings were sampled and analyzed for dioxins and furans during the PDI-2 activities. Of the 25 borings, 12 had concentrations above 30 ng/kg $TEQ_{DF,M}$ to depths ranging from 4 to 18 ft bgs and the remaining borings were all below 30 ng/kg $TEQ_{DF,M}$ down to 18 ft bgs, as shown on Figure 2-5. Consistent with the objectives of the PDI-2 investigation, borings along the northeastern and eastern sides of the Northern Impoundment exhibiting $TEQ_{DF,M}$ concentrations below 30 ng/kg are to be used in the RD to define the extent of the excavation and the alignment of the outer BMP. This is further discussed in Section 5.2.

All subsurface analytical results from the RI, PDI-1, and PDI-2 are shown in Table 2-6 and on Figure 2-9. The data bars on Figure 2-9 show the interval results as elevations, adjusted to account for the depth of surface water atop each boring location, giving an indication of the total depth of waste material to be excavated during the RA. Two borings locations (SJSB046-12 and SJSB071) had samples above 30 ng/kg $TEQ_{DF,M}$ in the deepest sample interval collected. These locations were further investigated in the 2021 SDI event.

The validated analytical PDI-2 data, shown in Table 2-3, provides quality assurance that the data collected are usable. The PDI-2 analytical laboratory reports and data validation reports are included as part of Appendix A.

2.2.7.2 PDI-2 Geotechnical Results

During the RI and PDI-1, the Northern Impoundment soil lithology was characterized as interbedded Recent Alluvial Sediments (silts, sands, and clays) to an approximate depth of -30 feet North American Vertical Datum of 1988 (NAVD88), which was confirmed during the PDI-2. The previous investigations also indicated that the Beaumont Clay formation extended below this reference elevation (-30 ft NAVD88) to a minimum elevation of -60 ft NAVD88 on the western side of the Northern Impoundment and to approximately -50 ft NAVD88 on the eastern side of the Northern Impoundment. Additional geotechnical borings installed during PDI-2 (specifically boring SJSB057) encountered the Beaumont Clay formation at approximately -80 ft NAVD88 (an additional 20 ft of thickness) on the western side and at approximately -50 to -65 ft NAVD88 (up to an additional 15 ft of thickness) on the eastern side. Additionally, the investigations prior to PDI-2 indicated a sand formation extending below the clay formation across the Northern Impoundment to approximately -80 ft NAVD88. These sands, although encountered in the PDI-2, were not found to be consistent across the Northern Impoundment.

The PDI-2 geotechnical results are included in Appendix B. Further analysis and discussion of the geotechnical data as it relates to the RD of the BMP are included in Section 5.2.3.

2.2.7.3 Transducer Results

Consistent with the results of the PDI-1 aquifer tests, data from the transducers indicated that there is a strong hydrological connection between the river and the shallow sand/silt layer underlying the Northern Impoundment. The water levels are nearly identical in all observed data, with a slightly dampened response time observed in the monitoring well data that matches pressure changes in soils versus a free-flowing river. As part of the RD, water pressure heads from the shallow permeable layer have been correlated with fluctuations in the river water levels and accounted for, as such.

2.3 Supplemental Design Investigation (SDI)

The BMP design detailed in the 30% RD was subsequently deemed to be infeasible and following submittal of the 30% RD, a new design approach for the BMP (a double wall BMP system) was developed, the alignment of the BMP was changed, and new approach to the excavation methodology was developed. Based on the changes in BMP design and alignment and changes in excavation methodology, data gaps were identified in the available analytical delineation and geotechnical data.

ED_014247_00001351-00024

As discussed during a TWG Meeting on December 15, 2020, an additional field investigation was deemed necessary to address these data gaps in the analytical and geotechnical data and better inform the RD. A proposed plan to collect additional analytical and geotechnical data was presented in a TWG Meeting on February 5, 2021, and then formalized in the SDI Work Plan, submitted to the EPA on February 19, 2021 (GHD, 2021b). A TWG Meeting was held to discuss the details of the SDI Work Plan on March 10, 2021, and the EPA provided comments on the SDI Work Plan (EPA, 2021b) on March 29, 2021. On April 15, 2021, a draft Response to Comments table and figures were sent to the EPA in response to the EPA's comments and were then discussed in detail during a TWG Meeting that took place on April 19, 2021. After further discussion with the EPA regarding the SDI scope of work and other significant modifications to it, a revised SDI Work Plan (Revised SDI Work Plan) was submitted to the EPA on May 21, 2021 (GHD, 2021c). The EPA approved the Revised SDI Work Plan on June 4, 2021 (EPA, 2021c). Between the February submittal of the SDI Work Plan and the June approval of the Revised Work Plan, the scope of the SDI event grew substantially. Most notably, seven analytical boring locations were added, with six of those additional borings being located in very challenging water-based locations. The original 10-week schedule for field work thus expanded to more than 12 weeks. The SDI fieldwork was conducted by GHD from June 28, 2021, to September 16, 2021.

The objectives of the SDI included the following:

- Further delineate the vertical extent of the waste material exceeding the ROD clean-up level around the perimeter of the excavation area to support the BMP design, elements of the anticipated excavation methodology, and other aspects of the RD.
- Address data gaps for the vertical and horizontal extent of waste material exceeding the ROD clean-up level across the area anticipated to be excavated to better refine the estimated excavation bottom elevations and the volume of material to be removed (which had already increased due to the depths of the waste material encountered during the PDI).
- Collect additional geotechnical data along the conceptual alignment of the BMP to inform the BMP design.
- Collect additional hydraulic conductivity data of the material to be excavated to better estimate the amount of seepage water that will require management during the RA.
- Collect additional hydraulic conductivity and pore pressure data to evaluate the risk of hydraulic heave during the RA.

The SDI field activities included installation of 35 analytical sample borings and 17 geotechnical soundings (13 Cone Penetrometer Test [CPT] soundings and 4 instrumented boreholes), as shown on Figure 2-6. Borings were advanced from the surface to a maximum depth of 24 ft bgs for analytical borings, and to a maximum depth ranging from 24 to 75 ft bgs for geotechnical soundings.

A photographic log documenting the SDI field event is included in Appendix A.

2.3.1 SDI Drilling Methodology

Similar to the PDI-2 event, several drilling methodologies were employed to account for variable water levels at the Northern Impoundment. Boring installation and sampling were conducted using the following methodologies:

- Track mounted drilling rig (DPT).
- Airboat-mounted drilling rig (DPT).
- Track-mounted drilling rig (mud rotary).
- Truck-mounted CPT drilling rig.
- Truck-mounted CPT drilling rig secured to a floating modular barge.

Of the 35 analytical boring locations selected for SDI, all but 11 of them were located in areas that were under water. All water-based analytical borings were installed utilizing an airboat-mounted DPT rig and all land-based analytical borings were installed utilizing a track-mounted DPT rig. The three land-based piezometers were installed using a track-mounted mud-rotary rig and the land-based CPT soundings were performed using a truck-mounted CPT drilling

ED_014247_00001351-00025

rig. The water-based CPT soundings were taken using a truck-mounted CPT drilling rig secured to a floating modular barge. SDI boring and CPT locations are shown on Figure 2-6.

At locations accessible by standard terrestrial equipment, a mini-excavator was used to remove armored cap rock, then the geotextile and/or geomembrane was cut prior to drilling activities. At boring locations that were submerged but were accessible by airboat-mounted drilling equipment, certified divers hand cleared the cap rock from each boring location, precisely cut the geotextile liner, and marked the location with a buoy. The drilling rig then installed a short surface casing (4 ft diameter HDPE pipe or 18-inch diameter steel pipe) to protect against sloughing of the surrounding surface cap materials during drilling. For underwater borings, a wider-diameter casing was first pushed until refusal was encountered (approximately 5 to 7 ft bgs on the shallower locations and approximately 5 to 10 ft bgs on the deeper locations) and then the drill rod was advanced through the casing to prevent the potential release of any impacted material to the river during drilling activities. At the conclusion of drilling at all boring locations, the borings were grouted, the casing was pushed to the mudline (for underwater borings), the geotextile and/or geomembrane was repaired, and the armored cap rock was replaced.

As required by the Revised SDI Work Plan (GHD, 2021c), turbidity curtains were deployed around the northwest corner of the Northern Impoundment during the installation of the four soil borings in that area. The initial plan utilized curtains that spanned the full extent of the water column, but due to higher-than-expected water velocities in that area, it was not possible to maintain that configuration and the curtains were realigned to allow for shorter curtains across the deeper areas. The timeline of activities and the significant challenges encountered were detailed in a letter to the EPA dated September 28, 2021 (GHD, 2021e).

2.3.2 SDI Analytical Sampling

In accordance with the Revised SDI Work Plan (GHD, 2021c), the sampling program was designed to further delineate the vertical and horizontal extent of material exceeding the ROD clean-up level. To that end, a total of 373 discrete samples (including 61 field and lab duplicate samples) were collected from 35 locations across the Northern Impoundment. Discrete samples were collected from two-foot intervals, to a total depth of 24 ft bgs. The sample intervals from 0 to 18 ft bgs were analyzed by the analytical laboratory, and the sample intervals from 18 to 24 ft bgs were archived by the laboratory pending the results of the 16 to 18 ft bgs sample interval. Analysis of the 16 to 18 ft bgs interval from each location was prioritized to expedite the determination as to whether the samples from the deeper sample intervals should be analyzed. If the 16 to 18 ft interval yielded an analytical result with $TEQ_{D,F,M}$ levels above 30 ng/kg, one or more of the three deeper intervals from 18 to 24 ft were also analyzed.

There were five boring locations (SJSB072, SJSB075, SJSB077, SJSB083, and SJSB101) that were co-located with historical boring locations in which a sample interval below the clean-up standard was not observed at the bottom of the boring (SJGB010, SJGB012, SJSB036, SJSB046-C1, and SJSB071). Three of the five locations were in upland areas (SJSB072, SJSB075, SJSB077), and the other two locations (SJSB083 and SJSB101) were in areas that are normally covered in water.

For the co-located borings adjacent to historical borings with $TEQ_{D,F,M}$ levels above 30 ng/kg, with the exception of SJSB083 and SJSB101 which were analyzed for waste characterization purposes, only sample intervals in the co-located borings that were deeper than the terminal depth of each historical boring with $TEQ_{D,F,M}$ levels above 30 ng/kg were analyzed. For example, at proposed boring location SJSB072, the first sample interval analyzed was 8 to 10 ft bgs, because co-located historical boring SJGB012 had a $TEQ_{D,F,M}$ level above 30 ng/kg at its terminal depth of 8 ft bgs.

All analytical samples were analyzed by Eurofins TestAmerica Laboratory for dioxins and furans using EPA Method 1613B and percent moisture using SM 2540G. Data validation was completed by GHD.

2.3.3 SDI Geotechnical Sampling

To delineate the subsurface stratigraphy along or in reasonable proximity to the conceptual BMP alignment, thirteen CPT soundings were taken.

ED_014247_00001351-00026

Twelve of these CPT soundings (SJCPT-001 through SJCPT-010, SJCPT-002A, and SJCPT-006A) were taken along or in reasonable proximity to the conceptual BMP alignment. The initial contractor engaged to complete the water-based CPT borings was unable to successfully reach terminal depth due to the insufficient capacity through resistive force of its CPT drill rig and associated vessel. After multiple attempts by the initial contractor to successfully anchor and reach terminal depth, the initial CPT contractor and CPT drill rig demobilized and a second contractor with a larger capacity truck-mounted CPT drilling rig secured to a floating modular barge was retained to complete the CPT soundings.

A thirteenth CPT sounding (SJCPT-011) was taken adjacent to piezometer location, SJMW-016, as a "calibration sounding" to provide both CPT data and geotechnical laboratory test data for comparison with the newly-collected CPT data from the other 12 CPTs.

To provide the corresponding laboratory test data for comparison, geotechnical samples were collected at different locations (depths) during borehole SJMW-16 advancement and sent to Thompson Engineering Geotechnical Laboratory for laboratory analysis. The samples were collected along the entire length of this deep boring, including from the surficial alluvium, Beaumont Clay and Beaumont Sand layers (historical investigations gathered limited data from these lower geological strata).

In addition, nine vane shear tests were performed near CPT locations SJCPT-01 to SJCPT-03, and SJCPT-05 to SJCPT-10 using manual equipment. Vane shear tests were conducted in approximately 1.5 ft increments and progressed up to 24 ft bgs or until refusal, in order to define shear strength values within the surficial alluvions and calibrate the CPT results. The locations of the CPT soundings are shown on Figure 2-6.

Using the common set of information and well-defined relationships for various parameters available, the CPT results obtained from the 12 soundings along the current conceptual BMP alignment were calibrated against data from SJMW-016, and correlated to vane shear tests and existing geotechnical laboratory test data from past investigations. Physical geotechnical samples were collected and analyzed from SJMW-017 as supplemental geotechnical data.

2.3.4 Waste Characterization Sampling

Six waste characterization samples were collected from three analytical borings (SJSB083, SJSB101, and SJSB102). The original plan, as detailed in the Revised SDI Work Plan (GHD, 2021c), had been to collect duplicate samples from each planned 2-ft interval from 0 to 24 ft bgs in soil borings SJSB083 and SJSB101 and to archive the duplicates for potential waste characterization, pending dioxins analytical results. Upon receipt of the dioxins analytical results, the two samples in each boring with the highest dioxins concentration would have been identified and the duplicate samples from each of those intervals would have been analyzed for Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics per EPA-required test methodology in 40 CFR Part 261. As detailed in SDI Sampling Plan Refinement Notice - 1, submitted to the EPA on July 26, 2021 (GHD, 2021d) and approved by the EPA on August 4, 2021 (EPA, 2021d), due to short analytical hold times for some of the RCRA hazardous waste characteristics parameters, the plan was revised to pre-select the intervals for analysis based upon historic dioxins data from nearby soil borings. Based upon data from historic soil boring SJSB046-C1, the 8 to 10 ft bgs and 10 to 12 ft bgs intervals were selected for waste characterization analysis from SJSB083. Based upon historic soil boring SJSB071, the 0 to 2 ft bgs and 2 to 4 ft bgs intervals were selected for waste characterization analysis from SJSB101.

Due to shipping delays, the waste characterization samples for SJSB083 were delivered to the analytical laboratory outside of the approved temperature range. The samples were analyzed, but in order to bolster the dataset for waste characterization, a third location was selected to collect waste characterization samples. Duplicate samples from two 2-ft intervals (8 to 10 ft bgs and 10 to 12 ft bgs) were collected from SJSB102 to analyze for waste characterization parameters. Waste characterization data is included in Table 2-5 and Appendix A.

2.3.5 Supplemental Data Collection

In addition to the sampling described above, supplemental data was collected to support the design of turbidity control measures for use during installation and removal of the BMP during the RA. These data collection activities focused

ED_014247_00001351-00027

on thicknesses of surface materials, geotechnical characteristics of surficial sediment, and velocity measurements in locations outside the proposed BMP alignment. Each of these data collection activities is described below.

2.3.5.1 Sediment and Rock Thickness

The extent and thickness of armored rock cap along the conceptual alignment of the BMP was investigated, together with the thickness of any sediment deposited on top of the armored rock cap. The information was collected by diver-assisted probing at specific intervals and further verified by examining past quarterly bathymetry surveys.

2.3.5.2 Surficial Sediments Geotechnical Properties

Ten samples of river sediment that had deposited on top of the armored rock cap were collected in Lexan® tubes that were hand driven into the sediment to collect a minimum 6-inch thick sample. The sediment within each tube was composited to form a single sample for geotechnical analyses. Samples were collected in proximity to corresponding CPT locations (SJCPT001 through SJCPT010, not including SJCPT-002A and SJCPT-006A) as shown on Figure 2-6.

Divers were required to clear surficial rock at six locations (SJCPT005 through SJCPT010) prior to driving each of the performed CPTs. At the time of clearing the CPT locations, the nearby six surficial sediment samples were collected at these six locations. An additional four locations (SJCPT001 through SJCPT004) were also sampled in a similar manner though the removal of rock at these locations was not necessary. Some boring locations were adjusted based on field conditions.

Both sets of samples were shipped under chain of custody procedures to a geotechnical laboratory for testing. Each sample were tested for water content (ASTM D2216), dry density (ASTM D2937), Atterberg limits (ASTM D4318), specific gravity (ASTM D854), particle size distribution (ASTM D422) and organic carbon content (ASTM D2974). The samples were also tested for consistency/stickiness using the Natural Resources Conservation Service method.

2.3.5.3 Water Velocity and Turbidity Measurements

During the week of November 8, 2021, two velocity meters (e.g., acoustic doppler current profiler) were deployed in locations outside of the conceptual BMP alignment, in accordance with the Revised SDI Work Plan (GHD, 2021c). Four turbidity monitors were deployed at the same time in accordance with the *Revised Ambient Turbidity Measurements Plan*, submitted to the EPA on October 6, 2021 (GHD, 2021g) and approved by the EPA on October 15, 2021 (EPA, 2021e). The four turbidity monitors and one of the two velocity monitors (Velocity Monitor A to the northwest) were removed from the river during the week of June 7, 2022. Velocity Monitor B will remain deployed for up to six more months. The locations of the meters are shown on Figure 2-8. Data from the velocity and turbidity monitors will be used to inform the turbidity monitoring and controls plan to be implemented during installation and removal of the BMP during the RA. Data from December 2021 through June 2022 is summarized in the SWMP (Appendix J).

2.3.6 Piezometer Installation

Four piezometers were installed using mud-rotary drilling equipment during the SDI to better understand the hydraulic conductivity and subsurface hydrostatic pressure of the groundwater bearing units below the Northern Impoundment. The locations of the piezometers are shown on Figure 2-6.

A shallow piezometer was installed and screened from the ground surface to -8 ft NAVD88 at boring SJMW-014 to get a better understanding of the hydraulic conductivity of the waste material itself. An intermediate piezometer was installed and screened from approximately -15 to -25 ft NAVD88 at boring SJMW-015 to obtain a better understanding of the hydraulic conductivity of the zone directly below the waste material. Deep piezometers were installed at borings SJMW-016 and SJMW-017 to better evaluate the potential for hydraulic heave during excavation activities. These piezometers extend into the sand layer below the Beaumont Clay Formation. SJMW-016 was screened from approximately -60 to -70 ft NAVD88, and SJMW-017 was screened from approximately -65 to -75 ft NAVD88, each representing the top ten feet of the lower sand layer below the Beaumont Clay.

ED_014247_00001351-00028

During the installation of deep piezometers (SJMW-016 and SJMW-017), split spoon and Shelby Tube samples were collected as explained in Section 2.3.3. The samples were shipped under chain of custody procedures to the Thompson Engineering geotechnical laboratory for testing. Selected samples were analyzed for Unconsolidated Undrained Compression Test (ASTM D2850), Atterberg limits (ASTM D4318), moisture content (ASTM D2216), grain size (ASTM D6913/D7928), and #200 wash (ASTM D1140).

All four piezometers were constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) threaded casing. After development, a transducer was installed in each, and a slug test was performed to evaluate the lateral hydraulic conductivity of the strata through which each piezometer was screened. The locations of piezometers SJMW-014 and SJMW-015 were selected from adjacent boring log data to capture the highest representative conductivity values to inform choices on peak excavation seepage rates and water volumes. The hydraulic head in the lower sand was measured after development of the two deep piezometers (piezometer locations SJMW-016 and SJMW-017) to determine the confined hydrostatic pressure.

Pressuremeter Tests (PMT) were also performed by Braun Intertec at multiple intervals in the two deep piezometers boreholes using Texam Pressuremeter equipment. The tests were performed to evaluate the pressuremeter modulus, the limit pressure and the at-rest horizontal pressures of the surficial alluvium and Beaumont Clay Formation.

2.3.7 Summary of SDI Results

2.3.7.1 SDI Analytical Results

A total of 35 analytical borings were sampled and analyzed for dioxins and furans during the SDI activities. Of the 35 borings, 30 borings had concentrations above 30 ng/kg $TEQ_{DF,M}$ to depths ranging from 0 to 22 ft bgs and the remaining borings were all below 30 ng/kg $TEQ_{DF,M}$ at a depth of 18 ft bgs, as shown on Figure 2-7. Consistent with the objectives of the SDI, an interval below 30 ng/kg $TEQ_{DF,M}$ was encountered at the terminal depth of every soil boring, establishing vertical delineation of the waste material. Data from the SDI also identified waste material exceeding 30 ng/kg $TEQ_{DF,M}$ at elevations deeper than previously encountered (-28.36 ft NAVD88 at SJSB098).

Due to the apparent variability of the SDI results in some borings (which often include an interval with results above 30 ng/kg $TEQ_{DF,M}$ below several feet of material with results below 30 ng/kg $TEQ_{DF,M}$), a subset of data consisting of 36 selected sample intervals from the full SDI dataset was selected to be re-extracted and reanalyzed by the analytical laboratory. These re-extractions are identified in Table 2-4 as Laboratory Duplicates and the results from these samples are in addition to the 19 field duplicates that were collected and analyzed as a part of project quality assurance procedures. To evaluate the data, the relative percent difference (RPD) was calculated for each set of duplicates. Consistent with the criteria listed in the QAPP for sediment field duplicate samples, the RPD was compared to an acceptance criteria of 100% or less. Using this criteria, analysis of the duplicate data found there to be 8 of the 36 sets of data in the lab duplicate set that were above the 100% RPD threshold and four of the 19 sets above the threshold for the field duplicate sets. Given the small sample extraction amount required for the analysis and the notoriously high variability of sediment samples, this amount of variation in the duplicate datasets was deemed realistic and within normal ranges of variability for sediments. The data presented on Figures 2-7 and 2-9 and in Table 2-6 represents the highest value obtained from either the parent, field duplicate, or laboratory duplicate samples for each sample interval.

All subsurface analytical results from the RI, PDI-1, PDI-2, and SDI are shown on Figure 2-9. The data bars in this figure show the interval results as elevations, adjusted to account for the depth of water atop each boring location. Table 2-6 also presents all subsurface analytical results as elevations.

The validated analytical SDI data, shown in Tables 2-4 and 2-6, provides quality assurance that the data collected are usable. The SDI analytical laboratory reports and data validation reports are included as part of Appendix A.

2.3.7.2 SDI Waste Characterization Sampling

Consistent with the results from waste characterization sampling performed as part of the PDI-1 and PDI-2 Treatability Testing, all six samples collected during the SDI for analysis of waste characterization parameters were below the

thresholds to be classified as RCRA hazardous waste. Notably, the dioxins results from three of the six samples were significantly elevated (4,400 ng/kg $TEQ_{DF,M}$ at SJSB083 [8 to 10 ft bgs], 52,000 ng/kg $TEQ_{DF,M}$ at SJSB101 [0 to 2 ft bgs], and 47,000 ng/kg $TEQ_{DF,M}$ at SJSB101 [2 to 4 ft bgs]) indicating that these samples targeted locations with high dioxins concentrations. Waste characterization results are included in Table 2-5. Analytical laboratory reports and data validation reports are included as part of Appendix A. Conclusions of the waste characterization testing are further discussed in Section 3.3.

2.3.7.3 SDI Geotechnical and Hydrogeological Sampling

Additional geotechnical sampling was conducted during the SDI, including Shelby tube and SPT testing at SJMW-016 and SJMW-017. PMT was also completed at these locations. Results were within expected ranges, with alluvium being underlain by the Beaumont Clay, which was underlain by the deep Beaumont Sand. The CPT soundings indicated that the compressible clay strata consisted predominantly of one layer on the west side of the Northern Impoundment but on the east side, this layer may be interlayered by thin occasional granular lenses. The CPTs also provided a continuous profile of the undrained shear strength of the Beaumont Clay to the termination depth of the tests. The SDI geotechnical results are included in Appendix B. Further analysis and discussion of the geotechnical data as it relates to the RD of the BMP are included in Section 5.3.3.

Single well response aquifer tests (slug tests) were conducted at the newly installed piezometers at SJMW-014, SJMW-015, SJMW-016, and SJMW-017 on August 13, 2021. The test results were evaluated with the aquifer testing software AQTESOLV version 4.50 and can be viewed in Appendix A.

The shallow alluvium piezometer SJMW-014, which was screened through the waste material, yielded a hydraulic conductivity value of 0.000127 centimeters per second (cm/s), which is appropriate for a silty material. The deeper alluvium piezometer SJSMW-015 screened in the more permeable zone directly below the waste material, yielded a hydraulic conductivity value of 0.001175 cm/s, which is within expectations for a fine-grained sand.

The deep Beaumont Sand piezometers SJMW-016 and SJMW-017 were installed and screened in the ten-foot interval below the Beaumont Clay. The confined Beaumont Sand was found to have a relatively gradual hydraulic gradient sloping to the east. The two measurement points obtained from SJMW-016 and SJMW-017 were compared to each other and available historical well measurements to confirm the gradual hydraulic gradient. This low gradient allowed the water levels taken at SJMW-016 and SJMW-017 to be extrapolated to approximate water levels across the entire excavation area. The two deep piezometers yielded hydraulic conductivity values of 0.000170 cm/s and 0.000313 cm/s, which are appropriate for a silty sand.

Hydraulic conductivity data was used to verify and refine assumptions for water storage and treatment during the RA, as further described in Section 5.2.

2.3.7.4 SDI Surficial Sediments Geotechnical Properties Sampling

Surficial sediments/alluvium deposits consisting of clay, silt and sand with organic matter contents ranging from 0.7 percent to 9.7 percent were encountered at the surface at all boreholes and CPT locations. The alluvium deposit is black to grey in color with specific gravity ranging from 2.58 to 2.79 and dry bulk density ranging from 45.3 pounds per cubic foot (PCF) to 95.0 PCF. Further details regarding geotechnical conditions are included in Appendix B.

2.4 PDI and SDI Conclusions and Recommendations

When the ROD was issued, only eight subsurface borings had been installed in the Northern Impoundment. As part of PDI and SDI activities, an additional 71 subsurface borings were installed, providing additional horizontal and vertical (to as deep as -36 feet NAVD88) characterization. Analytical results from these samples indicate that the vertical impact of material with $TEQ_{DF,M}$ exceeding 30 ng/kg extends much deeper than initially determined. As shown in Table 2-6 and on Figure 2-9, data from the PDI and SDI indicate that the excavation elevations during the RA range up to an elevation of -28.36 feet NAVD88 with an average depth of -12.8 feet NAVD88. The average depth of waste referenced in the ROD was -8 feet NAVD88. The corresponding volume of waste material was found to be approximately 50 percent greater than what was known at the time of the ROD. The horizontal and vertical waste

extents were used as part of this RD to determine the type of BMP necessary to implement the selected remedy and the appropriate removal methodology. The data from the PDI and SDI was also used to determine the area of the Northern Impoundment that will require remediation and the alignment of the BMP. Data analysis, civil excavation contouring, and BMP design are further discussed in Section 5.

Understanding the geotechnical characteristics of the soils beneath the Northern Impoundment is a critical component of the RD. Given the significantly deep elevations of waste material encountered during the SDI, a detailed evaluation was conducted to examine the potential for hydraulic heave during excavation activities. The evaluation examined the thicknesses of the underlying strata beneath the Northern Impoundment including the alluvium and underlying Beaumont Clay and the interface between the Beaumont Clay and Beaumont Sand. The evaluation also examined the pore pressures of the Beaumont Sand, as measured by the deep piezometers to determine the hydraulic head level. Finally, the evaluation examined the properties of the soils including the unit weight of the clay and overlying alluvium and the presence of sand lenses in some parts of the clay layer. This evaluation was intended to assess whether the pore pressures within the Beaumont Sand and/or sand layers within the clay would be sufficient to overcome the weight of the overburden considering the planned excavation depths.

Based on this evaluation, it was determined that there are several areas across the Northern Impoundment (primarily in and throughout the northwest corner) in which there would be significant risk of hydraulic heave if material is removed to the currently known elevations presented in this document (See Table 5-1). The evaluation indicated a total stress analysis safety factor (SF) below 1.25 for removal of material to the depths of deepest impact in these areas. A total stress analysis SF of 1.25 is considered protective of hydraulic heave and is in accordance with USACE guidance. Based upon the results of this evaluation, it is not safe to excavate the material in the northwest corner to the currently known depths in the manner required by the ROD. The results of this evaluation were detailed in a Hydraulic Heave Analysis Report submitted to the EPA on December 9, 2021, (GHD, 2021i) and in a follow-up letter submitted to the EPA on December 22, 2021 (GHD, 2021j). Based upon this evaluation, excavation of the northwest corner is technically impracticable as prescribed by the ROD (i.e., "in the dry") and that area will have to be addressed using a different remedial approach. Thus, the design for removal of the material in the northwest corner is not included in this 90% RD and will be addressed in a future RD submission.

A detailed analysis of the geotechnical conditions at the Northern Impoundment, as they relate to the RD, are included in Appendix B and are discussed in Section 5. The Hydraulic Heave Analysis Report is also included as an attachment to the Geotechnical Engineering Report included in Appendix B.

3. Treatability Studies

3.1 2019 Treatability Study Overview

As part of the PDI-2 field activities in October 2019, waste material, porewater, and armored cap material samples were collected and contact water was generated from the Northern Impoundment for treatability testing, as specified in the *Treatability Study Work Plan* (TSWP) (GHD, 2019c) submitted to the EPA on May 20, 2019, and approved on August 27, 2019 (EPA, 2019d). Treatability testing was conducted in the GHD Treatability Laboratory in Niagara Falls, New York (GHD Treatability Lab). Analytical testing was completed by Eurofins TestAmerica Laboratories.

Four composite waste material samples were collected from the four quadrants of the Northern Impoundment for additional waste characterization sampling to determine eligibility for Texas Class I and/or Class II non-hazardous industrial waste disposal and evaluation of solidification mix design, as necessary. Three composite samples of armored cap material were collected for characterization and evaluation for reuse.

As described in the TSWP, two water management approaches were evaluated, as part of the Treatability Study: traditional treatment through clarification and filtration, and thermal evaporation.

ED_014247_00001351-00031

To assess the traditional treatment approach, contact water was generated in an excavation on the southwest quadrant of the Northern Impoundment and a field pilot test which involved on-site clarification and filtration was performed. Effluent from the on-site treatment was also utilized in bench-scale treatability testing at the GHD Treatability Lab, to evaluate particle size and the effectiveness of filtration to remove Constituents of Potential Concern (COPCs) for water discharge criteria.

Concurrently, a pilot study was conducted to evaluate the proposed thermal evaporation treatment approach using the clarified contact water. The fate of dioxins and furans was evaluated at different steps of the evaporation treatment process.

3.2 2019 Treatability Study Objectives

As outlined in the TSWP, the objectives of the Northern Impoundment treatability testing included:

- Evaluation of optimum solidification mix designs to solidify the waste material for transportation and disposal.
- Evaluation of optimum solidification mix designs to meet requirements for Texas Class I and/or Class II non-hazardous industrial waste disposal, in accordance with 30 TAC 335.505-506 and 335.508.
- Evaluation of evaporation technology, including processing capacities, fuel consumption, evaluation of the characteristics of the brine produced by the evaporation process, and air emissions.
- Evaluation of traditional water treatment technology.
- Determination of optimum treatment alternatives for contact water to comply with ARARs.
- Evaluation of the armored cap materials at the Northern Impoundment to determine whether such materials can be reused on-site during or post-remedy implementation.

3.3 2019 Waste Material Treatability Testing

Based on the origin of waste material in the Northern Impoundment, the waste material is not listed as hazardous under 40 CFR Part 261, Subpart D. Further, waste characterization samples collected during the PDI-1 were analyzed for ignitability, corrosivity, reactivity, and toxicity, as defined in Title 40 of CFR Part 261, Subpart C, to determine if the material is characteristically hazardous. The results indicate that the material is not a characteristic hazardous waste under RCRA or EPA or TCEQ regulations. Validated PDI-1 waste characterization data are included in Table 2-2.

Additional testing was conducted during the Treatability Study to further classify the non-hazardous waste under applicable Title 30 of the TAC, (Industrial Solid Waste and Municipal Hazardous Waste) (30 TAC 335). The material was also tested in accordance with EPA Method SW-846 Test Method 9095B (i.e., paint filter test), to determine whether free liquids were present which would prevent the material from being disposed of without solidification. Solidification tests were also performed on the waste material to determine the level of solidification necessary to achieve a target unconfined compressive strength (UCS) that may be required for off-site disposal.

Additional waste characterization testing was also performed on six samples collected during the 2021 SDI to supplement the previous dataset.

3.3.1 Treatability Testing Sample Collection

As part of the Northern Impoundment PDI-2 activities conducted from September to December 2019, four approximately 30-gallon composite samples of waste material were collected from the southwest, northwest, northeast, and southeast quadrants of the Northern Impoundment to utilize for treatability testing, as shown on Figure 3-1. Composite Sample 1 in the southwest quadrant was composited from waste material removed from the excavation to create contact water for water treatability testing. The samples were containerized in 5-gallon buckets, sealed, and transported via freight to the GHD Treatability Lab on September 19, 2019. The remaining three samples were composited from cuttings in the first 20 feet from the geotechnical borings in each quadrant (Composite Sample 2 from the northwest quadrant, Composite Sample 3 from the northeast quadrant, and Composite Sample 4

ED_014247_00001351-00032

from the southeast quadrant). The samples were containerized in 5-gallon buckets and transported via freight to the GHD Treatability Lab on December 17, 2019.

3.3.2 Baseline Characterization

An initial baseline characterization was performed to determine if there was significant variation of the chemical and physical properties between the four quadrant waste material samples collected within the Northern Impoundment and to provide data for further waste characterization.

Each waste material sample was analyzed for the following parameters to determine whether it met TCEQ Class I or Class II non-hazardous waste landfill disposal requirements:

- Percent Solids - SM for the Examination of Water and Wastewater 2540G.
- TCLP Dioxins and Furans - EPA 1613B.
- TCLP Volatile Organic Compounds (VOCs) - EPA 8260C.
- TCLP Semi-volatile Organic Compounds (SVOCs) - EPA 8270D.
- TCLP Organochlorine Pesticides - EPA 8081B.
- TCLP Polychlorinated Biphenyls (PCBs) - EPA 8082A.
- TCLP Herbicides - EPA 8151A.
- TCLP Glycols - EPA 8015D Direct Injection.
- TCLP Metals - EPA 6010C.
- TCLP Mercury - EPA 7470A.
- TCLP Methomyl - EPA 8321A.
- Total Cyanide - EPA 9014.
- Sulfide - EPA 9034.
- Ignitability - EPA 1020B.
- pH - EPA 9045D.
- Paint Filter - EPA 9095B.

3.3.3 Waste Material Treatability Results and Conclusions

Consistent with the results obtained during PDI-1 and PDI-2, results from the SDI testing characterization indicated that all waste material samples are expected to meet disposal criteria for a Class II landfill and that the material is a non-hazardous waste under RCRA. The basis for this classification is discussed in the sections below.

The results from the PDI-1 waste characterization testing are shown in Table 2-2, the results of the SDI waste characterization testing are shown in Table 2-5, and the results from the PDI-2 Treatability waste characterization testing are shown in Table 3-1. Analytical laboratory reports for the PDI-1 and SDI testing are included as part of Appendix A and analytical laboratory reports for the PDI-2 Treatability Testing are included as part of Appendix C.

3.3.4 Waste Characterization Conclusions

The EPA's guidance regarding the management of remediation waste states that "contaminated environmental media, of itself, is not hazardous waste and, generally, is not subject to regulation under RCRA." (*Management of Remediation Waste under RCRA*, EPA, 1998). The material to be excavated during the Northern Impoundment RA for disposal off-site is the environmental media to be evaluated, and it is subject to regulation under RCRA as hazardous waste only if one of the following two conditions exists:

1. The media is impacted with a listed hazardous waste at concentrations that are above the health-based risk levels.

ED_014247_00001351-00033

2. Any constituent in the media exhibits one of the characteristics of hazardous waste.

GHD submitted a waste characterization evaluation for the Northern Impoundment to the EPA on October 20, 2020 (Waste Characterization Letter; GHD, 2020g). The purpose of the evaluation was to describe how pulp and paper mill waste, proposed to be excavated as part of the Northern Impoundment RA, has been characterized and classified in accordance with the RCRA regulations as non-hazardous waste. EPA subsequently concurred with the conclusions contained in the Waste Characterization Letter in a letter to GHD dated November 19, 2020 (EPA, 2020h).

As part of this evaluation, the following sections of Title 40 of the CFR Part 261 - *Identification and Listing of Hazardous Waste*, were evaluated:

- Subpart A - Definition of Solid Waste, Hazardous Waste & Exclusions (261.1-.9).
- Subpart B - Criteria for Identifying the Characteristics and Listing of Hazardous Wastes (261.10-.11).
- Subpart C - Characteristics of Hazardous Waste (261.20-.24).
- Subpart D - Lists of Hazardous Wastes (261.30-.33).

3.3.4.1 Listed Waste Evaluation

The listed waste evaluation involved determining whether the material contains a "listed" hazardous waste at concentrations above regulatory thresholds. The categories of listed hazardous wastes, using the codes assigned to each category, are:

- "F" codes = Non-Specific Sources.
- "K" codes = Specific Sources.
- "P" codes = Commercial Chemical Products (acutely hazardous).
- "U" codes = Commercial Chemical Products (non-acutely hazardous).

According to EPA guidance, information about the source of the waste is to be used in making the determination. Information about the waste material was summarized in the Waste Characterization Letter. The evaluation concluded that the material did not meet any of the listed descriptions.

3.3.4.2 Characteristic Waste Evaluation

Under RCRA, a solid waste is a hazardous waste if it exhibits any of the following characteristics:

- Ignitability (D001).
- Corrosivity (D002).
- Reactivity (D003).
- Toxicity (D004 - D043).

The evaluation involved a review of available waste characterization data from PDI-1 and PDI-2 and information from the RI about the material deposited in the Northern Impoundment. It concluded that the excavated material at the point of generation (when it is excavated) would not exhibit the characteristics of a RCRA hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity).

In its letter to GHD dated November 19, 2020, the EPA stated that "based upon information provided in the October 20, 2020 evaluation, EPA agrees with GHD's determination that the initially generated waste would not be a listed hazardous waste meeting the current definitions of an F, K, P or U waste. From review of the analytical testing results, the samples are all non-hazardous" (EPA, 2020h). Additional waste characterization sampling was conducted during the 2021 SDI, the results of which further support the conclusions summarized in GHD's October 2020 letter. Additional sampling may be required to further characterize excavated material to determine whether it meets the definition of Class 1 or Class 2 non-hazardous waste under the regulations governing classification of non-hazardous industrial solid waste in Texas. If additional characterization is conducted it will be done so in accordance with the guidance provided in Chapter Nine "Sampling Plan" of the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 1986) and in *RCRA Waste Sampling Draft Technical Guidance* (EPA, 2002). If at

ED_014247_00001351-00034

any time a hazardous waste, as defined in 40 CFR Part 261, is identified, it will be managed and disposed of in accordance with RCRA regulations.

3.3.5 Solidification Testing

Solidification testing was conducted to determine the appropriate reagent dosages to solidify the waste material for transportation to an off-site disposal facility. Off-site disposal facilities typically require incoming waste to pass paint filter testing (an indicator of moisture content) and meet a minimum UCS criteria. A series of tests were performed on material with various levels of the following parameters:

1. Moisture content - to simulate a wide range of site conditions.
2. Reagent concentration - to develop optimal dosage percentage to address paint filter and UCS disposal requirements.
3. Reagent mix - to develop optimal reagent blend for cost analysis.

The solidification testing methodology and results are summarized in the sections to follow.

3.3.5.1 Solidification Testing Methodology

Waste material composite Sample 3 and composite Sample 4 from the Northern Impoundment were utilized for solidification testing. The testing mixtures were prepared by placing 400 grams (g) of waste material with the predetermined amount of reagent in a mechanical mixer. Waste material and reagent were mechanically mixed for five minutes and then placed into a mold for curing. Reagent doses and blends tested are summarized in Table 3-A, as follows:

Table 3-A Solidification Testing Parameter Matrix

Percent Solids Tested (%)	Reagent Type Tested	Reagent Dosage(s) Tested (%)
35 ,45, 55, 70	Portland Cement	2, 5, 10, 20
	Lime	5, 10, 20
	Portland / Lime	5/5, 10/10, 10/20, 15/20

Notes:
(1) Portland/Lime reagent blends were utilized to evaluate cost effective substitutes.
(2) "5/5" indicates percentage of Portland cement and lime used (i.e., 5% Portland + 5% lime).

Curing was monitored using a pocket penetrometer and samples were monitored for the presence of free water which would be a leading indicator of not passing a Paint Filter Test. Pocket penetrometer testing was conducted on molds starting from two days after mixing up to 14 days. Results of solidification testing is summarized in Section 3.3.5.2.

3.3.5.2 Solidification Results and Conclusions

The results of the solidification testing indicated that free water (Paint Filter testing) and UCS requirements of an off-site disposal facility can be met across a range of waste material percent solid scenarios (35 to 70 percent) utilizing Portland cement and/or lime. In general, Portland cement was more effective at achieving both disposal requirements. Lime dosages did not result in significant strength (UCS) or free water reduction. In addition, combining lime with Portland cement did not result in the ability to lower the percentage of Portland cement utilized.

Based on these solidification tests, the required dose of Portland cement increases with decreasing percent solids and ranges from a dose of two percent for waste material with 70 percent solids to 10 to 20 percent (depending on potential landfill strength requirements) for material with 35 percent solids. Material with 45 percent solids or less has the potential to fail the Paint Filter test without adequate treatment. The selected Remedial Contractor (RC) may perform their own testing at the time of the RA. The specifics of the off-site disposal facility requirements will be worked out between the RC and the selected off-site disposal facility at the time of the RA. More detailed data for these solidification treatability tests can be made available upon request.

ED_014247_00001351-00035

3.4 2019 Water Treatability Testing

During the RA, as specified in the ROD, as sections of the armored cap are removed, water will come into contact with the waste material through seepage or stormwater and will require management. Additionally, water generated from equipment decontamination and the water treatment system (WTS) containment area will need to be managed. Water treatability testing was performed to evaluate two water management options: (1) traditional treatment and (2) discharge using clarification and filtration and thermal evaporation.

To generate a sufficient quantity of representative contact water for all necessary testing, an open excavation area was constructed in the waste material in the southwestern quadrant, as shown on Figure 3-1, and filled with potable water to simulate potential stormwater or seepage that may come into contact with the impacted waste material. A sample of the raw contact water was collected and sent to the GHD Treatability Lab for baseline characterization and filtration testing.

The remaining generated contact water was processed on-site through a modular filtration treatment system, including polymer addition with inline mixing followed by clarification, sand filtration, and bag filtration. Samples were collected at each step of the treatment process to evaluate the concentration of dioxins and furans. Additional focused filtration testing was performed on a sample of the final clarified and filtered effluent to further evaluate dioxin and furan concentrations using different filter sizes. Treatability testing was also conducted on the clarifier underflow (solids that settle out during the clarification process) to evaluate the level of settling and solidification necessary to prepare the waste stream for off-site disposal.

A batch of clarified water, prior to filtration, was sent to the Purestream pilot test facility in Logan, Utah for a thermal evaporation pilot test to evaluate air emissions.

All water testing results were evaluated against calculated water discharge criteria, as discussed below.

3.4.1 Water Discharge Criteria

So that discharge of treated water during the RA meets water quality standards, COPC discharge criteria were developed by conducting a water quality-based effluent limitation (WQBEL) assessment. The Texas Surface Water Quality Standards (TSWQS) are specific to water bodies, not to discharges, so WQBELs take into account the load that the site-specific discharge would add to the water body as a whole to determine the necessary limits to maintain protection of human health and aquatic life.

The TCEQ utilizes the Texas Toxicity Screening (TexTox) Menus to determine WQBELs. TexTox Menus include all relevant formulas and inputs found in the *Procedures to Implement the Texas Surface Water Quality Standards* (Implementation Procedures), June 2010 (TCEQ, 2010). Depending on the type of receiving water body, different TexTox Menus would be assigned. During the RA, treated water from the Northern Impoundment will likely discharge to either Segment 1005 (Houston Ship Channel/San Jacinto River Tidal, south of I-10) or Segment 1001 (San Jacinto River Tidal, north of I-10) of the San Jacinto River, which is classified as a bay/wide tidal river.

For discharges into Segments 1005 or 1001, TCEQ would assign the TexTox Menu #5 to calculate WQBELs. This TexTox Menu requires inputs for Total Suspended Solids (TSS), effluent flow, and effluent fractions for chronic and acute aquatic life and human health. Based on the estimated location of the outfall and the type of water body, the following default dilution fractions were used, per TCEQ guidance: 30 percent for Zone of Initial Dilution (Acute), eight percent for Aquatic Life Mixing Zone (Chronic), and four percent for Human Health Mixing Zone. Since Segments 1005 and 1001 are tidal water bodies, they are dominated by the ebb and flow of tides rather than from upstream flow. These effluent fractions, along with an estimated effluent flow, serve as main inputs for the discharge information required by the TexTox Menu to calculate WQBELs. The estimated discharge flow rate for the RA ranges from 300 to 1,000 gpm (0.432 to 1.44 million gallons per day [gpd]). The default dilution factors are recommended for any discharge into a bay/tidal river greater than 400 ft wide with a flow rate less than 10 million gpd.

Using default dilution factors, river segment specific inputs, and expected TSS and discharge flow rates from the anticipated Northern Impoundment WTS discharge, preliminary discharge concentrations were determined. These

ED_014247_00001351-00036

preliminary calculated discharge criteria were used to evaluate water treatability testing results and can be found in Table 3-2.

3.4.1.1 Compliance with the Texas Surface Water Quality Standard - Dioxins and Furans

The EPA has made a determination regarding compliance with the TSWQS for dioxins and furans as an ARAR, based on the substantive requirements of the TCEQ's regulation for surface water discharge, as detailed in e-mail correspondence dated February 18, 2020 (EPA, 2020b; included in Appendix D).

EPA has determined that compliance with the TSWQS ARAR will be attained as follows:

1. *The state surface water quality standard for Dioxins/Furans is 7.97 x 10^{-8} micrograms per liter (µg/L)[1] [0.0797 picograms per liter (pg/L)[2]] (as TCDD equivalents).*
2. *Compliance with the TSWQS will be determined using the minimum level of the EPA approved method (1613B), cited in 40 CFR Part 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants), in sampling of surface water discharges during the Site remedial action.*
3. *If an effluent sample analyzed for dioxin is below the minimum level using the EPA approved method, the sample result would be identified as non-detect and the discharge would be determined to be in compliance with the ARAR.*
4. *The Minimum Level (ML) for each analyte is defined as the level at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and clean-up procedures have been employed.*
5. *This approach is consistent with the state's guidance and other permits issued by the TCEQ. EPA's determination is contingent on the water treatment facility using a 1 micron final filtration step in the water treatment process.*

3.4.2 Contact Water Pilot Testing

3.4.2.1 Contact Water Creation

Contact water for pilot testing was generated from the Northern Impoundment by creating an open excavation in the southwestern portion of the Northern Impoundment, with approximate dimensions of 20 ft by 20 ft and a depth of 10 ft. The excavated material was temporarily stored in roll-off containers. The excavation remained open overnight, and water that seeped into the excavation was collected and submitted for analysis. Approximately 20,000 gallons of potable water was then transferred into the excavation and mixed using an excavator bucket to generate a worst-case sediment and water mixture that may be encountered during the RA. This simulated contact water was then pumped into two storage tanks and the contents of the two tanks were homogenized prior to treatment.

3.4.2.2 Pilot Test Overview

Once the contact water was created and removed for treatment testing, as described above, the excavation was backfilled with the stockpiled waste material, the geomembrane cover was replaced and sealed, and the armored cap material was replaced. A sample of contact water created from the on-site excavation was shipped to Evoqua Water Technologies LLC (Evoqua), to determine the optimum polymers for addition during the on-site field filtration pilot testing. The modular filtration treatment system included polymer addition with inline mixing followed by clarification, sand filtration, and bag filtration, as depicted on Process Flow Diagram (PFD) shown on Figure 3-2. During the treatment system operations, the storage tanks were continuously mixed, while the water was recirculated between the two tanks to homogenize the feed to the treatment system.

One batch of contact water was treated through clarification only, and one batch was treated through both clarification and sand filtration. The batch of clarification-only water was sent to the Purestream pilot test facility in Logan, Utah, and used to evaluate thermal evaporation technology for water management. The batch of clarified and filtered water

ED_014247_00001351-00037

was sampled and used to evaluate traditional pump-and-treat technology through on-site field and bench-scale testing, as described in the subsequent sections.

The pilot test treatment system was operated at a flow rate of approximately 30 gpm. The system was initially flooded with contact water, which was directed to an off-specification wastewater storage tank. Clarifier effluent turbidity was monitored as the polymer dosage rates were adjusted. Once the clarifier effluent turbidity dropped below 10 Nephelometric Turbidity Units (NTUs), the clarified water was directed to a separate holding tank. After 7,500 gallons were collected, the clarified effluent was directed to the sand and bag filters, and the effluent to the off-specification tank. Once turbidity levels remained at a consistent value of 10 NTUs in the effluent out of the clarifier, and at approximately one NTU in the filtrate from the filters, the filtered effluent water was discharged to a separate holding tank. Clarifier underflow solids were discharged to a holding tank and allowed to further settle. Photographs from the water treatment pilot test activities are included in the photographic log included in Appendix C.

3.4.2.3 Filtration Pilot Test Water Samples

As discussed previously, contact water was generated in the southwestern part of the Northern Impoundment by placing potable water in an open excavation. This simulated contact water was then processed through an on-site pilot treatment system which included polymer addition with inline mixing followed by clarification, sand filtration, and bag filtration. Water samples were collected and analyzed at different steps in the process, as depicted in the PFD included as Figure 3-2.

A contact water sample taken from the storage tank prior to homogenization was sent to the GHD Treatability Lab for bench-scale testing. This sample and the excavation seepage water were analyzed for the following parameters:

- Total and Dissolved Dioxins and Furans - EPA Method 1613B.
- VOCs - EPA Method 8260C.
- SVOCs - EPA Method 8270D.
- Organochlorine Pesticides - EPA Method 8081B.
- Herbicides - EPA Method 8151A.
- PCBs - EPA Method 8082A.
- Anions - EPA Method 300.0R2.1.
- Total and Dissolved Metals - EPA Method 6010C.
- Total and Dissolved Mercury - EPA Method 7470A.
- Alkalinity - SM 2320B.
- Ammonia Nitrogen - EPA Method 350.1.
- Biochemical Oxygen Demand - SM 5210B.
- Chemical Oxygen Demand (COD) - EPA Method 410.4.
- Cyanide - EPA Method 9012B.
- Ferrous iron - SM 3500.
- Hydrogen sulfide - EPA Method 15.
- pH - EPA Method 9040C.
- Phosphorus - EPA Method 6010C.
- Sulfide - EPA Method 9034.
- Total Dissolved Solids (TDS) - SM 2540C.
- Total Organic Carbon (TOC) - SM 5310C.
- TSS - SM 2540D.

The two homogenized contact water samples, the clarified effluent sample, and the filtered effluent sample were analyzed for any COPC that had a detection in the results of the previous non-homogenized contact water sample.

ED_014247_00001351-00038

Based on those results, these samples were analyzed for all of the same constituents listed above, except the following which were found to be non-detect: VOCs, SVOCs, Organochlorine Pesticides, Herbicides, and PCBs.

In addition, samples were collected from the clarifier underflow and settling tank for treatability testing and TSS analysis.

3.4.2.3.1 Filtration Pilot Test Results

Results of the water samples from each step of the on-site pilot testing are summarized in Table 3-2 and were compared to the estimated discharge criteria established by the EPA (ML), as described in Section 3.4.1. Analytical laboratory reports are included as part of Appendix C.

The homogenized contact water initially exhibited levels of dioxins and furans, TSS, and some metals (including copper, lead, and zinc) above the estimated discharge criteria. Following clarification, the metal concentrations in the clarified effluent sample were below the estimated discharge criteria. Following filtration, dioxins and furans concentrations were also below the ML. The table on Figure 3-2 shows the stepwise decrease in dioxins, metals, and TSS levels at each step in the treatment process. This treatment process is being used as the basis for the RD with additional proposed unit processes, as discussed in Section 5.7.

Turbidity was monitored online at both the clarifier effluent and the filtered effluent. Turbidity results are presented on Figure 3-3. Clarifier turbidity was typically at 10 NTUs or less, while filtered effluent turbidity was typically at one NTU or below. The clarifier effluent TSS concentration was 10 milligrams per liter (mg/L), while the filtered/clarified effluent TSS was 2 mg/L. Based on the observed relationship between turbidity and TSS, turbidity levels can be used as an indication of the TSS concentration. One dioxin congener was above the ML in the clarified effluent, but below the ML in the filtered effluent. For the RA, TSS and turbidity levels can be used to indicate if the dioxin and furan level is below the ML based on these pilot testing results, as well as the bench-scale filtration results.

A turbidity spike occurred at the 19:30 hour mark during the filtration pilot test as a result of the loss of polymer feed. Once this issue was observed, the polymer feed was changed from automatic to manual then restarted, and turbidity dropped to the pre-spike levels. This result supports the benefit of polymer, as well as the ability to monitor performance using turbidity as an indicator.

3.4.2.4 Thermal Evaporation Pilot Test

For the thermal evaporation evaluation, approximately 5,000 gallons of clarified contact water were transported to the Purestream pilot test facility in Logan, Utah, for a three-day pilot test. The pilot test facility utilized a 1/10 scale replica pilot test model of a Flash thermal evaporation unit, which utilizes a direct flame to evaporate influent water to the atmosphere, creating a brine byproduct only (that would need to be disposed) with no effluent water stream for river discharge. The pilot test included three days of stack testing to evaluate emissions of COPCs. Results of the stack testing indicated that none of the COPC emissions were above the levels of the applicable air emissions ARAR (the Permit by Rule [PBR] 30 TAC §106.261(a)(3)). This indicates that most of the COPCs remain in the brine byproduct generated by thermal evaporation.

As part of the RD evaluation, water treatment rates and storage requirements were evaluated for both water management alternatives. The treatment flowrate for the traditional pump-and-treat option is proposed to be 300 gpm. In order to achieve a 300-gpm flowrate using the thermal evaporation option, 25 thermal evaporation units would be needed. It was determined that it would not be feasible to stage and operate this large a number of units at the Northern Impoundment during the RA. As a result, contact water would need to be stored and evaporated at a lower flow rate, resulting in storage of larger volumes of water over a longer duration as compared to the treat-and-discharge option. As a result, traditional treatment through clarification and filtration was selected for use in the 90% RD and thermal evaporation was not further evaluated. Thus, results of the thermal evaporation evaluation are not included in this 90% RD.

ED_014247_00001351-00039

3.4.3 GHD Treatability Bench-Scale Testing

The bench-scale testing of the non-homogenized contact water is described in Section 3.4.2.3. In addition to the initial analysis and characterization of the contact water, bench-scale filtration tests were performed on the generated contact water (Section 3.4.3.1, below). Bench-scale testing was also performed on the clarified and filtered effluent from the pilot test (Section 3.4.3.2, below) to evaluate additional filtration steps.

As part of the clarification process, solids settle out of the water into a sludge. This clarifier underflow sludge will likely be disposed off-site as a separate waste stream. Because the sludge will have a very high moisture content, it will need to be solidified prior to off-site transport. Treatability testing was performed to evaluate options for solidification of the sludge. To optimize the amount of reagent necessary for solidification, additional settling treatability testing was performed to evaluate the effectiveness prior to solidification (Section 3.4.3.3, below).

3.4.3.1 Contact Water Filtration Testing

A serial filtration test was performed on the non-homogenized contact water during the bench-scale testing in order to determine the size distribution of the particles present in the contact water and any relationship between particle size and the concentration of dioxins and furans in the sample.

The test was performed on a 7-liter sample of non-homogenized contact water. The entire sample was filtered through a pre-weighed 100-micron (µm) filter paper. A one-liter sample of the filtrate was then collected for analysis of dioxins and furans. This process was repeated using the remaining filtrate water and pre-weighed 10, 1, 0.45 and 0.1 µm filter papers, with collection of a filtrate sample after each filtration. After the filtration test was complete, each filter paper was dried and then weighed to determine the amount of particulate captured on the filter, and the filtrate samples were analyzed for dioxins and furans.

Testing of other water treatment technologies identified in the TSWP, such as those for metals and ammonia removal, were not required as these compounds did not exceed discharge criteria in the baseline characterization.

Contact Water Filtration Test Results

The results of the filtration test showed more than 90 percent of the particulates were larger than 10 µm in size. Concentrations of dioxins and furans that exceeded the MLs were observed in the filtrate that had passed through the 100 µm and 10 µm filters; however, after filtration with a 1 µm filter, concentrations of all dioxins and furans were below their MLs. These results are summarized in Table 3-3 and shown graphically on Figure 3-4. Analytical laboratory reports are included as part of Appendix C.

3.4.3.2 Focused Filtration Testing

The on-site filtration pilot test water treatment included clarification, followed by sand filtration and nominal bag filtration. In order to determine the effect of additional filtration on the already filtered effluent from the pilot study, the pilot study filtrate water was filtered through 1 µm, 0.45 µm, 0.1 µm, 0.05 µm and 0.025 µm filters. The filtrate from each filter was collected and analyzed for dioxins and furans.

Further testing on the effluent included coagulation/flocculation testing and testing of granular activated carbon (GAC) for polishing.

Focused Filtration Testing Results

The filtrate from the 1 µm, 0.45 µm, 0.1 µm, 0.05 µm and 0.025 µm filters was analyzed for dioxins and furans. These results are summarized in Table 3-4 and shown graphically on Figure 3-4. Analytical laboratory reports are included as part of Appendix C. Consistent with the results obtained from the initial effluent bench-scale filtration testing, none of the filtrate samples contained dioxins and furans above the MLs. This confirms that a 1 µm filter is sufficient for removal of the dioxins and furans from the water. This and the contact water filtration testing data (Section 3.4.3.1) were presented and discussed with members of the TWG on January 27, 2020. Based upon the results and the TWG discussion, the EPA sent correspondence to the Respondents on February 18, 2020 (EPA, 2020b), stating that

ED_014247_00001351-00040

"compliance with the TSWQS will be determined using the minimum level of the EPA approved method (1613B)." The correspondence further specified that this determination would be "contingent on the water treatment facility using a 1 µm final filtration step in the water treatment process."

Coagulation/flocculation jar testing was performed on the non-homogenized contact water by Evoqua, and the results were used to inform the polymer dose utilized during the pilot test discussed in Section 3.4.2.

Further testing of the effluent included polishing with GAC. As dioxins and furans were not present above their MLs prior to GAC treatment, removal of dioxins and furans by GAC could not be quantified. However, GAC treatment will be included in the RD to provide a final polishing step to the effluent discharge.

3.4.3.3 Clarifier Underflow Solids Testing

As previously discussed, bench-scale treatability testing was performed to evaluate the effectiveness of additional settling of the clarifier underflow prior to solidification for off-site disposal. As part of the settling test, a sample of the clarifier underflow was agitated to resuspend solids and an initial sample was analyzed for TSS. A subsample of the material was poured into a 500 mL graduated cylinder and allowed to settle. The height of the sediment/water interface was recorded every five minutes and a sample of the supernatant was analyzed for turbidity every ten minutes. After settling was complete (i.e., no change in the sediment/water interface was observed), a sample of the supernatant was analyzed for TSS.

Solidification tests were also performed on both the raw clarifier underflow and the clarifier settled solid samples that were generated, as described above. The solidification tests were conducted by placing 400 grams of waste material with the amounts of solidification agent, stated below, and water in a mechanical mixer. The waste, water, and solidification agent were mixed for five minutes and then placed in a plastic mold. The samples were allowed to cure for two weeks. During curing, the hardness of the sample was evaluated using a pocket penetrometer three times per week. After curing, the samples were analyzed for UCS.

For the raw clarifier underflow sample, solidification was tested using the sample alone and the sample mixed in a 1:1 ratio with a sample of waste material composite. Cement doses between 15 percent and 85 percent were tested with and without the addition of lime at doses between 20 percent and 70 percent.

For the settled solids sample, solidification was tested using the sample alone and the sample mixed in a 1:1 ratio with a sample of waste material composite. Cement doses between 10 percent and 30 percent were tested with and without the addition of lime at doses between 20 percent and 30 percent.

Similar solidification testing was performed with the brine from the evaporation pilot test. Since evaporation is no longer being considered as an option for water treatment, these results will not be discussed in this 90% RD.

Clarifier Underflow Solids Test Results

Settling of the clarifier underflow solids occurred quickly; the bulk of the solids settled within four minutes and the supernatant gradually cleared to produce a low turbidity, low TSS liquid within two hours. These results indicate that settling is useful in removing suspended solids. Photographs of the settling tests are shown in the photographic log included in Appendix C.

For the raw clarifier underflow solidification tests in which lower Portland cement and lime doses were used, even though good solidification of the solids was achieved, standing water remained on top of the solidified mass. This showed that the water had not been incorporated into the solidified material.

To eliminate standing water in the samples, a dose of 35 percent Portland cement and 60 percent lime was required for the raw clarifier underflow sample and a dose of 70 percent Portland cement was required for the clarifier underflow sample mixed at a 1:1 ratio. A pocket penetrometer hardness of >64 pounds per square inch (psi) was achieved for these samples.

These data show that a large dose of Portland cement and lime would be required to solidify the clarifier underflow on its own and that mixing with the waste material at a ratio of less than one part underflow per part of waste material would be recommended in order to minimize the reagent dose for solidification.

ED_014247_00001351-00041

For the solidification test using the settled solids, standing water was observed initially in some tests with lower doses of cement and lime. However, after two days, the standing water had been absorbed by the solidified solids. The minimum reagent doses to achieve a pocket penetrometer hardness of >64 psi and a UCS of >50 psi were 25 percent Portland cement with 30 percent lime or 20 percent Portland cement with a 1:1 mixture of waste material and settled solids.

These data show that the settled solids can be solidified on their own but that mixing with waste material at a 1:1 ratio can reduce the required reagent dose. The selected RC may perform its own testing at the time of the RA. The specifics of the off-site disposal facility requirements will be worked out between the RC and the selected off-site disposal facility at the time of the RA. More detailed data for these solidification treatability tests can be made available upon request.

3.5 2019 Armored Cap Material Treatability Testing

The TSWP scope of work included generation and testing of an elutriate to characterize the armored cap material and evaluate the potential for reuse as part of the RA. During the December 17, 2019 TWG Meeting, the EPA requested that the scope be revised to include additional analyses of the sediment that is generated from the rinsing of the armored cap material, as well as analysis of the crushed rock itself. The revised scope was documented in a *Treatability Study Work Plan Refinement Notice*, submitted January 10, 2020, (GHD, 2020a) and approved by the EPA on January 17, 2020 (EPA, 2020a).

Composite samples of the armored cap material were collected from three different locations in the Northern Impoundment (the west side of the impoundment, the east side of the impoundment and the bermed areas). The sample locations included submerged and non-submerged areas, and the samples were collected only from areas in which a geotextile and/or geosynthetic liner separates the rock from the waste material. Two five-gallon buckets of armored cap material were collected per composite sample area. All treatability activities were performed at the GHD Treatability Lab. Approximate locations of the armored cap material samples are shown on Figure 3-5.

The elutriate was generated by mixing the armor rock with deionized (DI) water at a ratio of 1:5, agitating the mix for 30 minutes before removal of rock, settling the solids in the supernatant water for one hour, and finally, centrifugation of the supernatant water. The resulting elutriate water was then analyzed for dioxins and furans using EPA Method 1613B.

The settled solids from the containers comprising the same armored cap material sample, as well as any solids that resulted from centrifugation of the respective rock water, were combined and sent to the laboratory for analysis of dioxins and furans.

The armored cap material that was washed during the elutriate testing was crushed using a rock crusher and the crushed material from the three separate armored cap locations was analyzed for dioxins and furans.

Armored Cap Treatability Testing Results

No dioxins or furans were detected in any of the elutriate samples above their MLs. Similarly, all $TEQ_{DF,M}$ results from the solids that were washed from the rocks and of the crushed rocks, themselves were below the 30 ng/kg clean-up level. These data are shown in Table 3-5. Analytical laboratory reports are included as part of Appendix C.

3.6 Additional Treatability Testing

Treatability activities performed prior to the submittal of the 30% RD and summarized in the previous sections of this 90% RD, were designed to evaluate the water treatment process for the pump-and-treat approach where water generated from the RA would be stored in aboveground tank(s) and then treated. The 30% RD described an alternate remediation approach (Approach B) that was being considered for the Northern Impoundment. Water treatment under this approach would have included water treatment technology similar to that of the pump-and-treat approach except that water would be treated in-situ in a flooded excavation cell via a recirculation and filtration process. The feasibility of the Approach B excavation methodology hinged on the success of the Approach B water treatment methodology.

ED_014247_00001351-00042

As described in the 30% RD, additional treatability testing was proposed to evaluate the effectiveness of the Approach B water treatment methodology. In addition, a field filtration test was proposed to evaluate operation of an absolute filter for the reduction of dioxin and furan concentrations in the clarified and sand-filtered contact water that remained on-site following the 2019 field pilot testing.

The planned treatability testing was summarized in an *Additional Treatability Testing Notice* submitted to the EPA on April 16, 2020 (GHD, 2020b). Comments were received from the EPA on May 5, 2020 (EPA, 2020c). The EPA's comments were addressed in the *Revised Additional Treatability Testing Notice* (Revised Notice; GHD, 2020c), submitted to the EPA on June 4, 2020. The Revised Notice was approved by the EPA on June 11, 2020 (EPA, 2020d). In response to revisions that were requested by the EPA during a call on October 9, 2020, a *Refinement Notice - Revised Additional Treatability Testing Notice* was submitted to the EPA on October 15, 2020 (GHD, 2020f)

The two treatability testing scopes included in the Revised Notice were conducted in 2020. In addition, some supplemental filtration confirmation testing was performed in October 2021. The results of these three treatability scopes are presented in the following sections.

3.6.1 Field Filtration Testing

As described in the Revised Notice, a field filtration testing was conducted on May 28, 2020, at the Northern Impoundment to further refine the filtration design requirements (specifically the use of nominal versus absolute filters) evaluated in the initial October 2019 field pilot testing. Absolute filters provide a higher removal efficiency than nominal filters at the same pore size. Therefore, the use of absolute filters was expected to provide more efficient removal of dioxins and furans than the nominal filters.

The May 2020 field filtration testing consisted of filtration of contact water that had previously been clarified and sand filtered during the October 2019 field pilot testing through absolute filters.

The primary objectives of the field filtration testing were to:

- Evaluate water quality using 1 µm and 0.5 µm absolute filters.
- Evaluate the operating costs of 1 µm and 0.5 µm absolute filters.
- Evaluate which pore size filter is more appropriate for the application, based on operational efficiency.

3.6.1.1 Field Filtration Testing Process

The field filtration tests were conducted in May 2020.

ProAct, a subsidiary to Evoqua, provided a modular filtration system containing both 1 µm and 0.5 µm absolute filters with a design flow of 80 to 100 gpm. Filtration tests were conducted in one day over the course of ten hours. Prior to filtration, turbidity was measured in the filter feed tank while mixing until readings stabilized, indicating that tank contents were sufficiently mixed and solids were adequately suspended. Flow was then passed through the filter housing with no bag filters so that influent samples could be collected.

The 0.5 µm absolute bag filter was placed inside the housing and then flow was passed through the filter, during which time flow and differential pressure across the filter were continuously monitored. After approximately 35 minutes, flow through the 0.5 µm filter was stopped, and the test was repeated with the 1 µm absolute filter. Again flow and differential pressure were continuously monitoring across the filter. The 1 µm filter test ran for approximately 25 minutes before the volume of water available was expended.

Samples of influent (i.e., the previously sand filtered and clarified contact water), filtrate through 0.5 µm filter, and filtrate through 1.0 µm filter were analyzed for water quality parameters. Parameters of interest were total dioxins and furans, TSS, total metals, and dissolved metals (field filtered).

ED_014247_00001351-00043

3.6.1.2 Field Filtration Test Results

Flow and differential pressure measurements for the 0.5 µm and 1 µm absolute filters were plotted versus time and then extrapolated over a longer duration as shown on Figure 3-6.

Figure 3-6 shows that flow decreased rapidly, especially through the 0.5 µm filter, which dropped to nearly 0 gpm after 40 minutes of operation. Flow through the 1 µm filter was projected to drop by almost 20 percent after operating for 50 minutes, although this is based on limited data (due to only a limited volume of water being available to use in the testing). Differential pressure variations appear to correlate with flow variations, increasing significantly even after short operational durations. Differential pressures through the 0.5 µm filter were projected to increase to almost 30 psi after only 40 minutes of operation. Differential pressures through the 1 µm filter show a more gradual increase, but projections are based on fewer data points.

Analytical results from the influent, 1 µm filtrate, and 0.5 µm filtrate samples for parameters of interest are presented in Table 3-6.

Results show that concentrations of TSS and dioxins and furans were low in the influent water, with TCDD levels already below the MLs. As expected, filtration further reduced TSS and dioxins and furans to levels below the MLs after the 1 µm filter, with additional reduction after the 0.5 µm filter. Both filters achieved dioxins and furans concentrations below MLs. Finally, results for both total and dissolved metals showed no concentrations above the discharge criteria.

3.6.1.3 Field Filtration Testing Conclusions

Analytical results indicate that the 0.5 µm and 1 µm absolute filters achieve very low concentrations of dioxins and furans below the MLs however, the data shown on Figure 3.6 indicate that operations using absolute filters at the small pore sizes evaluated (0.5 µm and 1 µm) may cause operational difficulties, such as rapid increase in differential pressures due to filter fouling, that would require frequent filter changeout. These difficulties are addressed in the WTS design by providing a two-step filtration process after the media filters using a 10-µm filter system before the 1 µm filter system. In addition, the WTS design includes redundant 10 µm and 1 µm filtration systems in parallel, which will allow rapid change over from the duty to the standby system to reduce downtime. Subsequent filtration tests (summarized in Section 3.6.3) indicate that filters provide effective removal of dioxins and furans to below the MLs; therefore, the WTS described in this 90% RD prescribes the use of 95% efficient 10 µm and 1 µm filter cartridges or bags. Actual filtration during treatment may improve based on refining chemical addition and filter feed rates during operation.

3.6.2 Approach B Water Filtration Testing

Approach B excavation methodology considered in the 30% RD included removal of soils through a water column. Approach B in-situ water treatment would have involved adding chemicals to the water column within the barrier wall and then sending the water through a recirculating filtration system (with filter pore sizes down to 1 µm) to reduce TSS concentrations below the target level which is also expected to remove dioxins and furans.

The primary objectives of the Approach B water filtration testing were to:

- Quantify volume of soil particles that become suspended in the water after excavation.
- Determine particle size distribution and dioxin load of the suspended soil particles.
- Determine settling properties of the suspended soil particles.
- Determine time needed for the filtration system to reduce TSS of the water column to acceptable levels.
- Evaluate effects of adding polymer to the water column containing suspended soil particles.
- Evaluate polymer/coagulant mix required to condition soil for filtration and the design parameters for this filtration.

3.6.2.1 Approach B Water Filtration Testing Process

The Approach B water filtration tests were conducted in the GHD Treatability Lab in Niagara Falls, New York from October 2020 through January 2021. Test activities included the following steps:

- Two (2) tanks with sampling ports were constructed to simulate the water column in the excavation cell. The two tanks were used to run parallel tests as follows:
  - Tank #1 tests evaluated treatment effectiveness with the addition of coagulant and polymer.
  - Tank #2 tests evaluated treatment effectiveness without any chemical addition.
- A slurry was prepared with simulated river water and waste materials collected from the Site.
- The slurry was added to each tank and then solids were allowed to settle to mimic an in-situ water column.
- Excavation was simulated in the tanks to reagitate the solids.
- Chemicals, including coagulant and polymer, were added to facilitate setting and filtration.
- After chemical addition, solids were allowed to settle in the tank. Supernatant was sampled for TSS.
- Solids were resuspended then recirculated through a series of filters with decreasing pore sizes down to 1 µm. For this test, Geotube® fabric was used for initial filtration to remove larger particles of TSS and mitigate clogging of the subsequent finer filters.
- Filtrate was then collected for analysis of general chemistry parameters, specifically dioxins and furans.

3.6.2.2 Approach B Water Filtration Testing Results

After simulating the excavation within the water column in the tanks, settling tests showed that the chemical addition increased the rate of solids settling, reaching low levels of TSS and turbidity within three hours of settling as compared to more than 24 hours of settling that was required without chemical addition. However, results from both tests produced supernatant with dioxins and furans still above the MLs.

Geotube filtration tests showed that chemical addition improved TSS removal, reducing TSS in settled supernatant by 90 percent as compared to 50 percent without chemical addition. Recirculation filtration of Geotube filtrate did not remove TSS as much as expected based on calculations using Geotube filtrate particle size distribution. Figure 3-7 shows the actual versus expected TSS values over the time of the recirculation filtration.

After recirculation tests were completed, the solids were mixed to simulate the full-scale operation excavation that would be conducted while recirculating the water column through filters. Particle size distribution was evaluated on samples from both tanks after completion of the recirculation tests and after simulating excavation.

Results showed that there was some decrease in solids particle sizes after excavation simulation, suggesting that excavation activities along with recirculation breaks down particles to sizes that may pass through filtration, even after chemical addition. Additionally, larger particle sizes were observed in the tank where chemicals were added, indicating that chemical addition effectively increases particle sizes of the solids.

Water in the tanks after recirculation testing was analyzed for dioxins and furans. Data show that a series of recirculating filters did not reduce dioxins and furans as expected/calculated. Analysis of dioxins and furans in the filtrate water from each filter size showed significant reduction in dioxin/furan concentrations. However, filtrate through even the smallest 0.1 µm filter did not achieve dioxins and furans below the MLs, compared with previous tests on the pump-and-treat methodology that achieved dioxins and furans below the MLs after a 1 µm filter (Section 3.4.3.). Analytical results from these tests are shown in Table 3-7.

Further review of the particle size distribution test results showed that the majority of particulates containing dioxins and furans are between the sizes of 10 and 41 µm; therefore, it was expected that the filtration through the 10 µm should have produced filtrate with dioxins and furans close to or below the MLs. Inadequate removal of dioxins and furans observed during recirculation testing suggests that the mixing energy imparted from recirculation may break down solids into smaller sizes that can pass through a 0.1 µm filter and allow breakthrough of dioxins and furans in the filtrate.

3.6.2.3 Approach B Water Filtration Testing Conclusions

Treatability testing showed that the Approach B in-situ water treatment approach is not effective. This is due to challenges in mixing in order to keep solids in suspension to allow for effective removal via filtration.

ED_014247_00001351-00045

Based on these results, this approach was eliminated as an option for the WTS and was not carried forward in this 90% RD.

3.6.3 Additional WTS Treatability Testing

Following the Approach B water filtration testing which demonstrated that in-situ filtration methodology was not effective, the design shifted to focus on a dry excavation and pump-and-treat aboveground WTS.

The WTS design included herein includes pumping contact water from the excavation area to a separate aboveground WTS utilizing chemical treatment (i.e., coagulation/flocculation) followed by filtration and activated carbon treatment to reduce the TSS below the target level, which would be expected to also remove dioxins and furans. Previous filtration testing of contact water from the site showed that filtration through a 1 µm filter reduced solids to achieve dioxins and furans concentrations below MLs (Section 3.4.3).

Certain tests that had been conducted in previous testing (including polymer addition and settling) were not applicable to the design of the WTS process, as they had been conducted to evaluate the Approach B methodology. As such, to verify the effectiveness of the treatment process included in this 90% RD and to evaluate its operational feasibility, additional WTS treatability testing was conducted.

The primary objectives of the additional WTS treatability testing were:

- Determine particle size distribution and dioxin load of the suspended soil particles.
- Determine settling properties of the suspended soil particles.
- Evaluate polymer/coagulant dosages required for effective setting and filtration.
- Develop design parameters for the chemical addition and filtration processes.

3.6.3.1 Additional WTS Treatability Testing Process

The additional WTS treatability testing was conducted at the GHD Treatability Lab in Niagara Falls, New York in October 2021. Test activities included the following steps:

- Contact water was prepared using simulated precipitation water and waste material collected from the site during the SDI activities.
- The contact water was added to a tank and then solids were allowed to settle.
- Chemicals were added to facilitate setting and filtration.
- After chemical addition, solids were allowed to settle in the tank. Supernatant was pumped to a separate tank and sampled for TSS.
- Supernatant was then sent through a series of filters with decreasing pore sizes to simulate the filtration included in the design of the WTS.
- Filtrate was then collected for analysis of general chemistry parameters, specifically dioxins and furans.

3.6.3.2 Additional WTS Treatability Testing Results

Supernatant from initial one-hour settling tests had high TSS and concentrations of dioxins and furans well above the MLs. Chemicals were added to facilitate solids settling; 100 mg/L of polyaluminum chloride coagulant and 25 mg/L of polymer were added. After chemical addition, settling times decreased, with the majority of solids settling after five minutes. Supernatant from settling after chemical addition was then filtered through 5 µm and 1 µm filters. TSS and dioxins and furans were analyzed after each treatment step with results shown in Table 3-8.

Results showed that filtration achieves very low concentrations of dioxins and furans, with concentrations of all congeners below the MLs, using a 5 µm filter with chemical addition.

Because dioxins and furans are organic compounds, GAC is being included in the treatment process downstream of the 1 µm filter to remove residual dioxins and furans prior to discharge. TOC concentrations were measured in the

ED_014247_00001351-00046

5 µm and 1 µm filtrates at 21 mg/L and 19 mg/L, respectively. These are relatively low concentrations that maintain the ability of the GAC to adsorb residual dioxins and furans prior to discharge.

3.6.3.3 Additional WTS Treatability Testing Conclusions

The additional WTS treatability testing confirmed that the pump-and-treat WTS process included in the RD will successfully remove dioxins and furans to levels below MLs and will meet all TSWQS for discharge. This testing also indicated that chemical addition followed by the use of a 5 µm filter is effective in removing an adequate amount of solids to achieve the target dioxin and furan concentrations, with 1 µm filtration and GAC provided as an additional SF for water treatment prior to discharge. Settling tests indicated that the addition of 100 mg/L of coagulant followed by 25 mg/L of polymer was the most effective at achieving solids settlement prior to filtration.

Based on these results, the design of the optimized WTS is further outlined in Section 5.8.

3.7 Treatability Study Conclusions

Waste Material

- Characterization results for the Northern Impoundment waste material samples collected during PDI-1, PDI-2, and SDI indicate that the waste material is non-hazardous and is not subject to regulation under RCRA. This position was detailed in a Waste Characterization Letter, submitted to the EPA on October 20, 2020 (GHD, 2020g) and approved by the EPA in a letter dated November 19, 2020 (EPA, 2020h). In addition, the characterization results from the SDI suggest that the waste material should meet criteria for disposal in a Texas Class II landfill.
- Solidification testing on waste material samples indicates that an addition of a low dose (2 to 10 percent) of Portland cement will allow the removed waste material to meet landfill paint filter and compressive strength requirements.

Water

- Results of the particle size analysis and filtration testing of both simulated contact water and filtered effluent indicate that dioxins and furans in water are primarily associated with the level of TSS in the water. TSS and turbidity demonstrated potential to serve as an indicator parameter for dioxins and furans that can be measured real-time in the field.
- The results of the 2019 bench-scale testing show that filtration with a 1 µm filter can reduce concentrations of dioxins and furans in the contact water to below the ML. Further testing in the 2021 Additional WTS Treatability Testing suggest that filtration with a 5 µm filter with chemical addition can reduce concentrations of dioxins and furans to levels below the ML. Further evaluation of the use of a 5 µm filter in lieu of a 1 µm filter may be warranted depending upon the long-term operational performance of the 1 µm filter.
- Treatment of simulated contact water by clarification and filtration resulted in an effluent that meets the discharge criteria established by the EPA. The success of the treatment process and methodology was corroborated through the implementation of parallel bench-scale tests conducted in 2019 and 2021. This technology has been selected to be advanced in the RD for water treatment. The treatment process will be designed in accordance with EPA correspondence to Respondents dated February 18, 2020, (EPA, 2020b) which stated that "if an effluent sample analyzed for dioxin is below the ML using the EPA approved method, the sample result would be identified as non-detect and the discharge would be determined to be in compliance with the ARAR."
- In-situ recirculation water treatment methodology (Approach B) was unsuccessful at achieving an effluent that met the TSWQS. This methodology has not been carried forward in the RD.
- Solids in the clarifier underflow will likely require further settlement to produce a concentrated stream for solidification. The settled solids from the clarifier can be solidified with doses as low as 20 percent Portland cement if mixed with waste material in a 1:1 waste material to settled solids ratio.

ED_014247_00001351-00047

Armored Cap Material

- No dioxins or furans were detected in any of the armored cap elutriate samples above their MLs. Similarly, all $TEQ_{DF,M}$ results from the sediment that was washed from the rocks and the crushed rock samples themselves were below the 30 ng/kg $TEQ_{DF,M}$ clean-up level. These results support the proposed reuse of the existing armored cap material during or after execution of the Northern Impoundment RA.

4. Applicable or Relevant and Appropriate Requirements (ARARs)

Compliance with ARARs does not include formal submission of permit applications to the agencies for permits or approvals. Instead, information sufficient to demonstrate compliance at the Site with the relevant ARARs will be presented to the EPA and coordinated with other agencies.

The EPA recognizes the following three types of ARARs:

- ***Chemical-Specific ARARs***: Chemical-specific ARARs include health- or risk-based numeric limits or methods that establish the acceptable amount or concentration of a chemical that may be found in or discharged to the environment.
- ***Location-Specific ARARs***: Location-specific ARARs include limits on allowable concentrations or on activities associated with hazardous substances solely because they occur in special locations.
- ***Action-Specific ARARs***: Action-specific ARARs include technology- or activity-based requirements or limitations on actions involving the management of hazardous substance.

As part of the RD, and since the submittal of the 30% RD, focused efforts have been made to engage with the relevant regulatory stakeholders that may have interest in the Northern Impoundment RA to make them aware of the anticipated scope of the RD and to ensure that all substantive permit requirements are identified for purposes of this 90% RD. These efforts at engagement included meetings between the Respondents and the EPA with the following agencies: TCEQ, USACE, United States Coast Guard (USCG), TxDOT, Port of Houston Authority (POHA), Harris County Flood Control District (HCFCD), Harris County Pollution Control, and the Coastal Water Authority (CWA). Applicable regulatory requirements along with project-specific comments that explain how these regulations apply to the project, and how the RD and RA will comply with the regulations are summarized in Table 4-1. Table 4-1 addresses each of the ARARs identified in the ROD and certain additional ARARs applicable to the Northern Impoundment RD. In addition, several supporting documents are included in Appendix D, as referenced in Table 4-1.

5. Remedial Design

This Section provides an overview of the remedial approach for the Northern Impoundment to implement the remedy selected in the ROD and outlines the corresponding RD components, including the following:

- Excavation.
- Engineered Barrier BMP.
- Water Management.
- Transportation and Disposal.
- Monitoring and Controls.
- Technical Uncertainties that remain.

5.1 Remedial Design Background

The remedy selected for the Northern Impoundment, as outlined in the ROD, includes the excavation and off-site disposal of waste material located beneath the TCRA armored cap such that the resulting surface is below the prescribed clean-up concentration of 30 ng/kg $TEQ_{DF,M}$. As described in the ROD, the selected remedy is to utilize a BMP, such as a cofferdam, to isolate the excavation area from the river.

At the time that remedial alternative was selected, the only subsurface data available had been collected during the RI in 2011 and 2012. At the time the ROD was issued, eight soil borings had been installed from elevations ranging from -7.6 ft to -22.7 ft NAVD88. As part of the RD process, 71 additional subsurface soil borings were installed in the Northern Impoundment at deeper elevations up to -35 feet NAVD88. Analytical results from these borings have further defined the vertical and horizontal extent of material located beneath the TCRA armored cap and have significantly increased the volume of waste material to be excavated from the volume and depth estimates that was the basis for the ROD.

The selected remedial alternative in the ROD was based on an expected excavation with an average depth of approximately -8 ft NAVD88. However, results from the PDI and SDI indicate that the actual excavations necessary to remove materials exceeding 30 ng/kg $TEQ_{DF,M}$ are significantly deeper, ranging up to an elevation of -28 ft NAVD88. Furthermore, based on geological and geotechnical data collected during the SDI and not available at the time the ROD was selected, some of the deeper excavation elevations pose a significant risk of hydraulic heave if the remedy is conducted as stated in the ROD (i.e., in the dry).

The following summary provides context to the transition in the RD from the 30% RD submitted in May 2020 (GHD, 2020d) to the RD included in this 90% RD and the need for the northwest corner to be addressed in a subsequent submission.

Approach B Water Treatability Testing

During a TWG Meeting in February 2020, newly obtained PDI-2 data was discussed which showed that material exceeding the ROD clean-up level extended to depths that were significantly deeper than were previously understood. It was further explained that utilizing traditional excavation methodology in dry conditions (referred to as "Approach A" in the 30% RD) would pose significant risk and technical challenges for the deeper areas within the Northern Impoundment, as excavating within the confines of a BMP, to the required depth could undermine the structural integrity of the BMP. Therefore, when the 30% RD was submitted, it included an alternative for excavation (referred to as "Approach B") in areas of deeper waste depths. This approach included installing the BMP and then removing material exceeding the clean-up level through a column of water using barge-mounted excavation equipment. As described in the 30% RD, this approach would require that prior to the end of an excavation season, the water within the BMP would be recirculated through a treatment system until it achieved the TSWQS (as demonstrated through compliance with the ML). In order to evaluate the practicality and effectiveness of this conceptual approach, additional treatability testing was proposed. This additional treatability testing was summarized in the *Revised Additional Treatability Testing Notice*, submitted to the EPA on June 4, 2020 (GHD, 2020c), and approved by the EPA on June 11, 2020 (EPA, 2020d).

The additional treatability testing, as described in the approved notice, included a bench-scale simulation of the recirculation process through a bench-scale filtration system to determine if the ML could be met. The recirculation testing was conducted by the GHD Treatability Laboratory in Niagara Falls, New York from November 2020 to January 2021. As summarized in Section 3.6.2, treatability data indicated that after 16 days of recirculation the TSS reduction had plateaued at around 500 mg/L and the resulting dioxin and furan concentrations remained above the ML.

As presented during a TWG Meeting in December 2020, based on the results of the recirculation testing, Approach B water treatment was deemed technically infeasible for full-scale application during the RA. Since the water treatment for Approach B was shown to be technically infeasible, Approach B excavation methodology was also deemed technically infeasible. As a result, the design process was again significantly altered to focus on performing all

ED_014247_00001351-00049

excavation work "in the dry." As such, additional data, including full vertical delineation and geotechnical data along the revised BMP alignment, was required to evaluate the feasibility of excavating the deeper areas "in the dry."

Supplemental Design Investigation

A major uncertainty identified in the 30% RD was the constructability of the BMP wall. Even with the assumption that the majority of the Northern Impoundment would be excavated through a column of water, the required BMP design included in the 30% RD was extremely robust and was arguably technically infeasible. The pile types necessary would have been 5.5-ft diameter tubular pipe piles and double I-beam piles, driven to tip depths as deep as -93 ft NAVD88 into Beaumont Sand layer. Significant concerns were identified in the Northern Impoundment 30% RD about the ability to successfully drive and/or remove the piles. Given these concerns and the poor performance of the Approach B water treatability testing, following the submittal of the 30% RD, the design team began evaluating other BMP types and excavation methodologies that could overcome these limitations. An optimized BMP design was identified. The optimized BMP design includes a double wall system that allows for shallower embedment depths than the single cantilever wall proposed in the 30% RD. The double wall in this optimized design is further offset, except in limited circumstances, by a minimum of 30-ft from the area of excavation than the BMP described in the 30% RD to increase the structural stability of the BMP system.

Previous investigations had not included collection of data regarding soil properties and stratigraphy in the areas of the new BMP wall. Given the modified alignment of the BMP, the Respondents and EPA agreed that it was necessary to collect additional analytical data to more fully delineate the waste material and geotechnical data to better understand the soil properties and thickness of the shallow stratigraphy in locations in and near the proposed conceptual BMP alignment. With the change in excavation methodology, an additional risk that needed to be evaluated was the potential for hydraulic heave.

The SDI was performed in the summer of 2021 to supplement the delineation of the vertical extent of material requiring excavation and to provide information to aid in designing a structurally robust BMP, potentially capable of withstanding forces associated with excavation in the deeper areas of the Northern Impoundment.

Risk of Hydraulic Heave

The SDI was conducted from June through September 2021 in accordance with the Revised SDI Work Plan, submitted to the EPA on May 21, 2021 (GHD, 2021c) and approved by the EPA on June 4, 2021 (EPA, 2021c). The investigation included the installation of 35 analytical soil borings, 17 geotechnical borings (13 CPT soundings and four instrumented boreholes). Data from the SDI indicated that impacted material above the clean-up level was at deeper elevations than previously understood, with impacts as deep as -28 ft NAVD88 in the northwest corner. Based on these deeper impacts, a focused evaluation was conducted to assess the potential for hydraulic heave while excavating to target depths of known impact. The technical evaluation regarding hydraulic heave was discussed with the EPA, USACE, and TCEQ in detail during the October 19, 2021, November 16, 2021, and December 14, 2021, TWG Meetings. It was documented in the Hydraulic Heave Analysis Report submitted to the EPA on December 9, 2021, (GHD, 2021i) and written correspondence to EPA dated December 22, 2021 (GHD, 2021j). The Hydraulic Heave Analysis Report is included as part of Appendix B.

Based on this evaluation, it was determined that there are several areas across the Northern Impoundment in which there would be significant risk of hydraulic heave if material were to be removed to the currently estimated elevations of impact. Figure 5-A, below, shows the areas across the Northern Impoundment that are at risk of hydraulic heave. The figure has been color-coded to indicate how many additional feet (if any) could be excavated before hydraulic heave becomes a significant risk (SF < 1.25). Areas shown in white indicate areas that would be at risk of hydraulic heave if waste material is removed to the elevations of deepest impact. Red shading indicates areas in which an additional one foot of excavation (as could be required based upon post-excavation confirmation sampling) would put the area at risk of hydraulic heave. Red-orange shading indicates areas in which excavating an additional one to two feet would put the area at risk, and so on.

ED_014247_00001351-00050

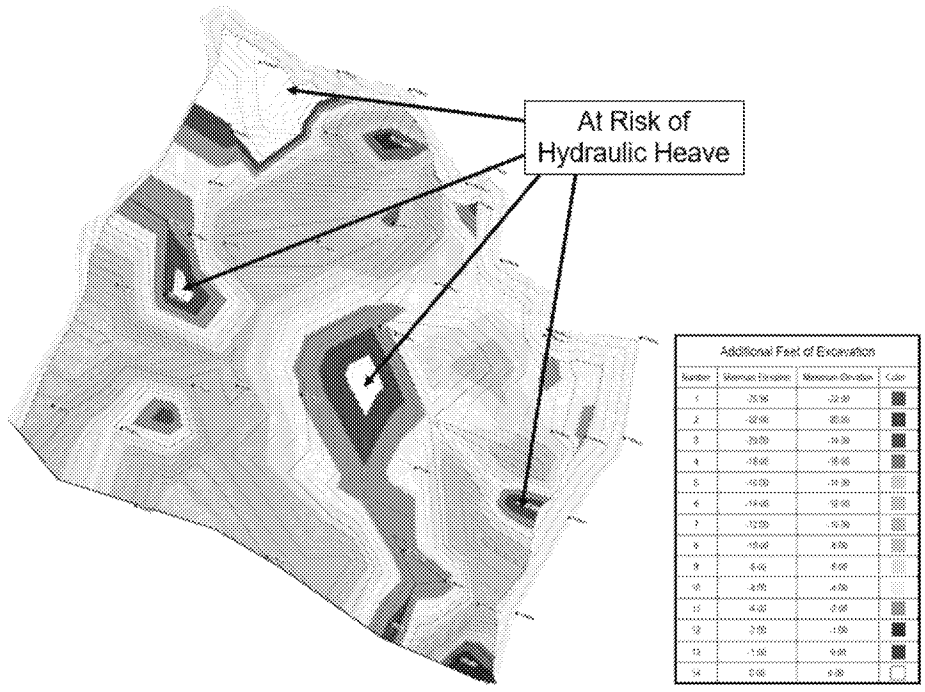


Figure 5-A Risk of Hydraulic Heave

Based upon the results of this evaluation, it was determined that it is not technically feasible to excavate the material in the northwest corner to the currently known depths in the manner required by the ROD. As previously mentioned, due to the risk of hydraulic heave, if excavation is performed "in the dry," the design of the northwest corner of the Northern Impoundment is technically impracticable and has not been included in this RD package. Respondents have requested an extension with respect to the submission of a 90% RD for the northwest corner and anticipate that the details of the RD for that area will be addressed separately. The challenges associated with the northwest corner are further detailed in Section 5.11.

5.2 Remedial Approach

The remedial approach based on a double-wall BMP is described below. As previously mentioned, due to the risk of hydraulic heave if excavation is performed "in the dry," the design of the northwest corner of the Northern Impoundment is technically impracticable and has not been included in this RD package.

There are a number of significant outstanding technical uncertainties associated with the implementation of the RD as it is presented in this 90% RD, as detailed in the discussion of Uncertainties in Section 5.11. Some of the key challenges and potential impediments to the implementation of the 90% RD are noted in the paragraphs, below.

One challenge associated with the Northern Impoundment design is the lack of usable land from which to perform the work. A remediation effort of this magnitude requires significant space for site operations, truck staging, materials laydown, and water storage and treatment. In addition, as the RA progresses over time, the limited upland area available (on the western side of the impoundment itself) will be removed. Despite ongoing efforts over the last few years, access to a property to utilize during the RA has not yet been secured. The RA, as designed, cannot be implemented without a separate property to use as a logistical support area.

Another challenge, and potential impediment to implementation, is that the only land access to the Northern Impoundment is through the approximately 60-foot wide TxDOT right of way (ROW). The 90% RD is premised on TxDOT allowing the construction of the southern extent of the BMP wall on the ROW and for it to occupy a significant portion of the ROW for the duration of the RA. In addition, trucks used to haul the excavated waste must have unrestricted access into the BMP via the ROW, which will include the construction of a ramp up and over the BMP to

allow the trucks to enter and leave the Northern Impoundment. TxDOT is currently planning a project to replace the I-10 Bridge that would take place during the period of implementation of the RA. Given TxDOT's plans, it is unknown whether or to what extent TxDOT will provide access to the ROW or allow the southern wall of the BMP to be placed on its ROW.

It also is unknown whether the BMP's southern wall can be constructed as designed given the presence in that area of both pipelines and bridge structures (existing or planned).

Further discussion of the technical uncertainties associated with the RD is provided in Section 5.11.

Notwithstanding the above, GHD has, as required by the AOC, developed a pre-final design for the Northern Impoundment RD in order to meet the approved schedule for submission of the 90% design package for the Northern Impoundment. An overall remedial approach has been developed, in coordination with members of the TWG, and includes several fundamental elements. These elements are discussed below.

BMP Alignment and Lateral Excavation Extent

The lateral extent of the excavation for purposes of the RD is defined by the lateral extent of waste material above the 30 ng/kg $TEQ_{DF,M}$ dioxin clean-up level underneath the armored cap. The lateral extent of the planned removal is shown in green shading on Figure 5-B, below.

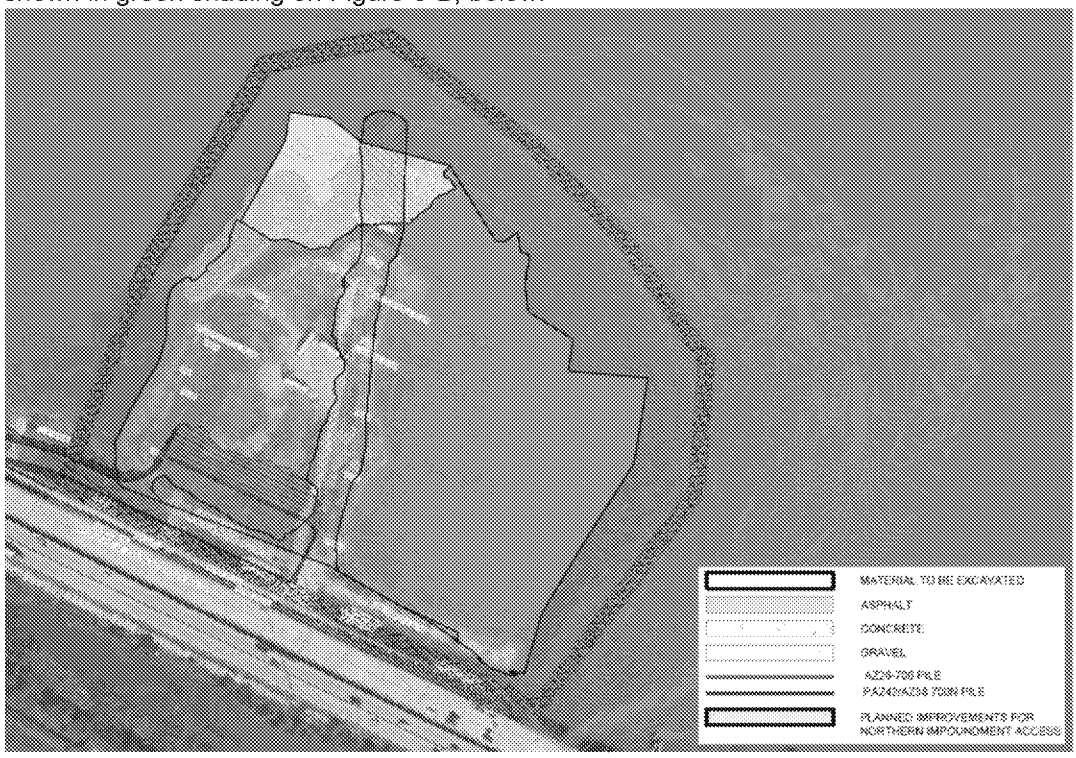


Figure 5-B ***BMP Alignment and Excavation Extent***

The lateral limits of the planned removal area also define the corresponding outer alignment of the BMP. The optimized double wall BMP system includes two parallel single cantilever walls spaced approximately 30-ft apart, connected with tie-rods and walers, and filled with aggregate.

In the 90% BMP wall design, the existing riverbed between the BMP (interior wall) and the excavation area is referred to as the "Soil Buttress." This Soil Buttress is essential to the stability of the wall and the ability to excavate to the target elevations "in the dry." In some instances, additional fill material is added to the Soil Buttress to raise the riverbed elevation and reduce the exposed height of the BMP above riverbed elevation. That additional fill is referred to as a "Raised Bench."

Along the west, north, and east sides of the BMP, the system includes at least a 30-ft wide Soil Buttress between the inner wall and the top edge of any excavation inside the BMP to support the wall system and in one section on the west side, a Raised Bench. Along the south side of the BMP, the Soil Buttress in some locations is less than 30-ft wide, due to space constraints.

This optimized wall system pushed the alignment of the BMP further out from the excavation area than the alignment considered in the 30% RD. The alignment of the BMP is shown on Figure 5-B, above. A conceptual depiction of the BMP and a conceptual cross-section of the BMP system are shown below on Figure 5-C.

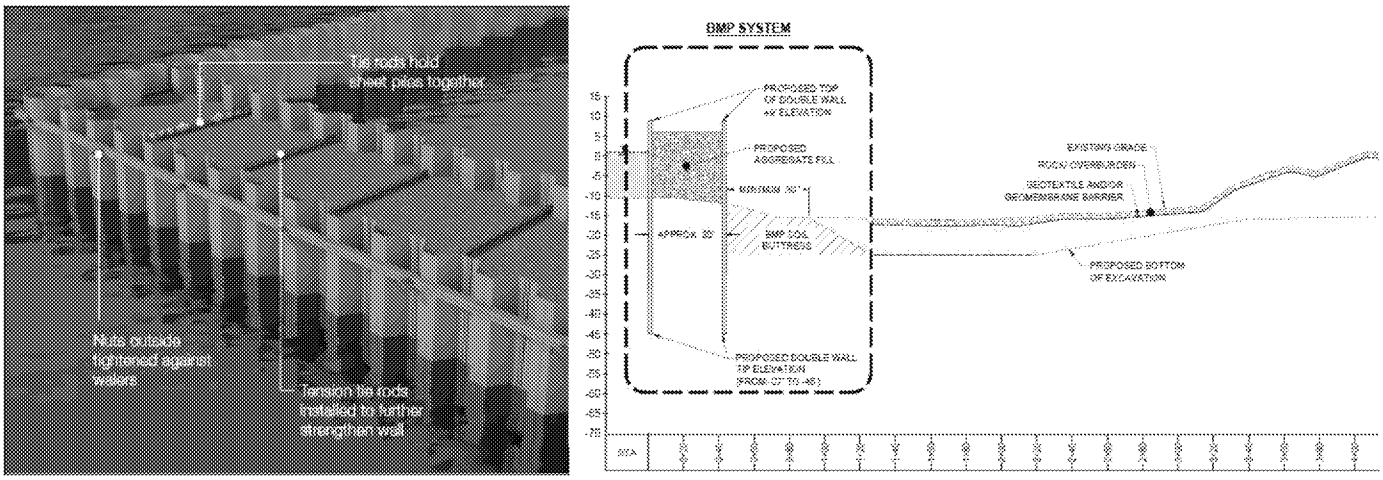


Figure 5-C ***BMP Alignment and Excavation Extent***

Seasonal Excavation, and Top of Wall Elevation

The ROD states that performing the removal of the waste material using a BMP would reduce short-term impacts, prevent any material release to the San Jacinto River during removal, and ensure compliance with ARARs. As such, to design the BMP, historical San Jacinto River water surface elevation data, dating back to 1994, was obtained and evaluated. Based upon an evaluation of that historical data, the San Jacinto River seasonally has experienced high water levels between May and October. Therefore, as a risk management measure, an excavation period of November to April was selected for use in the RD and approved by the EPA and members of the TWG during the February 19, 2020 TWG Meeting. This same excavation season had been used as the basis for the 30% RD. See Section 5.3.2 for further detail.

The historical San Jacinto River elevation data were also used to identify a top elevation for the BMP assuming that any high-water events during the planned excavation months of November to April would not exceed historical levels. Based upon the historical data, since 1994 there were no high-water events that exceeded an elevation of +9 ft NAVD88 during the period of November to April. This information is contained on Figure 5-1. Therefore, for design purposes, the top of pile elevation for the BMP was established as +9 feet NAVD88. As further detailed in Section 5.11, the use of this design top elevation will not eliminate the risk of overtopping during any of the excavation seasons, and the protectiveness of this design top elevation will need to be confirmed following receipt of modeled flow data from the CWA in relation to its planned improvement project for the Lake Houston Flood Control structure located upriver of the Northern Impoundment.

With the excavation period being limited to November through April, the excavation of the Northern Impoundment would be approached as seasonal cells - with a single cell being excavated each excavation season. The exact shape and size of the seasonal cells will not be pre-defined but will be based upon production efficiency each season. This is different than the plan proposed in the 30% RD which included pre-defined seasonal cells divided by interior barrier walls. Instead, during an excavation season, only the portion of the TCRA armored cap covering the area targeted for excavation during that season will be removed, with the rest of the TCRA armored cap remaining intact. At the end of

each excavation season, the bottom of the seasonal cell will be confirmed clean and the exposed slope between that seasonal cell and the remaining TCRA armored cap will be covered with a cap, consistent with the design used during the TCRA. Following capping of the exposed slope, the Northern Impoundment may be intentionally flooded with river water to off-set the forces acting on the BMP and to prevent uncontrolled overtopping during the off-season in the event of a high-water event. At the start of the next excavation season and prior to the initial excavation season, the river water inside the Northern Impoundment BMP will be returned to the river and the process will start again.

A conceptual visualization of the overall project sequencing, including a potential seasonal cell layout is included on Figure 5-D, below. Although the design for the northwest corner is not included in this 90% RD and will be addressed separately, it is important to note that the early completion of the RA in the northwest corner is critical to the overall sequencing of the project. This 90% RD has been prepared to be "implementable" as designed excluding the northwest corner, but in reality, the northwest corner would likely need to be completed in the first excavation season due to access issues and bathymetric conditions. If the other areas of the Northern Impoundment were completed first, it would eliminate land access to the northwest corner and make it very difficult to complete a remedy in that area. Completing the northwest corner first would also be appropriate due to the deep bathymetry in that area and the implications of that deep bathymetry on water management. The Final 100% RD will combine the separate plans for the northwest corner with the RD for the remainder of the Northern Impoundment.

Including the northwest corner, it is anticipated that the RA excavation activities could be completed in 5 seasons, however this is subject to EPA's approval of the use of area-based average concentrations to define the excavation bottom, as discussed below under Excavation Approach and in Sections 5.3.4, along with complexities of the required confirmation sampling program. The planned number, size, and configuration of the cells are flexible and may change based upon the following factors:

- ***Volume and Removal Rates*** -The tentative cell sizes ensure that the volume of planned removal from within each cell could be achieved within the excavation period of November through April.
- ***Excavation Depth*** - Depending upon the results of post-excavation confirmation sampling, the depths of the seasonal excavations could increase, which may, in turn, limit the area effectively excavated in that season.
- ***Access and Implementability*** - The tentative seasonal cells assume sustained access to each area for necessary excavation equipment and trucks.
- ***Transportation and Disposal*** - The target seasonal production rate used to define the tentative cell sizes is dependent on the ability to efficiently and consistently load out waste material and transport it to an offsite landfill, an activity which, as addressed above, requires full access to the TxDOT ROW and I-10.

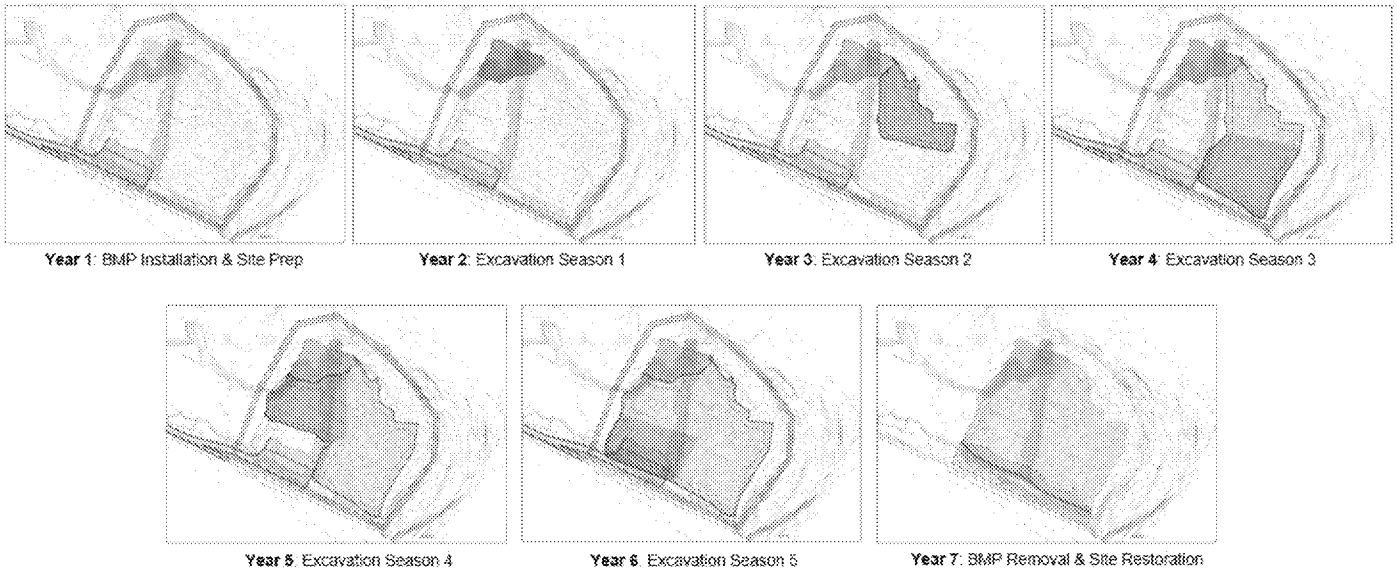


Figure 5-D Conceptual Project Sequencing

ED_014247_00001351-00054

Excavation Approach

As discussed above, results from the PDI and SDI indicate that the extent of waste material is significantly deeper in many parts of the Northern Impoundment than was known at the time the ROD was issued. This results in many areas of the Northern Impoundment being at risk of hydraulic heave if they are excavated (as shown on Figure 5-A). While this risk is most pronounced in the northwest corner, there are several other areas outside the northwest corner that are also at risk of or are sensitive to hydraulic heave if further excavation is necessary based upon post-excavation confirmation sampling results. As an attempt to overcome this limitation, the target excavation elevations included in this RD are based on implementing the target clean-up level (30 ng/kg $TEQ_{DF,M}$) on an area-based average concentration rather than a point-by-point basis.

The general premise underlying the use of average concentrations is that estimates of risk, which are the basis of action for the ROD, are based on exposures to conservative estimates of the average concentrations of a chemical. When human health risk assessments are conducted, risk is not characterized based on exposure to a single concentration of a chemical. It is instead assessed based on exposure to a concentration that represents an average of the concentrations to which an individual is exposed over time. This is a fundamental principle of risk assessment and risk management. As such, it is technically appropriate to apply the excavation clean-up level for the Northern Impoundment on an area-based average concentration and not on a point-by-point basis.

A detailed risk analysis that supports the use of area-based average concentrations is included as Appendix E. A presentation regarding this approach was made during a TWG Meeting on November 16, 2021. The same methodology used to establish the target excavation elevations that are detailed in the FSP (Appendix J, Attachment 3) and in Section 5.3.4 are summarized, below.

Using the abundant analytical data that has been collected at the Northern Impoundment over the years, a target excavation surface has been developed using calculated area-based average concentrations for all of the Northern Impoundment (excluding the northwest corner). The excavation surface was developed utilizing several guiding principles:

- Material cannot be removed below the elevation with a SF protective of hydraulic heave (1.25), no matter what the concentration.
- Target excavation depths/elevations were identified across the Northern Impoundment such that the resulting surface will meet the clean-up level of 30 ng/kg $TEQ_{DF,M}$ on a site-based average basis.
- A not-to-exceed threshold value of 300 ng/kg was applied (unless there is a risk of hydraulic heave). The concentration of 300 ng/kg was identified in the ROD as the Principal Threat Waste (PTW) concentration - ten times the 30 ng/kg clean-up level.

Applying these principles, an excavation surface was developed across the Northern Impoundment that should be implementable, mitigates hydraulic heave risk (except in the northwest corner), is protective of human health and the environment, is consistent with the methodology used to develop the clean-up standard outlined in the ROD, and would result in an exposed surface that is below the clean-up level on an area-based average basis. Figure 5-E, below illustrates the benefits of this excavation approach relative to the risk of hydraulic heave. In comparison to Figure 5-A, when the design excavation surface is compared to the hydraulic heave risk elevations, the "hot spots" of hydraulic heave sensitivity are eliminated or greatly reduced in size (with the exception of the northwest corner which will require a different remedial approach).

ED_014247_00001351-00055

Figure 5-E Hydraulic Heave Sensitivity

Table 5-1 presents the design excavation elevations at all the borings (other than those located in the northwest corner) using the area-based average approach and Table 5-2 presents the rationale for these elevations. This excavation surface (which does not include the northwest corner) results in approximately 168,000 CY of total volume removed, which accounts for an estimated 99.82 percent of the total mass of dioxins above the clean-up level calculated to be present beneath the TCRA cap (excluding dioxins present in the northwest corner). This excavation surface is intended to provide an indication of where the initial excavation ends (i.e., design elevations) and where the post-excavation confirmation sampling begins (i.e., base of design excavation surface); the data collected during the PDI and SDI has been used to inform this. Whether the clean-up level has been achieved would be confirmed using post-excavation confirmation sampling, as detailed in the FSP (Appendix J, Attachment 3) and in Section 5.6.4.

Excavation Methodology

The approach would include (1) installation of a physical BMP around the perimeter of the Northern Impoundment, (2) return of river water back to the river prior to removal of the TCRA armored cap, (3) removal of the waste material with land-based excavation equipment working within a seasonal cell, removing the TCRA armored cap as work progresses (while leaving in place the portions of the TCRA armored cap not being excavated), (4) placing an engineered cap over the exposed slope of the seasonal cell excavation at the end of each excavation season, and (5) flooding the impoundment with river water for the duration of the off-season. A conceptual illustration of the excavation methodology is shown on Figure 5-F.

ED_014247_00001351-00056

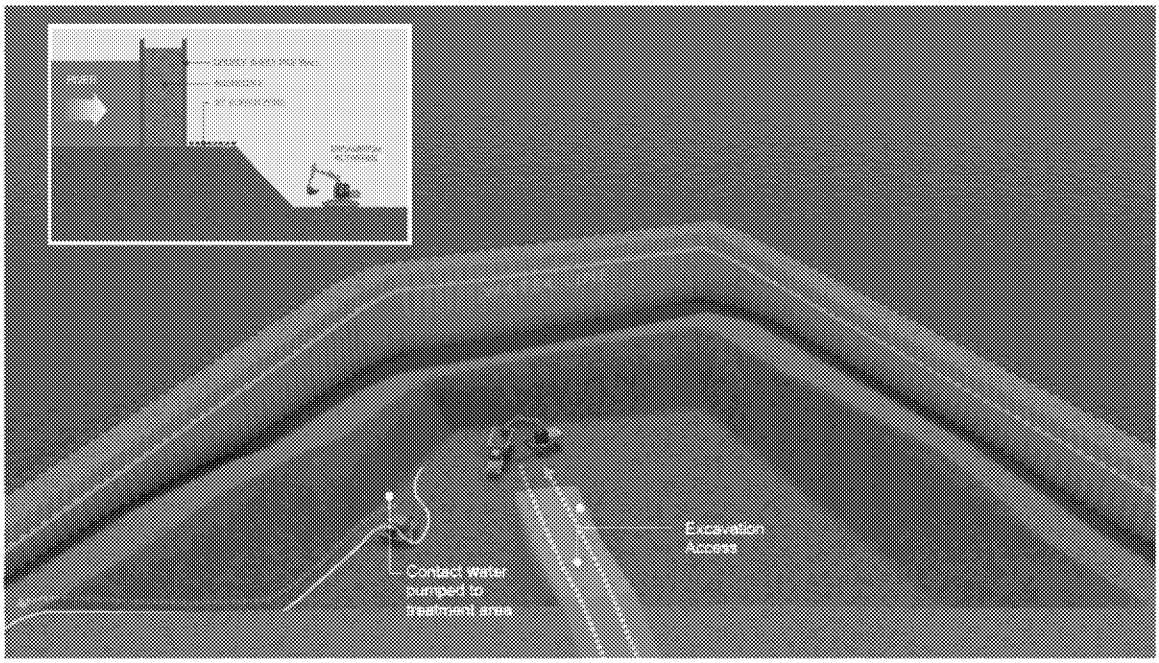


Figure 5-F Conceptual Excavation Methodology

Water Management

Following installation of the BMP, and at the beginning of each excavation season, river water trapped behind the BMP wall will be returned to the river. During the RA, any infiltration or stormwater that accumulates in an open excavation will be pumped to on-site water storage tanks, treated through clarification and filtration, and then discharged to the river.

Re-Use of TCRA Armored Cap and Historic Berm Material

The Northern Impoundment is currently covered by an armored cap comprised of 6- to12-inch diameter rock on top of a low-permeability geomembrane and/or geotextile barrier, and/or ACBM. As described in Section 3.5, treatability testing was performed on the TCRA armored cap material and results demonstrated that the rock, its elutriate, and sediment generated from its elutriate did not exhibit dioxin concentrations above the ML (as defined in Section 3.4.1) or the clean-up level of 30 ng/kg $TEQ_{DF,M}$.

Prior to removal of the waste material, the TCRA armored cap rock would be removed. The TCRA armored cap rock would be stockpiled at or near the Northern Impoundment for potential reuse during or after execution of the Northern Impoundment RA.

It is anticipated that during the RA approximately 25,000 CY of unimpacted material from the historic central and southern berms at the Northern Impoundment will be excavated. Based upon characterization data from the PDI (see Figure 2-9), these berms contain native material with dioxin concentrations below the clean-up level. During the RA, this unimpacted material will be considered for reuse for various site activities, construction of site features, cover material, etc. The material will be segregated from the waste material during excavation activities, stockpiled, and sampled prior to reuse, as detailed in the FSP (Appendix J, Attachment 3).

The locations of the historic berm and the TCRA armored cap rock planned for re-use are shown on Figure 3-5.

Preliminary RA Schedule

Based on the current remedial approach, it is anticipated that the implementation of the Northern Impoundment remedy following EPA final approval of the RD would require a period of at least 7 years to complete. This 7-year period would be preceded by an initial period in which parties undertaking the RA would select an RC and engage in

steps to procure necessary materials and other resources needed to begin construction of the BMP. Following that initial period, it will then take one year to construct the BMP, followed by an estimated 5 years of waste removal (one cell per excavation season plus 1 year for the northwest corner), and concluding with an additional and final year for BMP removal, site restoration, and project demobilization. The estimated five years of waste removal is based on the assumptions described above (including with respect to EPA's approval of area-based averaging to define the excavation limits) and the ability to achieve the assumed volume and excavation rates). This schedule assumes full access to the TxDOT ROW during the entire implementation period, both to construct the BMP wall and also for purposes of ingress and egress. Limitations on the use of the ROW, which is needed for the 4,000 truck trips required each excavation season to transport the excavated material off-site and reduced production due to traffic and access issues related to an I-10 Bridge replacement project, could extend the overall project schedule.

5.3 Basis of Design

5.3.1 Historic River Level Evaluation

To design the BMP and plan for the RA, all available historical San Jacinto River elevation data dating back to 1994 was evaluated. Data evaluated included continuous monitoring data from the Sheldon gage (described below) and a United States Geological Survey (USGS) Fact Sheet which reported a major flood event in October 1994. The Northern Impoundment is subject to both tidal fluctuations, as well as increases in river level from rainfall and tropical storm events. As such, installation of BMPs requires an understanding of both the vertical range of typical water surface elevations, as well as the temporal variation in water surface elevations, based on available historical data, that would be encountered during the RA.

To evaluate these influences, GHD developed a model to create a history of water surface elevations at the Northern Impoundment by hindcasting historical water level data from an upriver USGS gage in the San Jacinto River near Sheldon, Texas (i.e., Sheldon gage). This was required as historical routine water level readings had not been collected at the Northern Impoundment, whereas the Sheldon gage has a historical record dating back to 1996. This gage is upstream of the Northern Impoundment and is subject to large increases in surface elevation due to major rainfall events in the area. Although the Sheldon gage data are indicative of trends at the Northern Impoundment, the data are not appropriate for understanding the full pattern of water surface elevations at the Northern Impoundment. Historical water surface elevations for the USGS Sheldon gage are shown on Figure 5-1.

To understand the pattern of local variation in water surface elevations, a transducer gage was installed at the Northern Impoundment during the PDI-2 (see Section 2.2.5). Data collected from the transducer provided a direct understanding of water levels at the Northern Impoundment, which could be correlated with the Sheldon gage data thereby allowing for the hindcasting of the long history of data at the Sheldon gage to the Northern Impoundment.

To hindcast the Sheldon gage data to the Northern Impoundment, synchronous observations from the Sheldon gage and the Northern Impoundment were subjected to a machine-learning model. The Multivariate Adaptive Regression Splines (MARS) algorithm was used to correlate Northern Impoundment data with the Sheldon gage. MARS is an advanced form of linear regression that allows varying relationships between dependent and independent variables across the range of the independent variable. For example, in this case the model has the flexibility to predict different correlations between the Northern Impoundment and Sheldon gage depending on the water surface elevation at the Sheldon gage. The model selects relationship terms using a generalized cross validation (GCV) method which takes the form of:

$$GCV = RSS/(N \times (1-N_e)/N^2)$$

Where RSS is the residual sum of squares of the model, N is the number of observations, and N_e is the effective number of parameters. Thus, the GCV algorithm balances minimization of RSS (which may result in an overfitted model) with parameter number (which allows more flexibility in the model).

The form of the hindcasting model for the Northern Impoundment is:

$$WSE_{SJ,t} = WSE_{SH,t} \times L_{SH,t}$$

ED_014247_00001351-00058

Where, $WSE_{SJ,t}$ is the water surface elevation at the Northern Impoundment at time *t*, $WSE_{SH,t}$ is the water surface elevation at the Sheldon gage at time *t*, and $L_{SH,t}$ is the either rising or falling limb of the hydrograph at the Sheldon gage at time *t*. The model selected three first order terms (or correlations), and also found an interaction with limb, indicating that the water level at the Northern Impoundment scales differently with the Sheldon gage depending on whether the hydrographic limb is rising or falling.

The hindcasting model was then used to hindcast water surface elevations at the Northern Impoundment using the Sheldon gage record. Figure 5-2 shows the 24-year hydrograph for the Sheldon gage and the 24-year hindcasted water surface elevations for the Northern Impoundment.

Results of the model and surface water elevations were evaluated and discussed during the December 2019, January 2020, and February 2020 TWG Meetings. Based on the evaluations and discussions, the TWG agreed on the need to complete removal activities during a specified "excavation season," and also agreed on the proposed design elevation for the top of the BMP. Both of these topics as they relate to the 90% RD for the Northern Impoundment are further discussed below.

5.3.2 Excavation Season and BMP Height

Based on the historic river elevations, the San Jacinto River seasonally experiences high water levels between May and October due to rainfall and tropical storm events. Therefore, an excavation season of November to April was selected for the RD. To allow for the removal of waste material during the low water season (between November and April), the Northern Impoundment RA work will likely be divided into five cells - with a single cell being remediated each excavation season. During the non-excavation season months (May to October) of the RA, any necessary work will be conducted to prepare for the upcoming excavation season (procurement, work area staging, and access, etc.).

The historical San Jacinto River elevation data was also used to determine a top elevation for the BMP that would be protective of high-water events (based on the available historical data) during the planned excavation season. High-water events have historically occurred between the months of May and October, as shown on Figures 5-1 and 5-2. For example, in August 2017, Hurricane Harvey made landfall in the Galveston Bay area. During this event, water surface elevation peaked at 14.28 ft NAVD88 at the Northern Impoundment. More recently, Tropical Storm Imelda caused significant flooding in September 2019, with water surface elevation peaking at 8.9 ft NAVD88 at the Northern Impoundment. For reference, the typical river stage for September at the Northern Impoundment fluctuates between 1 to 3 feet NAVD88.

Comparison of the Sheldon gage and Northern Impoundment hydrographs for both the full year (shown on Figure 5-2) and for the November to April excavation season (shown on Figure 5-3) show that excluding the months of May to October would substantially reduce the number of high-water events that could be expected, based on the available historical data. These data were reviewed with the members of the TWG during the February 19, 2020, TWG Meeting and it was agreed that excavation activities should only take place between November and April.

A comparison of the Sheldon gage and Northern Impoundment hydrographs from 1996 through 2019 show that there were no high-water events that exceeded an elevation of +9 ft NAVD88 during the proposed excavation season. The members of the TWG agreed that an excavation season of November through April each year and a top of BMP elevation of +9 ft NAVD88 would reduce the risks of water overtopping and should be protective of all events in the hydrographic record dating back to 1996 and the October 1994 flood event. As further detailed in Section 5.11, the protectiveness of this design top elevation will need to be confirmed following receipt of modeled flow data from the CWA in relation to the CWA's planned improvement project involving the Lake Houston Flood Control structure located upriver of the Site.

5.3.3 Geotechnical Conditions

A primary objective of the SDI was to collect additional geotechnical data to provide a better understanding of the geotechnical properties of the underlying substrata to support the design of the double wall BMP system. A Geotechnical Engineering Report was prepared by Ardaman & Associates Inc. and GHD, and is included as Appendix B. A brief summary of the geotechnical subsoil conditions and the BMP design is presented, below.

ED_014247_00001351-00059

The results of the SDI CPT investigation confirmed PDI-2 results and showed that the subsoils in the Northern impoundment, and particularly along the BMP footprint, are principally composed of the three following stratigraphic units:

1. Fairly heterogenous alluvium sediments consisting of a mixture of sand, silt, and clay in varying proportions, present from the riverbed to elevations ranging from -20 to -35 ft NAVD88.
2. Stiff-to-very-stiff high plasticity clay formation (Beaumont Clay) encountered starting at elevations ranging between -20 to -35 ft NAVD88.
3. Compact-to-dense sandy formation (Beaumont Sand) encountered beneath the clayey deposit at elevations ranging between -50 to -70 ft NAVD88.

Continuous profiles of different geotechnical parameters were defined from the CPT results using robust published correlations (undrained shear strength, the pre-consolidation pressure, undrained modulus, hydraulic conductivity, friction angles etc.). All CPT defined parameters were compared and validated with those measured in previous investigations.

The Northern Impoundment characteristics vary across the impoundment and necessitate evaluation of multiple sections using soil-structure interaction. The presence of the thick cohesive formation that behaves in a drained or undrained state, requires consideration of both quick and slow loading cases (Q and S cases respectively).

The soft heterogeneous alluvium deposit on the riverbed may temporarily develop pore pressure upon backfilling between the sheet piles and will increase the loads against these sheet piles. Although the design for the northwest corner is not included in this 90% RD, the design of the BMP wall includes the full extent of the wall encircling the Northern Impoundment, including the portions of the wall surrounding the northwest corner. Due to deeper mudline depth in the northwest corner, dewatering within the BMP causes a large load differential between the interior and exterior sides of the BMP. In order to mitigate these challenges, design features such as additional buttressing on the interior and staged construction of the BMP such as installing fill in multiple layers with intentional delay between layers, and selecting appropriate fill height before installing tie-rods, will be required.

Since the BMP will be driven in the alluvium and Beaumont Clay with tip depths at elevations of approximately -40 ft NAVD88, no excessive vibrations and no detrimental impact on the stability of the existing slope on the riverbed are anticipated during installation.

5.3.4 Excavation Extent and BMP Alignment

Analytical data obtained from the RI, the PDI, and the SDI were used to inform the RD and determine excavation extents and volumes and the alignment of the BMP.

Lateral Extent

As described in the EPA-approved PDI-2 Work Plan (GHD, 2019d), the lateral extent of excavation is based on analytical data. Areas with $TEQ_{DF,M}$ levels below the clean-up level of 30 ng/kg will not require excavation, as depicted on Figure 2-9. The historic central and southern berms depicted on Figure 2-9 have been shown to have levels of dioxins and furans below the clean-up level. To allow for efficient waste removal, the berm material may be excavated in conjunction with but separated from the waste material, but it is anticipated that that unimpacted berm material may be reused on-site, pending analysis, as described in the FSP (Appendix J, Attachment 3).

The double wall BMP design requires a significant lateral footprint, in addition to the 30-ft width of the wall itself. A Soil Buttress with a minimum width of 30 ft is also necessary between the inner wall and the top of the excavation slope to support the wall. To accommodate the footprint of the BMP wall and to avoid installation of the BMP wall through the TCRA armored cap, the alignment of the BMP was moved outward to fully encircle the Northern Impoundment area.

On the south side of the Northern Impoundment, SDI results indicated that waste material was much deeper than previously understood (as deep as -20 ft NAVD88 while the ROD had assumed that area was -5 ft NAVD88). As the south side of the Northern Impoundment abuts the TxDOT ROW property, there is not sufficient space to accommodate a double wall system (including a slope out of the excavation, 30-ft Soil Buttress, and double wall)

without encroaching on the TxDOT ROW property. As further detailed in Section 5.5.6, several different wall types and alignments were evaluated as part of an effort to identify a structurally sound wall with a thinner profile than the double wall system. Ultimately, the only wall-type that proved to be structurally sound for installation on the south side of the Northern Impoundment was the double-wall system, the majority of which will need to be placed on the TxDOT ROW property. Figure 5-B shows the alignment of the BMP and the extent of the excavation area.

Vertical Extent

Analytical data from the RI, PDI, and SDI were also utilized to determine the vertical extent of the waste material requiring removal. As previously mentioned, results from the PDI and SDI indicated that waste material is present at elevations significantly deeper than was known at the time the ROD was issued. During the SDI, the elevation of waste material in the Northern Impoundment was found to be as deep as -28.3 ft NAVD88 with an average depth of -12.8 ft NAVD88.

As discussed in Section 5.2 and detailed in Section 5.3.3, due to the deeper elevations of waste material and the goal to design a remedy that includes excavation "in the dry," a detailed hydraulic heave evaluation was conducted. This evaluation indicated that there are significant hydraulic heave risks in certain areas, with the most pronounced risk in the northwest corner and along the western side and in the center of the Northern Impoundment, as shown on Figure 5-D. Based on this evaluation, it was determined that the northwest corner is technically impracticable to excavate in the dry, and will need to be addressed with a separate remedial approach.

To address the hydraulic heave sensitivity in the remainder of the Northern Impoundment and to implement an approach that utilizes the same risk-based approach used to develop the clean-up standard as the basis to demonstrate compliance with it, an area-based average concentration approach was used as the design basis for the excavation contours presented in this 90% RD.

As discussed in Section 5.2, the excavation surface was developed utilizing several guiding principles:

- Material cannot be removed below the elevation with a SF protective of hydraulic heave (1.25), no matter the concentration.
- Target excavation depths/elevations were identified across the Northern Impoundment such that the resulting surface will meet the clean-up level of 30 ng/kg $TEQ_{DF,M}$ on a site-based average basis.
- A not-to-exceed threshold value of 300 ng/kg was applied (unless in locations at risk of hydraulic heave). The concentration of 300 ng/kg was identified in the ROD as the PTW concentration - ten times the 30 ng/kg clean-up level.

Table 5-1 presents the analytical data at all borings based on elevations (rounded to the nearest foot), with concentrations greater than 30 ng/kg $TEQ_{DF,M}$ indicated by bold text. In Table 5-1 a red line identifies the elevation at each boring at which there is a calculated risk of hydraulic heave, with a SF of 1.25. A green line indicates the design excavation elevation at each boring based on the criteria listed above. Table 5-2 presents the rationale for the design excavation elevations. Data from borings located within the northwest corner is included in Table 5-1 but the cells in that area have been greyed out. Data from these borings were not included in the calculations described, below.

The area-based average concentration for the post-excavation surface was calculated by assigning a polygon area to each boring (with the polygon extending approximately halfway to adjacent borings), then multiplying that area by the post-excavation surface concentration at that boring (concentration immediately below the green line in Table 5-1). The area-weighted concentrations for each polygon are reported at the bottom of Table 5-1 (shaded orange). The calculated total surface concentration was then divided by the sum of the individual polygon areas (10.64 acres) to arrive at an area-based average concentration of 23.31 ng/kg for the whole excavation area (shown in blue in the top left corner), which is below the 30 ng/kg $TEQ_{DF,M}$ clean-up level. The design excavation contours can be seen in Design Drawings C-08, C-13, C-17, C-21, and C-27 in Appendix G. As noted in Section 5.2, these design excavation elevations indicate the initial excavation depths that will be verified through post-excavation confirmation sampling. All borings located within the northwest corner, where there is a significant hydraulic heave concern, are marked with a grey tone and were excluded from the evaluation for determination of the area-based average concentration calculation.

ED_014247_00001351-00061

As seen in Table 5-1, three boring locations (SJGB010, SJGB012, and SJSB046-C1) had results above 30 ng/kg $TEQ_{DF,M}$ in the deepest sample interval collected, as seen on Figure 2-9. At these locations, the design considered the adjacent co-located borings to determine the appropriate excavation elevations to complete the excavation bottom contours.

Based on the updated area-based average excavation limits, the approximate volume of waste material in the Northern Impoundment (excluding the northwest corner) is estimated at 168,000 CY. To facilitate a seasonal excavation approach, the total volume of material will be divided into multiple cells, with a single cell excavated each excavation season.

5.4 Pre-RA Activities

5.4.1 Property Access

To implement the RA, it will be necessary to have access to approximately 8 to 9 acres of dry land to utilize for lay-down storage of equipment, water storage and treatment, office trailers and parking. It is preferred that the property(ies) be located as close as possible to the Northern Impoundment to minimize the distance over which water requiring treatment needs to be conveyed. Property access will also need to be secured for the duration of the RA, which is expected to require at least 7 years and additional time to procure and mobilize equipment and personnel. Currently, several properties located in the vicinity of the Northern Impoundment are being evaluated. The general layout of the WTS is depicted in Drawings P-04 and P-08 (Appendix G). These layouts will need to be updated with site-specific detail in future design submittals once access to a property for laydown/staging has been secured.

Implementation of the Northern Impoundment RA will also require access to and utilization of the TxDOT ROW that runs parallel to I-10. As previously mentioned, in addition to providing the only land access route to the Northern Impoundment, the southern extent of the BMP will need to be installed on the TxDOT property. Executing the Northern Impoundment RA will require that an agreement be reached with TxDOT to allow for use of the TxDOT ROW both for access and purposes of construction of the BMP. In addition, as is discussed in more detail in Section 5.11.3, TxDOT plans to replace the I-10 Bridge beginning in the next 4 to 5 years. It is currently unknown as to how TxDOT's plans may impact its ability to allow access to its ROW for purposes of the Northern Impoundment RA, but it is expected that two large construction projects taking place at the same time in such a confined area will result in additional delays.

As part of RD efforts, the Respondents have engaged with the POHA and the HCFCD to inform these stakeholders about the planned alignment and design of the BMP wall that will be present in the San Jacinto River for at least 7 years. As requested by the HCFCD, a Floodplain Drainage Impact Analysis was conducted to evaluate the effect that the BMP could have on the surrounding floodplain. Water levels in the vicinity of the Northern Impoundment were evaluated with and without the BMP present under 2-year, 10-year, and 100-year flood scenarios. Modelling results indicated that the effects of the BMP on the surrounding floodplain would not be significant under all three scenarios. The evaluation was submitted to the HCFCD in a letter dated March 30, 2022 (GHD, 2022a). Comments were received from the HCFCD via e-mail on April 8, 2022 (HCFCD, 2022) and a revised letter was submitted on May 6, 2022 (GHD, 2022b). This letter is included in Appendix D and all hydrodynamic modeling performed to date is summarized in a Hydrodynamic Modeling Report, included as Appendix F. The hydrodynamic modeling data was also provided to TxDOT on April 4, 2022, to allow TxDOT to begin evaluating the effects of the BMP on its bridge structures.

5.4.2 Northern Impoundment Preparation and Layout

In order to facilitate waste material removal, solidification, and water treatment, the RC will be required to complete several activities to prepare to implement the Northern Impoundment RA.

Assuming that access can be obtained to use the existing TxDOT ROW to implement the RA, the existing TxDOT ROW cannot accommodate two-way traffic for haul trucks; therefore, the TxDOT ROW would need to be enhanced/widened in order to make Northern Impoundment RA operations efficient and safe. Widening the ROW may

necessitate installation of a bulkhead along the north side of the TxDOT ROW to bolster and protect the roadway. This access road will also need to be built up as it approaches the south side of the Northern Impoundment, such that the elevation of the access road at the entrance of the Northern Impoundment will be at or above the BMP top elevation of +9 ft NAVD88. This access ramp will be constructed to allow truck traffic to traverse in and out of the Northern Impoundment, over the BMP wall, while maintaining a protective BMP height to prevent overtopping during the excavation season. In addition, the elevated roadway would need to be constructed in a manner that will accommodate TxDOT's need for its vehicles to have access to the ROW for purposes of maintenance of the existing I-10 Bridge structure and future construction of a replacement bridge structure. The area immediately north of the TxDOT ROW is owned by a third-party landowner and access to it will be required to improve the access road.

Working and staging areas on the Northern Impoundment are limited due to the existing topography and tidal conditions. On the west side of the impoundment, the existing TCRA armored cap rock creates uneven terrain that is not suitable for truck traffic. The east side of the impoundment is consistently covered in water during high tides. Therefore, access roads to and within the Northern Impoundment may need to be constructed in different areas of the Northern Impoundment, depending on which cell is being addressed, in order to allow for truck access and turnarounds. The exact nature and extents of these access roads will be determined by the RC as part of its initial work plan submittals.

Staging and laydown pads may need to be constructed on the selected off-site property for materials staging and water storage and treatment equipment. The RC will also provide power, communications, and water utilities for the water treatment equipment, as necessary.

The RC may need to construct mixing areas for soil solidification. The exact location of the mixing areas may vary from excavation season to excavation season. For each excavation season, the RC will determine the exact nature and location of mixing areas to be used during that season. It is anticipated that these mixing areas will be constructed in areas adjacent to active cells to mitigate excessive handling and transport of wet material.

5.5 BMP Wall

The following guidelines, standards, and technical manuals are the primary sources used to develop the design of the BMP:

- American Society of Civil Engineers (ASCE) 7-16, Minimum Design Loads and Associated Criteria for Building and Other Structures.
- USACE Engineer Manual (EM) 1110-2-2504, Design of Sheet Pile Walls by USACE.
- American Institute of Steel Construction (AISC) 360-16, Steel Construction Manual 15th Edition.
- USACE Hurricane and Storm Damage Risk Reduction System Design Guidelines, updated June 2012.
- American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, = 2012.
- Nucor Skyline Technical Product Manual, 2021 Edition.
- Arcelor Mittal Impervious Steel Sheet Pile Walls Design & Practical Approach.

5.5.1 Structural Definitions

ASCE 7-16 categorizes structures into four Risk Categories (I through IV). During an excavation season, the BMP may be considered to be similar to structures or facilities that process, handle, or store toxic substances. ASCE 7-16 categorizes such structures or facilities as being in Risk Category IV, in which the failure of such structures or facilities may pose a significant hazard to the public.

EM 1110-2-2504 defines the following load case conditions based on severity and probability of occurrences during the design life of the structure:

ED_014247_00001351-00063

- ***Usual:*** Service level loading experienced frequently such as static earth pressure, hydrostatic pressures after installation of the BMP and during excavation with normal water levels in the river.
- ***Unusual:*** Loads larger than those considered usual and experienced less frequently, such as 100-year probability storm events and flood levels in the river.
- ***Extreme:*** Worst-case scenario loads, rarely experienced during the design life of the structure, such as hurricane level winds and flood levels in the river.

5.5.2 Material

Material grades for the various structural components are summarized below:

- ***Sheet Piles*** ASTM A572 Grade 60 (Yield stress, F_y = 60 kilopounds per square inch [ksi])
- ***Tie rods*** ASTM A615 Grade 120 (F_y = 120 ksi))
- ***Walers*** ASTM A36 Grade 36 (F_y = 36 ksi)

For purposes of the design, the standard sections for sheet pile and tie-rods were selected from the Nucor Skyline Technical Product Manual. The manual also included the section properties used for design calculations. Alternative sections with equivalent properties are available from other manufacturers and may be used in construction.

5.5.3 Design Loads

5.5.3.1 In-Situ Soil

The soil parameters specific to the Northern Impoundment are discussed in detail in Appendix B and Appendix I. The subsurface soils include fine grained material that is expected to behave differently in drained (long-term) and undrained (short-term) condition. Both drained and undrained loading conditions were considered. The designations for soil parameters are in accordance with the Unified Soil Classification System (USCS).

Drained and undrained clays and silts behave differently under loading and have different strengths with respect to time and duration of the applied load. Submerged clays loaded rapidly and for short duration behave the same as an undrained soil since drainage cannot occur through the clay particles in a short time, a condition which is referred to as the Q-case (EM 1110-2-2504). Over longer time frames, clay will drain, and the apparent strength will change. This condition represents the S-case loading (EM 1110-2-2504). Results of the stability analysis include strength from both cases, Q-case and S-case.

5.5.3.2 River Water

The loading from the river water with a density of 62.4-pound per cubic feet (lb/ft^3) would be applied as hydrostatic pressure to the exterior and interior BMP faces. Water elevations for various load case conditions are as follows:

- ***Usual*** +5 ft NAVD88
- ***Unusual*** +9 ft NAVD88
- ***Extreme*** +9 ft NAVD88

5.5.3.3 River Flooding

Based on the Federal Emergency Management Agency (FEMA) Flood Map (effective on January 16, 2017), the Northern Impoundment is designated as a special flood hazard area referred to as Zone AE. Since the excavation is planned to be completed seasonally (November to April) outside the period during which there is a greater risk of flooding events and it is anticipated that the structure will be flooded with river water during the non-excavation season, FEMA flood loads were not considered for the design of the BMP. Refer to Section 5.3.1 for discussion of river elevations and selection of the design water level.

ED_014247_00001351-00064

5.5.3.4 Scour

The presence of the BMP will affect the natural flow state of the San Jacinto River in the vicinity of the Northern Impoundment. The scour potential of the river flow around the BMP installation was evaluated using the Hydrodynamic Model developed for the Northern Impoundment. The analysis methods and results are provided in Appendix F. The evaluation indicated that the BMP diverted flow to the north side of the Northern Impoundment, decreasing velocities adjacent to I-10 Bridge. The increased flow also corresponded with increased shear stress at the southwest and north side of the BMP.

The 95th percentile shear stress for the BMP conditions have a maximum value of 2.3 pascals (Pa) and an average value of 0.11 Pa. The maximum value of the 95th percentile shear stress difference is 1.84 Pa with an average value difference of less than 0.01 Pa. Shear stress differences around the BMP are maximum in two spots with a larger value and difference at the southwest corner of the BMP, and the other at the north side of the BMP. The shear stress values are large compared to the critical shear stress value of 0.15 Pa for the sediment in the area, indicating that the soil particles are mobile and there is potential for scour and/or sediment deposition along the outside perimeter of the BMP.

The relatively small value of the average 95th percentile shear stress indicates that, except for the two locations discussed above, the conditions overall remain similar to the existing conditions (without the BMP in place). The pattern is similar for all the three modelled storm conditions (2-year, 10-year, and 100-year storm events) with only differences in magnitude.

As changes in the riverbed elevation will affect the design of the BMP, scour protection measures such as rock or rip-rap may be required around the outside perimeter of the wall.

5.5.3.5 Wind

The 3-second gust design wind speeds and hurricane exposure are defined in ASCE 7-16 Chapter 26. The web-based hazard tool by ASCE (**https://asce7hazardtool.online**) provides site-specific information. The standard design wind speeds relate to a maximum recurrence interval (MRI) of 100-years. The wind speeds for Risk Category IV structure in hurricane exposure areas correspond to MRI of 3000-years. All wind speeds are defined at 33-ft above ground level.

- Design wind velocity, 3-second gust, MRI 100-years, V_{100} = 116 miles per hour (mph).
- Design wind velocity, 3-second gust, MRI 3000-years, V_{3000} = 154 mph.
- Exposure Category C.
- Wind directionality, K_d = 0.85 (solid freestanding wall).
- Topographic Factor, K_{zt} = 1.0.
- Ground Elevation Factor, K_e = 1.0.
- Velocity Pressure Exposure Coefficient, K_z = 0.85.

  Velocity Pressure, $q_z = 0.00256\ K_z\ K_{zt}\ K_d\ K_e\ V^{2.}$

  Using $V = V_{100}$, qz_{100} = 24.89 pounds per square foot (lb/ft^2) (Unusual load condition).

  Using $V = V_{3000}$, qz_{3000} = 43.87 lb/ft^2 (Extreme load condition).

Velocity pressure from wind (q_z) was applied as uniformly distributed load on the exterior of the BMP.

5.5.3.6 Barge Impact

Given the heavy barge traffic in the San Jacinto River, there is a potential that the BMP will be struck by a barge. An impact could be the result of a barge coming off its mooring and drifting toward the BMP during a storm or it could be the result of a towed barge veering off course. The segment of the river around the BMP actively used by barges is shown on Figure 5-G. The barges traveling in the navigational waterway, either empty or loaded, would be likely to

ED_014247_00001351-00065

make contact with the BMP at an angle. The barges moored directly north of the BMP would be likely to make head-on contact with the BMP.

Impact Force

The kinetic energy from impact can be determined as follows, where velocity may be either the flow velocity or the navigation speed. The energy of impact will be lower for any impact angle other than head-on collision.

Kinetic Energy of Impact = 0.5 x Mass x (Velocity x cosine (α))$^{2.}$

Where:

cosine (α) = directional factor for impact angle relative to the velocity vector

= 1 for Head-on impact, i.e., 0 degrees relative to velocity vector

The kinetic energy will be absorbed by the structure but the barge itself will absorb some energy and suffer damage. The AASHTO[1] method to determine impact force absorbed by bridge piers is being used for evaluating the BMP. This method is conservative since the BMP has a larger profile area than the typical bridge piers to absorb impact and distribute the energy.

Figure 5-G Navigational Waterway - Northern Impoundment

USACE developed design guidelines outlining minimum impact forces for hurricane protection structures.[2] These include structures in protected waterways not exposed to tidal surge (Zone 1A), similar to the conditions at the

[1] AASHTO LRFD Bridge Design Specifications, Section 3.14.
[2] USACE Hurricane and Storm Damage Risk Reduction System Design Guidelines, Section 5.2.1.

ED_014247_00001351-00066

Northern Impoundment. The extreme load condition criterion for Zone 1A corresponds to an impact force of 400 kilopounds (kips) from a light (empty or ballast condition) barge applied at the top of the wall with hydrostatic pressure induced by the 100-year still water level and wind load applied on any exposed portion of the wall. It should be noted that heavier (loaded or laden condition) vessels did not govern the design as the velocities of these vessels were considerably less.

AASHTO requires all bridge piers located in navigable waterway crossings to be designed for ship and barge impact. The required minimum impact load corresponds to a 195-ft long, 35-ft wide and 12-ft tall empty hopper barge (displacement = 200-ton), drifting toward the structure. This barge size is representative of the barges in the area.

TxDOT's design criteria for the dolphin and fender system protecting the I-10 Bridge piers includes impact from a 30,000-barrel (BBL) barge, one of the larger barges in the area. A typical 30,000 BBL barge is 300-ft long, 54-ft wide, and 12-ft tall. In laden condition, the barge is loaded to full capacity and displaces 30,000 BBL equivalent or approximately 168,500 cubic feet (ft^3) of water. Thus, the barge weighs approximately 5,250 US-tons or 10,500 kips in laden condition. In ballasted condition, the barge carries only fuel and ballast water, and weighs approximately 910 US-tons or 1,820 kips.

The head-on impact from the 54-ft wide, 30,000 BBL barge was evaluated. A contact width of 50-ft was assumed to account for variations in barge bow shapes.

Impact Velocity

The hydrodynamic model (Appendix F) evaluated the flow velocities for three storm conditions at 2-year, 10-year, and 100-year recurrence intervals, both with and without the BMP present. The 95th percentile velocities for the river flow from the hydrodynamic analysis report are summarized in Table 5-A.

Based upon this data, the barge impact for the BMP was evaluated for flow velocity of 2.20 feet per second (ft/s).

Table 5-A 95th Percentile Velocity - Hydrodynamic Model

95th Percentile Velocity (ft/s)	Existing Conditions (No BMP)			With BMP in Place		
	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year
Maximum	2.21	1.45	0.73	2.16	2.20	1.04
Average	0.51	0.50	0.35	0.46	0.50	0.36

5.5.4 Load Combinations

The following load combinations (LC) are appropriate for the structural design in accordance with Allowable Stress Design in ASCE 7-16, Section 2.4.

LC#1 D + H + F

LC#1A D + H + F + I

LC#5 D + H + F + 0.6W

Where:

D = Dead load

F = Fluid load (hydrostatic pressure)

H = Lateral earth pressures (active and passive)

W = Wind Load on exposed surfaces (interior and/or exterior)

I = Barge Impact

LC#1 was evaluated for both Usual and Unusual load conditions. LC#1A was used to evaluate the barge impact as extreme load condition with water level at +9 ft NAVD88. An impact at lower water levels will cause less rotation in the structure.

ED_014247_00001351-00067

LC#5 combines wind load with other loads acting on the BMP. It is noted that wind load is applicable only to the exposed height of BMP above ground or water level. At the design water level for Unusual or Extreme conditions (+9 ft NAVD88), the BMP exterior would not be exposed to wind.

A parametric evaluation was performed for the effect of wind loads on the design of BMP using LC#5. The 0.6 reduction factor for wind load was conservatively ignored for the evaluation. The net load ($F + W_{Exterior} - W_{Interior}$) on the BMP, calculated as sum of the hydrostatic load and the wind load applied to both interior (above ground) and exterior (above water level), was compared to the hydrostatic load with water level at +9 ft NAVD88 acting alone. The net load was determined to be lower. Given that D + H are common to both load cases, LC#5 did not govern over LC#1 and was not evaluated further.

ASCE 7-16 recommends reduction in the load factor for resisting (passive) lateral earth pressure to 0.6. The intent of the reduction is to design structures resistant to overturning by reducing the resistance. Since the BMP wall was designed for overturning (rotational) stability with adequate embedment as described in Section 5.5.6, a reduction for lateral earth pressure was not considered.

5.5.5 Design Criteria

5.5.5.1 Failure Modes

EM 1110-2-2504 describes the following three primary failure modes for sheet pile wall systems:

1. The unstable slopes may cause a deep-seated rotational failure of the entire soil mass. The slope failures are independent of the sheet pile embedment and location of the anchor system. This type of failure can be addressed by changing the geometry of the retained material or improving the soil strength.
2. The sheet piles with inadequate embedment depth can be subjected to rigid-body rotational failure due to the lateral pressures exerted by the retained material. The classical design procedures such as the "free earth" Limit Equilibrium Method calculate the sheet pile embedment depths by balancing the active pressures behind the wall against the passive pressures provided by soil in front of the sheet piles. Adequate embedment depth is achieved at depth where the sum of horizontal forces and sum of moments is zero. Rigid-body rotational failure can be prevented, according to EM 1110-2-2504, by incorporating safety factors to decrease the passive pressures as appropriate for different loading conditions.
3. The sheet pile systems with stable slopes and adequate embedment may fail if the sheet pile sections, tie-rods, and/or the anchor components are overstressed or inadequately sized. Such failures can be prevented, according to EM 1110-2-2504, by incorporating safety factors in the design by limiting the allowable stress as appropriate for different loading conditions.

5.5.5.2 Safety Factors

The following safety factors and allowable stress limits were adopted in the design of the BMP with respect to the failure modes described in Section 5.5.5.1, consistent with EM 111-2-2504.

Embedment Depth

EM 1110-2-2504 recommends the minimum safety factors provided in Table 5-B to determine embedment depth for cantilever or anchored sheet pile wall systems. It should be noted that the safety factors are suitable for the "free earth" Limit Equilibrium Method where the sheet pile is considered a rigid body allowed to rotate about a point below ground level, and the active and passive pressures are balanced to determine the embedment depth. Adequate embedment depth is achieved at depth where the sum of horizontal forces and sum of moments is zero. The pressures, and resulting forces in the system, are considered independent of the wall displacement in the Limit Equilibrium Method.

The cantilever wall BMP presented in the 30% RD acted as both a floodwall and a retaining wall by maintaining differential water (higher water in the river) and soil elevations (excavation below riverbed elevation). However, the current BMP system in the new alignment primarily serves as a floodwall by maintaining a different water elevation

ED_014247_00001351-00068

between the excavation area and the San Jacinto River. The sheet piles are terminated in the fine grain soils of the Beaumont Clay layer. Hence, both the undrained (Q-Case) and drained (S-Case) conditions were evaluated to determine the stability of the BMP.

Table 5-B Safety Factors for Passive Pressures - EM 1110-2-2504

Loading Case	Floodwalls		Retaining Walls	
	Fine-Grain Soils	Free-Draining Soils	Fine-Grain Soils	Free-Draining Soils
Usual	1.50 Q-Case 1.10 S-Case	1.50 S-Case	2.00 Q-Case 1.50 S-Case	1.50 S-Case
Unusual	1.25 Q-Case 1.10 S-Case	1.25 S-Case	1.75 Q-Case 1.25 S-Case	1.25 S-Case
Extreme	1.10 Q-Case 1.10 S-Case	1.10 S-Case	1.50 Q-Case 1.10 S-Case	1.10 S-Case

Sheet Pile Sections

EM 1110-2-2504 recommends the maximum allowable stresses provided in Table 5-C for the sheet piles subject to different load case conditions. By definition of the various load case conditions (Section 5.5.3), the BMP is subject to Unusual and Extreme load case conditions less frequently than the Usual load case conditions. Hence, the allowable stresses are relatively higher for the more severe loading scenarios to provide design solutions appropriate for Unusual and Extreme load case events.

Table 5-C Allowable Stresses for Sheet Piles - EM 1110-2-2504

Load Case Conditions	Combined Bending and Axial Stress	Shear Stress
Usual	0.50 F_y	0.33 F_y
Unusual	0.67 F_y	0.44 F_y
Extreme	0.88 F_y	0.58 F_y

Tie-Rod Sections

The tie-rod sections, included in Table 5-D, are designed using allowable stress design methods in accordance with AISC 360. The tie-rods are critical to balance the forces and displacements of the BMP.

Table 5-D Allowable Stresses for Sheet Piles - EM 1110-2-2504

Limit State	Overstrength Factors
Tensile Yielding	1.67
Tensile Rupture	2.00
Tensile Rupture of Threaded Parts	2.00

If one tie-rod fails, the loads will be redistributed to the adjacent tie-rods. The individual tie-rods are designed for 150 percent of the demand loads, accounting for a tie-rod failure event where the loads are redistributed to adjacent tie-rods and preventing progressive failure and thereby, increasing the safety factor.

Walers

The walers are longitudinal beams connected to the tie-rods on the exterior face of the sheet piles. The walers distribute the loads from the sheet piles to the tie-rods and minimize variations in displacement along the BMP. In order to provide a continuous longitudinal beam, the individual waler beams will be spliced using bolted connections.

The waler are evaluated as simply supported multi-span beams with tie-rods providing the support reactions. The walers are also evaluated for condition with a longer span (150 percent) accounting for a tie-rod failure thus able to redistribute loads to the adjacent tie-rods. The walers are designed using allowable stress design method in accordance with AISC 360, provided in Table 5-E.

ED_014247_00001351-00069

Table 5-E Overstrength Factor for Waiers - AISC 360

Limit State	Overstrength Factors
Flexure or Bending Stress	1.67
Shear	1.67

5.5.5.3 Deflection

Total system displacement comprised of structural steel deformation, rotation and translation of the entire BMP and soil system was evaluated for the proposed BMP.

Neither EM 1110-2-2504 nor ASCE 7-16 provide guidance on limiting system deflection. For a cantilever sheet pile system, structural steel can deform significantly before structural failure occurs; hence, structural steel deformation could not be used as a limiting parameter in the previous submittal (30% RD).

The combination of tie-rod anchors and adequate embedment of sheet piles restrain the deflection in the sheet piles. The deflection at the top of the sheet pile translate to local deformations in the structure. These deformations are accounted for by the bending stress in the sheet piles and tensile stress in the tie-rods. The stresses will be limited within the allowable stress (Section 5.5.5.2) and within the elastic range (less than F_y) to avoid structural failure of the BMP.

5.5.5.4 Corrosion Protection & Maintenance

The Northern Impoundment BMP structures were designed for temporary, short-term use. It was assumed that the sheet piles would remain in place for a period of approximately 7 years after installation. Figure 5-H shows the five exposure zones typically considered for corrosion. It also shows a schematic for varying thickness loss along the height of the steel sheet piles exposed to a marine environment.

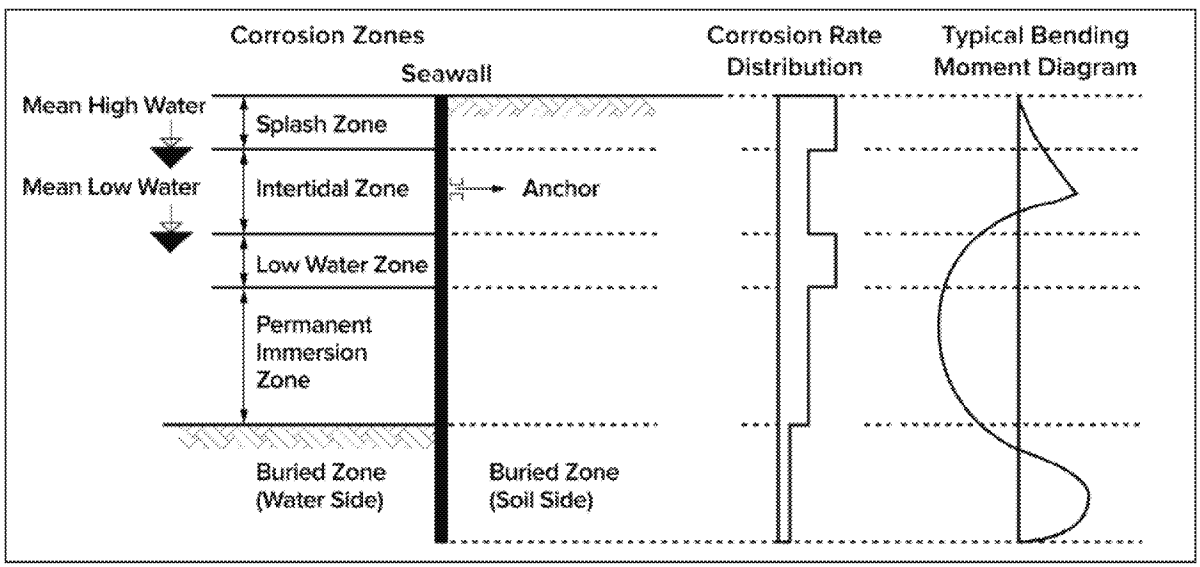


Figure 5-H Typical Thickness Loss - Nucor Skyline Catalog, Ports & Marine Construction

The loss of thickness due to corrosion relative to different exposure conditions are listed in Table 5-F. The corrosion rates are representative of industry-wide accepted rates where site-specific data is unavailable. Since the Northern Impoundment is located in brackish water, an average of total thickness loss for river (0.008 inches) and seawater (0.027 inches) exposure is appropriate (these two values are indicated in bold font in Table 5-F, below). The duration of exposure to each zone varies significantly on the exterior and interior face of the BMP. It is conservative to assume the same thickness loss on both sides of the sheet pile. A uniform sacrificial thickness of 0.035-inches (2 x 0.0175 inches) was included for each side of the sheet pile for the entire height of the wall. No additional maintenance should be required for the assumed 7-year RA period.

ED_014247_00001351-00070

Table 5-F Loss of Thickness due to Corrosion

Description of Exposure[1]	Loss in 5 Years[1] (inches)	Loss in 25 Years[1] (inches)	Loss in 7 Years[2] (inches)
Common fresh water (river, ship canal) in the zone of high attack (water line).	0.006	0.022	**0.008**
Very polluted fresh water (sewage, industrial effluent) in the zone of high attack (water line).	0.012	0.051	0.016
Sea water in temperate climate in the zone of high attack (low water and splash zone).	0.022	0.074	**0.027**
Sea water in temperate climate in the zone of permanent immersion or in the intertidal zone.	0.010	0.035	0.013

Notes:
1 Eurocode 3 - Design of Steel Structures, Part 5: Piling, BS EN 1993-5:2007.
2 Interpolated between 5 Years and 25 Years.

5.5.6 BMP Wall Analysis

The BMP cross-sections were analyzed for stability and determining stress in the structural components using Plaxis 2D, a finite element software program developed by Bentley Systems, Inc. The program can model complex soil profiles, structural sections and perform soil-structure interaction analysis to achieve a solution with compatible forces and displacements. The analysis also incorporates a time variable simulating the various stages of construction, such as end of sheet pile installation, adding fill between the walls, installing tie-rods, dewatering the excavation area after BMP is installed, and excavation to allow for consolidation or dissipation of porewater pressures. Additional details of the analyses for all cross-sections are provided in Appendix I.

The finite element analyses using soil-structure interaction incorporate the non-linear behavior of the soil, wall displacements and flexibilities of the sheet pile and anchors. The active and passive pressures vary as the system flexes to achieve a solution by balancing the forces and displacements in the entire system. By inherently balancing the forces and displacements, the system achieves a larger safety factor against rotational failure than the "free earth" Limit Equilibrium Method. Thus, the safety factors (Section 5.5.5.2) are not applied to determine effective soil parameters for calculating passive pressures.

The behavior of the BMP varies with the height of the sheet piles above riverbed and the subsurface strata. Hence, multiple cross-sections were evaluated to account for the variations in riverbed elevations, cross-slope of the riverbed along the BMP alignment, thickness of Alluvium Sediments, anticipated top of Beaumont Clay layers, and distance from the BMP to the excavation. Figure 5-I, below, shows the approximate extent of each cross-section selected for the analyses and the summary of results are provided in Table 5-H. These extents are approximate and may change in the final design to accommodate design optimizations, and other considerations related to standardizing construction practices.

Additional considerations were applied to Cross-Sections C2, C6, and C7 due to reasons described, below.

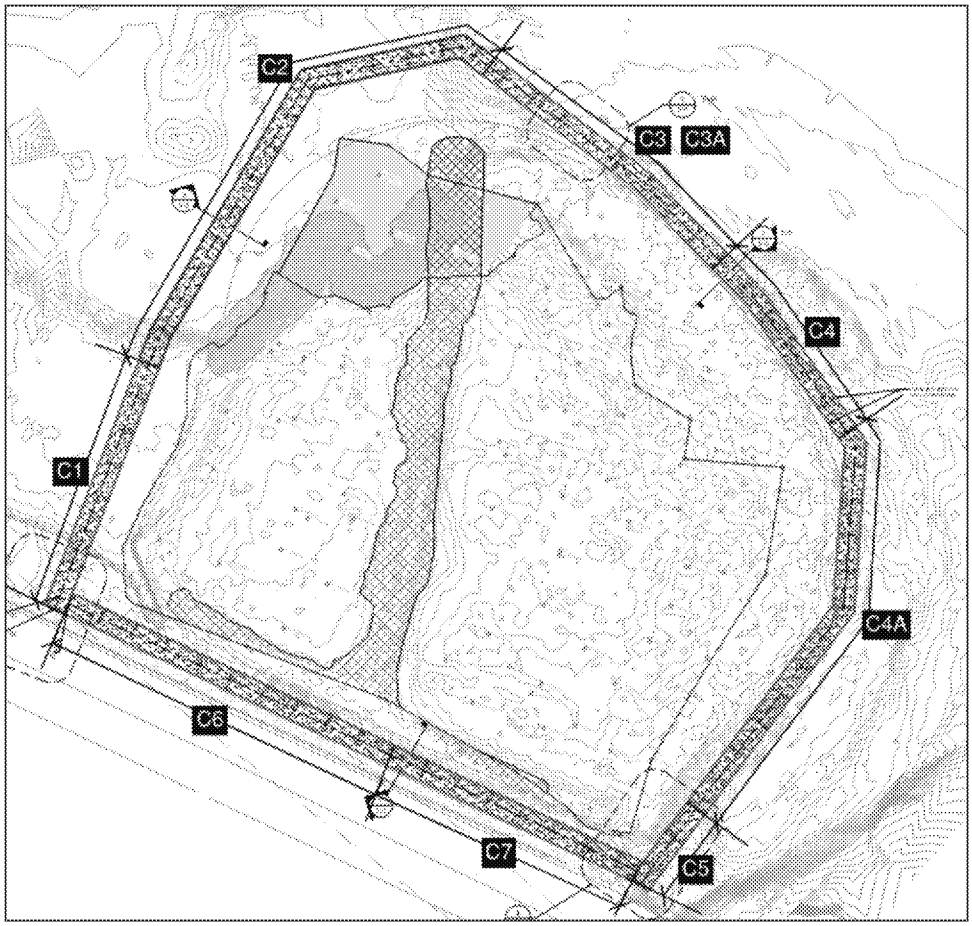


Figure 5-I BMP - Limits of Cross-Sections C1 to C7

5.5.6.1 Cross-Section C2

Cross-Section C2 represents the extent of the tallest height of the BMP above riverbed elevation (approximately -15 ft NAVD88). The approximate retained height on both the exterior and interior sides is 24 ft. The large height above the riverbed overstressed the sheet piles and tie-rods. Hence, a 30 ft wide Raised Bench (imported fill material) constructed above the Soil Buttress, to elevation -10 ft NAVD88 is required on the interior side to reduce the stresses. The sheet piles and tie-rods required to meet the demand loads are the among the largest standard sections available. The tie-rods are required to be installed at elevation -5 ft NAVD88, significantly below the normal water levels in the river, which has the potential to pose a safety hazard during construction.

This cross-section was analyzed and determined to be adequately designed assuming use of excavation methodology similar to that used in other areas in the Northern Impoundment as well as for other remedial alternatives. However, it should be noted that the areas in the northwest corner are subject to pronounced risk of hydraulic heave as described in the Geotechnical Engineering Report (Appendix B), and a different excavation methodology will need to be identified for the northwest corner.

5.5.6.2 Cross-Sections C6 and C7

Cross-Sections C6 and C7 represent the BMP along the alignment parallel to the I-10 Bridge. In the alignment previously presented in 30% RD, the BMP was placed directly at the edge of the existing berm and excavation limits extended to the sheet pile. The existing ground elevation varies between elevation 0 ft and Elevation +5 ft NAVD8S. The BMP design elevation at bottom of excavation is -14 ft NAVD88 and -20 ft NAVD88 for Cross-Section C6 and Cross-Section C7, respectively. The TxDOT ROW runs between the elevated portion of the freeway and the southern boundary of the Northern Impoundment.

Several concepts for the BMP, as described in the BMP Design Structural Report (Appendix I), were evaluated to determine if there an implementable solution along the original alignment. The significantly large height retained above the anticipated excavation bottom, the inability due to space constraints to include a Soil Buttress, and the need for active excavation along the face of the BMP resulted in the BMP (and the anchor system, where applicable) extending into the deeper sand layers. Due to concerns with pile driveability and associated vibrations in the vicinity of the I-10 Bridge, the ExxonMobil pipeline assets, and other underground utilities and other considerations, these concepts were considered unfeasible.

The only workable solution was a double-wall system, approximately 30-ft wide, similar to the double-wall around the balance of the Northern Impoundment. This required moving the BMP alignment farther south into the TxDOT ROW to allow for a sloped Soil Buttress beginning at Elevation 0 ft NAVD88 and extending into the excavation area. This placed the double wall within the TxDOT ROW, with the outer wall being approximately 20 ft from the I-10 Bridge guardrails on the TxDOT ROW.

Additional details are provided in Appendix I.

5.5.7 Barge Impact

Two cross-sections, C2 and C4 were analyzed with barge impact loads in Plaxis. These cross-sections have the largest retained height above the riverbed and are considered to be the most critical cross-sections for evaluating a potential impact at the top of the wall.

A 400 feet long three-dimensional model was created with the same stratigraphy, material properties and stages as the analysis sections described in Section 5.5.56. The linear elastic plates representing the sheet piles were assigned orthotropic parameters to capture the difference in stiffness of the vertical and horizontal directions. The barge impact load was applied as a static uniformly distributed load over a 50-ft x 1-ft area at top of the wall. Due to the instantaneous nature of the impact, the loads are evaluated using the undrained soil parameters and considered an Extreme load condition, with the impact at top of the wall with the water levels at +9 ft NAVD88.

The following two scenarios, which took into account multiple impact velocities and two barge displacement conditions (ballasted or laden), were evaluated. The loads correspond to higher velocities of flow for impact, than as summarized in Table 5-A, with a barge in ballasted condition, hence conservative for the analysis. However, for the laden condition, the loads represent the limiting loads.

Case 1: 20 kip/ft x 50 ft = 1000 kip:

- Corresponds to contact with 54 ft barge in ballasted condition at impact velocity of 3.8 ft/s or,
- Contact with 54 ft barge in laden condition at impact velocity of 1.6 ft/s

Case 2: 28 kip/ft x 50 ft = 1400 kip:

- Corresponds to contact with 54 ft barge in ballasted condition at impact velocity of 5.3 ft/s or,
- Contact with 54 ft barge in laden condition at impact velocity of 2.2 ft/s

The barge impact loads caused localized deformation of the wall along with increase in soil shear strains. However, the strains did not indicate a global failure would occur. In this scenario, there would be localized damage to the BMP due to limiting flexural capacity. The analysis results are summarized in Table 5-G.

ED_014247_00001351-00073

Table 5-G Barge Impact Analysis Output

Analysis Cross-Sections	Design Load (kip/ft)	Total Applied Force (kip)	Analysis Demands per LF			DCR - Moment	DCR - Shear
			Moment (kip-ft)	Shear (kip)	Deflection (ft)		
C2, AZ 40-700N	20	1000	342.4	64.5	1.4	1.11	0.19
	28	1400	465.9	68.5	2.8	1.51	0.21
C4, AZ 26-700	20	1000	159.6	39.6	0.8	0.81	0.14
	28	1400	251.2	39.6	1.6	1.28	0.14

Detailed analyses, results, and plots are provided in Appendix I.

As Cross-Section C2 is not near the navigational waterway, it was evaluated for impact with barge in ballasted condition only, under the assumption that any impact would be from moored barges. Under this scenario, the sheet piles would be overstressed by 11 percent (moment capacity) at an impact velocity of 3.8 ft/s, greater than the 95th percentile maximum velocity expected in the river (Table 5-A). Hence, Cross-Section C2 is considered adequate for impact loads from a 30,000 BBL, 54-ft wide barge in ballasted condition traveling at 2.2 ft/s.

Cross-Section C4 is closer to the navigational waterway and would be expected to potentially encounter impact with barges, ballasted or laden, as they are towed. Cross-Section C4 is considered adequate for impacts at velocity of 3.8 ft/s and 1.6 ft/s for barges in ballasted and laden condition, respectively.

The impact loads also reduce significantly at lower velocity of impact. The barges and tugboats typically slow down as the width of the navigational waterway reduces closer to the I-10 Bridge. Navigational signs could be posted on the exterior face of the BMP to require marine vessels to reduce speeds along the eastern side of the BMP.

5.5.8 Summary of Results

The summary of the structural sections required for the BMP is provided in Table 5-H. As extents of Cross-Sections 3 and 3A overlap, the BMP will be conservatively built as evaluated for Cross-Section 3.

Table 5-H Summary of Analysis Results

Analysis Section	Sheet Pile Section		Tie Rod Section		Waler Section
	Nucor Skyline	Length (ft)	Diameter (inches)	Spacing (ft)	
C1, C3, C3A, C4, C4A	AZ26-700	50	2.25	5	MC 12X35
C2	AZ40-700	55	3.00	5	MC 18X45.8
C5, C6, C7	AZ26-700	60	2.25	5	MC 12X35

5.5.9 Pile Driveability and Vibration Analysis

During the March 25, 2020, TWG Meeting, the design team was asked to perform an evaluation to quantify the risks associated with pile driving-induced vibrations and potential releases from the Northern Impoundment that may result from these vibrations. A vibration analysis for driving large diameter steel pipe piles into deep sands was performed and included in the 30% RD. Since the submittal of the 30% RD, the BMP concept has changed from cantilever (large diameter pipe piles) to a double wall system with Z-shaped steel sheet piles. The alignment of the BMP has been revised to install the sheet piles outside the perimeter of the TCRA armored cap and beyond the edges of the steep slopes present near both the northwest corner and east side adjacent to the I-10 Bridge. The sheet piles will also be terminated in the Beaumont Clay layer instead of driving into the stiffer sand layers, thereby, reducing the potential for vibrations significantly.

The vibration analysis performed for the cantilever wall design from the 30% RD is included in Appendix I. The analysis provided the limits of acceptable vibrations for the soil and ground slope for installation of the large sections. The installation method, equipment size, type, and energy required to install the smaller sections, such as the Z-shaped sheet piles will be within such limits.

ED_014247_00001351-00074

5.6 Excavation Procedures

5.6.1 Excavation Sequencing

To allow for the removal of waste material during the excavation season (between November and April), the Northern Impoundment RA work will likely be divided into five cells (one of which would include the northwest corner), with a single cell being remediated each excavation season. Prior to commencing any excavation activities, the initial season will involve site preparation activities and installation of the BMP around the entire excavation area, as detailed in Section 5.5. The order of cell excavation will likely include a sequence that allows the cell containing the northwest corner to be remedied first and the cell containing the upland working area (southwest corner) to be excavated last, although the excavation volume for each season will be determined by the RC and optimized based on weather conditions and productivity achieved during each season. The conceptual project sequencing is shown on Figure 5-D.

5.6.2 Excavation Methodology

Following BMP installation and water removal, the material in a seasonal cell will be excavated. For the cells other than the one encompassing the northwest corner, excavation will be performed utilizing standard track-mounted excavators located on dry land. The excavator would be positioned where it can reach into the excavation and swing around to load trucks or place material directly into a mixing pad. Where required, the excavator could track down to a ledge or bench to reach deeper or further, but generally, the excavator would operate from upland locations. Excavation methodology is detailed below. The details provided below are for excavation of the cells other than the cell encompassing the northwest corner.

5.6.2.1 Cell Dewatering

Following the installation of the BMP around the entire excavation area, river water will become trapped behind the BMP. At the beginning of each excavation season (and prior to removal of any portion of the TCRA armored cap to be removed during that excavation season), the river water located behind the BMP would be pumped back into the river to allow waste material removal activities within each cell to be conducted using land-based equipment in relatively dry conditions. At the end of each excavation season, the exposed slope of the excavation will be capped, and the area within the BMP wall may be intentionally flooded. At the start of the next excavation season, the river water trapped behind the BMP will again be returned to the river to allow the seasonal excavation to be reinitiated.

5.6.2.2 TCRA Armored Cap Removal

During each excavation season, after the cell to be excavated during that season is dewatered, the portions of the TCRA armored cap within that cell will be removed to expose the waste material for excavation. It is anticipated that only the portion of the TCRA armored cap in the specific l area in which waste material is being excavated will be removed (and the waste material exposed) at any given time. The rock may be salvaged for re-use during or after the RA. Depending on the space available on the Northern Impoundment, the rock removed during each excavation season may be stockpiled on the impoundment itself or at a nearby location. As part of TCRA armored cap removal, the geotextile and geomembrane barrier of the TCRA armored cap will be disposed of off-site.

5.6.2.3 Excavation Procedures

For each area in which the TCRA armored cap has been removed, excavation of the waste material to the target excavation elevations will take place using excavators. Any waste material that does not contain free liquids and/or does not require solidification may be loaded directly in haul trucks for off-site disposal. Waste material that contains free liquids and/or requires solidification will not be directly loaded into the haul trucks for off-site disposal and may be managed as described in Section 5.6.3.

As excavation activities advance below grade, dewatering sumps may be required to remove water in advance so the waste material can be dried out as much as possible prior to it being excavated. Following dewatering, the waste

ED_014247_00001351-00075

material may still be too wet (i.e., would not pass the paint filter test) to be directly loaded into haul trucks. This material would need to be temporarily staged and allowed to dry naturally and/or be solidified for off-site disposal. An earthen ramp will be constructed over the lip of the BMP to allow truck traffic into and out of the Northern Impoundment. Interior berms will be constructed seasonally to convey stormwater such that non-contact stormwater that falls directly onto the TCRA armored cap or areas of the excavation that have been confirmed clean can be segregated from contact stormwater that falls directly onto waste material. Non-contact water may be returned directly to the river, untreated. Contact water that accumulates in the excavation area during the excavation season will be pumped out, as needed to maintain excavation operations, to a WTS where it will be treated and discharged to the river, as described in Section 5.8.

5.6.2.4 Excavation Season Production Rates

The approximate volume of waste material removal within the Northern Impoundment is estimated at 168,000 CY (excluding the northwest corner), using the area-based average concentrations described in Section 5.3.4. To facilitate a seasonal excavation approach, the total volume of material would be divided into multiple cells, with a single cell excavated during each excavation season. Seasonal cell sizes will not be prescribed, but instead a target production rate will be maintained that should accomplish the full excavation over the course of five excavation seasons (including the northwest corner). The volume of waste that can be removed, transported, and disposed of during an excavation season (i.e., production rate) is based upon the following factors, and will continue to be analyzed/optimized throughout the RA:

- ***Volume and Removal Rates*** -The tentative cell sizes have been established so that the volume of planned removal from within each cell could be achieved within the excavation period of November through April.
- ***Excavation Depth*** - Depending upon the results of post-excavation confirmation sampling, the depths of the seasonal excavations could increase, which may, in turn, limit the area that can excavated in that season.
- ***Access and Implementability*** - The tentative seasonal cells assume sustained access to each area for necessary excavation equipment and trucks. To the extent that such access is not available, or there are limits on access (i.e., restrictions on access to the highway due to activities associated with the I-10 Bridge replacement project), it may reduce the volume that can be excavated during a single excavation season.
- ***Transportation and Disposal*** - The target seasonal production rate that the tentative cell sizes are based on is dependent on the ability to efficiently and consistently load out and transport waste material to an off-site landfill.

The assumptions and limitations of waste transport and disposal as a basis of the design are further discussed in Section 5.7.2.

5.6.3 Solidification and Load-Out

If the waste material does not pass the paint filter test for direct load out, it may need to be solidified prior to transport to the off-site disposal facility. This may be achieved by mixing in drier material, either from the excavation or using a solidifying reagent, such as Portland cement or lime. Solidification activities will likely be conducted on a designated mixing pad inside the confines of the BMP, or at a nearby location as space becomes limited within the BMP, prior to load out in the haul trucks.

5.6.4 Post-Excavation Confirmation Sampling

Post-excavation confirmation sampling will be implemented concurrently with excavation activities as the design elevations are achieved. As detailed in the FSP (Appendix J, Attachment 3), composite sampling across decision units (DUs) within each seasonal excavation cell will be used to demonstrate compliance with the clean-up level. Following excavation of an approximately 1/2-acre DU, six to eight (6 to 8) discrete samples will be collected from sample locations evenly spaced across the DU excavation bottom. A composite sample of these discrete samples will be prepared for laboratory analysis. A portion of each discrete sample will also be held by the laboratory pending the results of the composite sample analysis so that potential areas of over-excavation within each DU (areas in which additional excavation is necessary if clean-up levels are not met) can be targeted, if necessary.

ED_014247_00001351-00076

Following laboratory analysis of the composite sample, the result would be compared to the clean-up level. Results will be evaluated as described below.

- If the result of a composite sample is below the clean-up level, the excavation of that DU is complete.
- If the result of a composite sample is above the clean-up level, the discrete samples that the laboratory is holding may be analyzed to better pinpoint the location(s) within the DU at which the exceedances may be located. This will allow for targeted over-excavation.
- If discrete samples are analyzed, and if one or more of the discrete samples yields a result that would cause the calculated average of the discrete samples in that DU to be above the clean-up level, that portion of the DU may be over-excavated. Prior to over-excavation, the health and safety risks associated with over-excavation in that location would be evaluated:
  - If there is no health and safety risk associated with over-excavation, that portion of the DU would be over-excavated by up to one additional foot (delineated using locations which are halfway between sample locations).
  - Following over-excavation of that portion of the DU, a new discrete sample representing that portion would be collected and a new mathematical average would be calculated using the results from the original discrete samples but replacing the result of that portion with the new post-excavation result. This process would continue until the calculated average of the discrete samples in the DU is below the clean-up level. At that point, the excavation of that DU would be complete.
  - If it is deemed that over-excavation may compromise the BMP or excavation integrity (as in the case of hydraulic heave) or poses risks to worker safety, a risk management decision for that area will be made in coordination with the EPA.

Although the design excavation elevation contours are based on an area-based average concentration less than the clean-up level, as presented in Table 5-1, those elevations are only a starting point for the design. The post-excavation confirmation sampling results will be used to define whether the clean-up level has been achieved for each DU.

5.6.5 Excavation Area Restoration

There are no post-excavation restoration measures identified or required as part of the ROD. However, restoration activities may utilize the recycled TCRA armored cap rock, clean berm material, and/or clean imported sand or aggregate for restoration activities in lieu of disposing of these clean materials. These post-excavation restoration measures may be employed during the work, at the end of a working season, or after the completion of all excavation activities. After excavation along the south edge of the impoundment has been completed, a soil embankment would be constructed at an approximate 4-foot horizontal to one-foot vertical (4:1) slope along the vertical excavation face to support the exposed bank.

5.7 Characterization, Loading, Transportation, and Disposal

The RD elements related to the loading, transportation and off-site disposal of waste material from the Northern Impoundment are outlined in the TODP, included as Appendix J Attachment 8 to this 90% RD.

5.7.1 Waste Characterization

As summarized in Section 3.3, the waste material in the Northern Impoundment is not a listed hazardous waste under 40 CFR Part 261, Subpart D. Furthermore, waste characterization samples collected during the PDI-1, PDI-2, and SDI were analyzed for ignitability, corrosivity, reactivity, and toxicity, as defined in Title 40 of CFR Part 261, Subpart C, to determine if the material was a characteristically hazardous waste. The results indicated that the material is not a characteristic hazardous waste under RCRA or TCEQ regulations.

ED_014247_00001351-00077

GHD submitted a Waste Characterization Letter for the Northern Impoundment to the EPA on October 20, 2020 (GHD, 2020g). The evaluation described the detailed characterization evaluation and concluded that the waste has been characterized and classified in accordance with the RCRA regulations as non-hazardous waste. EPA concurred with the conclusions in a letter to GHD dated November 19, 2020 (EPA, 2020h). Additional testing was conducted during the Treatability Study to further classify the non-hazardous waste under applicable TCEQ regulations, 30 TAC §335.505, 335.506, and 335.508. The material was tested for leachability using TCLP. The results of the treatability testing indicate that the waste material from the Northern Impoundment is non-hazardous and should be eligible for disposal as a Class II non-hazardous waste per 30 TAC §335.505, 335.506, and 335.508.

Solidification testing, in accordance with EPA Method SW-846 Test Method 9095B (i.e., paint filter test), was also conducted to determine the appropriate reagent dosages to solidify the waste material for transportation to an off-site disposal facility. Off-site disposal facilities typically require incoming waste to pass paint filter testing and sometimes meet a minimum UCS criteria. The results of the solidification testing indicated that these criteria can be met across a range of waste material percent solid scenarios utilizing Portland cement and/or lime with doses typically ranging from 0 to 20 percent solidification reagent depending on the actual percent solids present. The RC may conduct additional tests to determine the appropriate reagent dose at the time of the RA.

5.7.2 Loading, Transportation, and Disposal

The total in-ground volume of waste material anticipated to be removed and disposed of from the Northern Impoundment using the area-based average approach is approximately 168,000 CY (excluding the northwest corner). Removal will likely be completed over a minimum of five excavation seasons (November to April each year including the northwest corner). Approximately 39,000 to 44,000 CY of impacted material would be excavated, transported, and disposed of off-site over the course of each excavation season. The tentative seasonal cells have been sized based on the amount of waste material that could reasonably be excavated and transported for disposal during one excavation season, although there will be many factors during implementation, including weather and access issues involving the TxDOT ROW, that will determine the actual productivity rate and volumes removed during each excavation season. It should also be noted that the actual volume sent for disposal may be larger due to the addition of solidification reagent if the waste material is too wet (i.e., cannot pass the paint filter test) for transport to the disposal facilities. Based on solidification testing discussed in Section 3.3.5, it is estimated that the use of reagent could increase the total volume for disposal by approximately 10 percent or 16,800 CY. This would increase the total volume for disposal to approximately 184,800 CY (excluding the northwest corner), or approximately 45,000 to 48,000 CY per season.

Because of limited access and staging area at the Northern Impoundment, the transportation and off-site disposal of waste material may be a limiting factor to the overall volume that can be successfully removed in an excavation season. The single-entry point onto the Northern Impoundment is the existing road within the shared TxDOT ROW. An agreement will need to be reached with TxDOT for the use of that road during the Northern Impoundment RA. TxDOT currently uses that road to access the San Jacinto River I-10 Bridge for maintenance, but as previously referenced in Section 5.4 and discussed in detail in Section 5.11.3, TxDOT is planning to replace the bridge within the next four to five years. The 90% RD assumes that there would be land access to the Northern Impoundment using the TxDOT ROW and that TxDOT will permit improvements to the existing access road, such as grading and widening, to allow for two-way traffic on that road. Even with these improvements, there will still be only a single land access point to the Northern Impoundment. The limited working areas, both on and adjacent to the Northern Impoundment, restrict the space available for truck staging, loading, and turnarounds. These factors will likely limit truck loadout and transportation efficiency, which will in turn limit excavation production rates.

One of the major factors influencing cell sizing is the ability to successfully transport and dispose of all removed waste material within an excavation season. Several off-site disposal facilities are currently under evaluation as disposal sites for the RA waste. These facilities are varying distances from the Northern Impoundment, ranging from 60 to 120 miles away. The transport distance to the furthest of these facilities was used as the design basis to influence the target cell size and excavation volume that can be completed in one excavation season. Based on the longest expected distance (120 miles, one way), it is estimated that haul trucks could complete a maximum of two roundtrips,

ED_014247_00001351-00078

or "turns," per working day. Additional factors that were considered when determining the anticipated transportation production rates and cell sizing were based on experience with similar projects, and included anticipated downtime related to mechanical issues, traffic delays, bridge or roadway closures, and other factors. Altogether, the RA may require approximately 13,200 truck trips (accounting for bulking and excluding the truck trips required to haul material from the northwest corner). The limited number of truck turns, limited area for staging and loading haul trucks, and anticipated delays all influence the estimated volume of waste material that can be transported and disposed of during an excavation season.

The assumed production rates do not account for on-site delays or overall increased traffic that would result from the TxDOT bridge replacement project, if it is takes place simultaneously with the RD. If access to the TxDOT ROW is available, but TxDOT construction activities related to the I-10 Bridge replacement project impact traffic in the vicinity (such as the ability of the trucks to enter and leave I-10), that could have a major impact on the volume of material that could be excavated and transported off-site for disposal during an excavation season.

5.8 Water Management

Following installation of the BMP, river water behind the BMP will be returned to the river, untreated, prior to commencement of the first excavation season. At the conclusion of each excavation season, the exposed areas of the excavation will be covered, and the area within the BMP may be intentionally flooded with river water for the duration of the non-excavation season. This would both provide support for the BMP wall and would prevent scour, etc. that could be caused by overtopping during a storm event during the non-excavation season. At the start of the next excavation season, the river water trapped behind the BMP will be returned to the river, untreated.

During excavation activities, measures will be taken to segregate stormwater that comes into contact with waste material from clean stormwater that falls on the TCRA armored cap or confirmed clean excavation areas. Non-contact water will be returned untreated to the river. Contact water will be treated through a WTS.

The water treatment process will include removal, treatment, and discharge of contact water generated during the RA to allow excavation to continue. The water will be pumped from the excavation area to storage tank(s), treated to remove dioxins and metals below discharge criteria, and then discharged to the river. This section describes the basis of design and design elements for the WTS.

5.8.1 WTS Basis of Design

5.8.1.1 Contact Water Characterization

As described in Section 3.4, water treatability testing was performed in accordance with the TSWP (GHD, 2019b) to inform the RD of the WTS. The results from treatability testing indicated that the average TSS concentration for the simulated Northern Impoundment contact water sample could be as high as 4,600 mg/L. This represents a maximum expected value since waste solids were actively mixed with water in the pilot test excavation to increase TSS concentrations to create this contact water. This worst-case TSS value was used as the basis of design for water treatment.

Treatability testing results indicated that the majority of metals and dioxins found in contact water were associated with the suspended solids and were not found in the dissolved phase.

Seepage water that entered the pilot test excavation during the PDI-2 was characterized to determine the required treatment if a sufficient volume accumulates in the excavation during the RA.

Water characterization results from PDI-2 are presented in Table 3-2.

5.8.1.2 Parameters Requiring Treatment

As described in Section 3.4, discharge criteria were estimated for COPCs in the Northern Impoundment; those discharge limits are presented in Table 3-2. Dioxins and several metals, including copper, lead, and zinc, were

ED_014247_00001351-00079

detected in the simulated contact water sample above estimated discharge criteria. Dioxins were detected in the seepage water at levels above the ML, but no other COPCs were above discharge criteria. Treatability test results indicate that metals and dioxins are primarily associated with solids, demonstrating that a treatment system that removes solids should reduce COPCs to levels below the discharge criteria.

5.8.1.3 Treatment Process

The WTS is proposed to treat contact water generated during the RA at the Northern Impoundment. Contact water may be generated from the excavation, stormwater, seepage, dewatering sumps, overburden stockpiles, dewatering activities, WTS containment, and equipment decontamination. Contact water will be pumped to large, aboveground storage tanks. Water from the storage tanks will be processed through the WTS. WTS treatment processes will include chemically enhanced solids precipitation/flocculation, gravity settling, multimedia filtration, cartridge/bag filtration, and GAC adsorption. Treated water will be discharged to the river. Based upon water treatability testing results, described in Sections 3.4 and 3.6, the process described herein has been proven effective in laboratory and pilot testing at reducing concentrations of COPCs in water to levels below their respective discharge limits.

5.8.1.4 Water Volume and Storage

For the Northern Impoundment, contact water may be generated from the following sources:

1. ***Stormwater:*** water from storm events that will accumulate in the excavation and containment areas (e.g., WTS, overburden storage, dewatering) during a rain event, and will be the vast majority of contact water generated and treated during the RA.
2. ***Equipment Decontamination Water:*** water that will be associated with the washing/rinsing of equipment (e.g., truck wash).
3. ***Mounded Water:*** water that will drain into excavation from surrounding soils when the bottom of the exaction is lower than the groundwater level.
4. ***Persistent Infiltration:*** water that will infiltrate through the soil from the river when the base of the excavation is below the average mean sea level (AMSL) of the river (i.e., 1.5 ft-AMSL), but since the BMP wall will be driven into the underlying Beaumont Clay, such persistent infiltration is assumed to be insignificant.
5. ***Miscellaneous Contact Water:*** other water that will come into contact with waste material not associated with water types listed above.

Contact Water generated by each of the abovementioned contact water sources was estimated by the following methods:

1. **Rainfall:**
    a. Rainfall will comprise a majority of the contact water that will be generated.
    b. Although measures will be taken to segregate contact water from non-contact water, the storage and treatment capacities included herein were designed to account for a worst-case assumption that all stormwater that falls within the BMP area is considered to be contact water. The area inside the BMP is ~730,000 square feet (ft^2).
    c. All rainfall collected inside the WTS containment area will be treated by the WTS system. The WTS containment area is ~73,000 ft^2
    d. Each area is multiplied by the largest 24-hour storm event recorded in Houston during the construction season from November to April, which is 6.2 inches.
    e. The maximum expected 24-hr contact water generation during the excavation season is ~415,000 ft^3 or ~3.1 million gallons.
    f. The estimated volume of contact water generate by rainfall during the excavation season (November to April) is 11 million gallons. This based on the average total rainfall during the excavation season from 1880 to the present.
2. **Mounded Water:**

ED_014247_00001351-00080

a. This was assumed to be primarily an issue at the start of each excavation season.
b. Mounded water will primarily be generated at the start of the season as the mounded water drains into the excavation.
c. Flowrate of mounded water into the excavation will decline over time as soil is dewatered.
d. The following assumptions were used to model the steady state flow of mounded water into the excavation.
   - Mounded Water is in a cube/block above the low point of the excavation (-15 ft AMSL)
   - Groundwater level is assumed to start at 1.5 ft AMSL across the block
   - Block is 750 ft long, 600 ft wide, and has 16.5 ft of water column height above the river bottom
   - All water will flow to the side of the cubic block facing this low point
   - No base flow from stored water below the river (i.e., cofferdam is watertight)
   - Homogeneous hydraulic conductivity of 3 ft per day (ft/day) across the block
e. Modelling predicts the highest flowrate of mounded water into the excavation will be ~90,000 gpd.
f. The estimated volume of mounded water that will flow into excavation during the excavation season is 18 million gallons.
g. Daily and annual mounded water discharge will be reevaluated after the first excavation season.

3. **Persistent Infiltration:**
   a. The BMP is assumed to be watertight and is keyed into the Beaumont Clay.
   a. Therefore, persistent infiltration is assumed to be insignificant.
4. **Equipment Decontamination Water:**
   a. This area is assumed to be within the BMP and is accounted for in the above rainfall assumptions.
5. **Overburden Storage and Dewatering Areas:**
   b. These areas are assumed to be within the BMP and are accounted for in the above rainfall assumptions.
6. **Miscellaneous Contact Water:**
   a. Assumed to be insignificant compared to other sources of contact water.

A summary of the maximum expected contact water generated, shown in gpd, from each source is provided in Table 5-I, below.

Table 5-I Summary of Maximum Expected Contact Water Generated

Influent Sources	Maximum 24-Hour Contact Water Generation	Notes
BMP Area	2.8 million GPD	Assumes all rain that falls within the BMP could be contact water. Area = 730,000 ft^2. Maximum 24-hour rain event (1930 to 2019) = 6.2 inches.
Rain Collection - WTS Containment Area	282,000 GPD	24-hr rain event, 73,000 ft^2. Maximum 24-hour rain event (1930 to 2019) = 6.2 inches.
Mounded Water (gpd)	90,000 GPD	See assumption above.
Rain Collection in Overburden/ Dewatering Areas (gpd)		Assumed to be accounted for in the BMP area contact water.
Truck Wash		Assumed to be accounted for in the BMP area contact water.

Design Treatment Capacity of WTS

The design treatment rate for the WTS is 300 gpm with an influent storage capacity of 1.8 million gallons. The WTS was designed with treatment and storage capacity to dewater the entire BMP area in approximately three days after the end of the worst-case rain event (6.2 inches). Since the most likely 24-hour rain events will be less than two inches, the entire BMP area can be dewatered in less than 24 hours for most rain events. At the start of the excavation season, the maximum mounded water flowrate into the excavation is predicted to be 90,000 gpd. The large equalization capacity will allow the mounded water to be stored and treated on a batch basis.

ED_014247_00001351-00081

5.8.2 Treatment System Design

A treatment system with multiple processes will be employed to reduce concentrations of suspended solids, dioxins and furans, and metals in the contact water to meet discharge criteria. The treatment process is anticipated to include the following unit processes:

- ***Bulk Water Removal*** - The treatment system will use pumps to rapidly remove water generated during the RA and deliver the water to storage tanks.
- ***Storage*** - Two (2) B-24 Lake Tanks (1 million gallons of working capacity each) are proposed to store water prior to treatment. Storage tanks will allow for water to be removed from the excavation area and stored prior to treatment. No mixing is proposed for these tanks. Some TSS settling will occur in these tanks and will be removed at the end of each construction season.
- ***Chemical Addition*** - Coagulant and flocculant will be used to precipitate and flocculate TSS and contaminants of concern. Organosulfide, acid and/or caustic may be used if needed for metals removal. Chemicals will be added to mixing tanks using metering pumps. The mixing tanks will have adequate residence time to allow for adequate solids and floc formation.
- ***Bulk Solids Removal Using an Inclined Plate Clarifier*** - Conditioned solids out of the flocculation tank will be settled in an inclined plate clarifier. An inclined plate clarifier is a vessel which includes multiple parallel plates at an angle greater than 45 degrees. As solid particles settle and contact the plates, the particles will be directed by gravity to the bottom of the clarifier, where the solids stream will be continuously removed. Because of the high surface area provided by the plates, an inclined plate clarifier requires a smaller footprint compared to a circular clarifier.
- ***Sludge Dewatering*** - Settled solids from the inclined plate clarification (underflow) will be pumped into a sludge dewatering box where solids will be dewatered by gravity. The liquid that drains out of the solids will be pumped back to the storage tank for reprocessing. The dewatered solids will be moved to the excavation solids dewatering area, solidified, and disposed of with other solids from the excavation.
- ***Sludge Recycle*** - If needed, a side stream of the settled solids from the inclined plate clarifier may be returned to the rapid mix tank to facilitate floc formation.
- ***Multimedia Filtration*** - Clarified water from the inclined plate clarifier (overflow) will be pumped through the multimedia filtration system, which is a series of pressure vessels filled with media of different densities and particle sizes. Typically, anthracite, sand, and garnet are used. Larger solids will be captured by the largest media (anthracite). Smaller particles will be captured further into the bed by intermediate media (sand), with the smallest solids captured by the smallest media (garnet). As solids build up in the filter, the pressure across the filter will increase, which requires backwashing to remove the collected particles. The backwashing process will use a forward feed process that does not require a backwash tank or backwash pump.
- ***Bag/Cartridge Filtration*** - Filtrate from multimedia filters will then enter bag filters to remove residual solids. Bag filters use fabric to collect solids as water is pumped through the filter. The filter is designed to collect particles larger than the specified opening in the filter. Filtrate will enter the two sets of filters, the first with a filtration size of 10 µm, followed by the second with a filtration size of 1 µm. Both filters will be specified to have a minimum of 95% removal efficiency for particles at the given micron rating. Higher removal efficiencies are obtained for larger sized particles. As discussed in Section 3.6, the results of bench-scale testing completed in October 2021demonstrated that filtration with a 5 µm achieve compliance with all COPCs. During the operation of the WTS, 5 µm bag filters may be tested on a side-stream to evaluate if they can be used in place of the 1 µm filters.
- ***GAC Filtration*** - GAC is a form of carbon that is processed to have small pores that increase the surface area available for adsorption. Residual dissolved organic compounds (e.g., dioxins, furans) in the filtrate from the bag filters will be removed with GAC.

Details of the basis of design of the WTS are provided below. Note, that the WTS design is subject to changes based on field performance.

ED_014247_00001351-00082

5.8.2.1 Major Equipment List and Sizing Basis

The major WTS components and basis of sizing are detailed in Table 5-3. This includes sizing criteria assumptions, design value, and notes for each major equipment and process component.

5.8.2.2 Water Treatment Equipment Layout

The WTS, including the two (2) 1.0-million-gallon water storage tanks and water treatment equipment, will be staged within a lined containment area of approximately 73,000 ft^2. The containment area will be surrounded by an earthen berm covered with an impermeable geomembrane. The layout of temporary water treatment equipment is shown in Drawing P-04 and a PFD is shown on Drawings P-02 and P-03.

At the time of the 90% RD submittal, property access negotiations are ongoing, so the location of the WTS has not yet been determined.

5.8.2.3 Specification and Equipment Data Sheet List

Detailed design drawings associated with the WTS, technical specifications detailing the potential water treatment equipment, consumables, staging/sequencing, and operation are included in Appendices G and H, respectively.

5.8.3 Operations and Maintenance Requirements

The WTS associated with the Northern Impoundment RA will operate intermittently primarily based on need to treat contact water resulting from precipitation. A preliminary discussion of the Operations and Maintenance (O&M) requirements (including consumables and utilities) associated with the WTS is provided, below.

5.8.3.1 Consumables

Effective treatment of contact water will require the use of several water treatment chemicals to facilitate solids separation, metals precipitation, and pH adjustment. A brief discussion of the water treatment chemicals is provided, below.

Coagulant - Coagulants (poly aluminum chloride or equivalent) will be dosed to facilitate enhanced removal of metals (through co-precipitation) and suspended solids in the inclined plate clarifier of the WTS. Required type and dosages will be confirmed based on on-site jar testing. It is anticipated that coagulant will be delivered to the work site in intermediate bulk container (IBC) totes (~300 gallons).

Polymer - It is anticipated that liquid polymers will be utilized to enhance the settling of suspended solids and precipitated metals in the inclined plate clarifier of the WTS. Polymer may also be required to enhance the dewatering of chemical sludge in the sludge dewatering boxes. Polymer will be activated/diluted prior to dosing into the water treatment process. Required type and dosages will be confirmed based on on-site jar testing. It is anticipated that polymer will be delivered to the work site in drums or IBC totes.

Organosulfide - Organosulfide is a flocculant that is a commonly used water treatment additive for removal of metals (via sulfide precipitation). Organosulfide may be added if influent soluble metals concentrations exceed the discharge criteria. Precipitated metals may be removed in the inclined plate clarifier and filtration processes of the WTS. It is anticipated that organosulfide would be delivered to the work site in IBC totes (~300 gallons).

Acid/Caustic - Acid and/or caustic may be added to the water to adjust the water pH to optimize metals removal, enhance the effectiveness of the added coagulants, and/or return the treated water pH to within the discharge criteria range. It is anticipated that acid/caustic would be delivered to the work site in IBC totes (~300 gallons).

Bag/Cartridge Filters - Bag and cartridge filters with minimum 95% removal efficiency will be used. As the bag and cartridge filters are fouled (with captured solids), they will need to be removed and replaced.

ED_014247_00001351-00083

GAC - The proposed GAC treatment vessels will be filled with bitumen-based GAC media. The GAC vessels will be configured in a lead- lag arrangement. Effluent quality of the lead GAC vessel will be monitored for chemical breakthrough (i.e., detection of COPCs in effluent) to identify the need for media replacement.

5.8.3.2 Power

The WTS (in addition to the other facilities) in the Northern Impoundment will require temporary source(s) of electricity for operation. The power requirements will be confirmed by the selected RC and will be obtained by temporary power connections from the local utility and/or by portable generators.

5.8.3.3 Labor

The WTS is expected to operate in a semi-automatic mode on an intermittent basis (i.e., after a rain event). The WTS will operate primarily during the initial phase of an excavation season to dewater the excavation cell and during precipitation events; thus, there may be periods of time in which the WTS is idle and treatment system operators are not required. Key process decisions and operations will be executed with oversight by the RC's treatment system operators. When the system is being operated, it is expected to require one to three operators, depending on the activities being performed.

5.8.3.4 Residuals

The operation of the WTS will result in the generation of a number of residuals.

Tank Liners: The liners from the Lake Tanks will need to be disposed of at the conclusion of each excavation season. The liners will be characterized and disposed of as indicated in the TODP (Appendix J, Attachment 8), which references the applicable federal and state requirements.

Solids in Lake Tanks: Solids that collect in the Lake Tanks will need to be disposed of at the conclusion of each excavation season. The solids will be characterized and disposed of as indicated in the TODP, which references the applicable federal and state requirements.

Chemical Sludge: The contact water is expected to contain solids from the waste material in the excavation. It is anticipated that coagulants, organosulfide, and/or polymers will result in the precipitation of metals and removal of suspended solids. The resulting sludge will be withdrawn as the underflow of the inclined plate clarifier. The settled solids will be directed to sludge dewatering boxes where it is estimated that it will be gravity-thickened to a solids concentration of up to 6 to 8 percent (mass basis). Treatability testing showed that the clarifier underflow can be thickened easily. However, provisions for polymer addition are being included in the design to provide enhanced thickening. During operation of the WTS, thickened chemical sludge may be generated at a rate of almost 700 pounds (lbs) per hour (dry solids basis). Once dewatered, the sludge dewatering boxes will be transported to the impacted solids dewatering pad for solidification and off-site disposal.

Spent Filter Bags: Filter bags will become fouled with solids as the treatment system operates. These fouled filters will need to be removed and replaced. The spent filter bags will be characterized and disposed of as indicated in the TODP, which references the applicable federal and state requirements.

Exhausted GAC Media: GAC media has a finite capacity to remove dissolved constituents (including metals and dioxins and furans) from water. As previously noted, the GAC vessels will be operated in a lead-lag configuration. The discharges of both the lead and lag GAC vessels will be monitored to identify when the GAC media is exhausted. When concentrations of COPCs are detected at elevated levels in the water in the lead GAC vessel, the media in this vessel will be removed and replaced. Once back in service, this vessel will become the lag vessel, and the previous lag vessel will be operated as the lead vessel. The spent media will either be regenerated or will be characterized and disposed of as indicated in the TODP, which references the applicable federal and state requirements.

ED_014247_00001351-00084

5.8.4 Compliance Monitoring

Routine effluent compliance monitoring requirements associated with the WTS are expected to include pH, TSS, metals, and dioxins and furans. Treated effluent samples from the WTS will need to be collected from a specified compliance monitoring point on the effluent line to the San Jacinto River. In accordance with 30 TAC Part 1 Chapter 319 Subchapter A Rule 319.5, Section A, (30 TAC 319.5 (a)), samples and measurements of the effluent will be taken at a location following the last treatment unit. Monitoring frequencies and sample types from 30 TAC 319.9 (c) Table 3 (for treatment units with effluent flow from 0.50 million gpd to less than 2.00 million gpd) are identified in Table 5-J, below:

Table 5-J Monitoring Frequencies and Sample Type

Parameter	Minimum Frequency of Measurement [3]	Standard Analytical TAT (business days)[4]	Sample Type
Flow	1 per operating shift	---	Instantaneous
pH	1 per day	---	Grab
TSS	2 per week	10 days	Composite
Metals[1]	1 per week	10 days	Composite
Dioxin/Furans[2]	1 per week	15 days	Composite

Notes:

1 The most conservative frequency for metals included in 30 TAC 319.9 (c) Table 3 (Copper, Lead, Nickel, Silver, Zinc) is twice per week, but based on characterization, dissolved metals in the untreated contact water were significantly less than discharge criteria. Therefore, the collection of weekly samples is proposed.

2 Monitoring frequency for dioxin/furans is not specified in 30 TAC 319.9 (c) Table 3. Due to the lag in receiving results due to long turnaround times for dioxins and furans analysis, a sampling frequency of once per week is proposed.

3 Based on the pilot testing results as well as the bench-scale filtration results, TSS of 2 mg/L or less can be used to indicate if the dioxins and furans level is below the ML.

4 Samples will be collected only while discharging.

5 Flow rate and pH data will be collected on-site using real-time in-line monitors.

Process monitoring samples will also be collected within the treatment process to inform necessary operational adjustments, such as chemical dose refinement. During pilot testing, clarifier effluent and filter effluent turbidity were measured to evaluate performance of the system and adjust chemical dosage rates. In addition, a direct correlation was established between turbidity, TSS, and $TEQ_{DF,M}$ concentrations. Based on the strong correlation between turbidity and dioxin and furan concentrations, it is anticipated that during the RA, real-time turbidity readings (post clarifier, post filtration, post GAC) will be used as an indicator for operational performance as related to TSS and dioxin and furans. TSS may also be used as a performance indicator. In addition, process monitoring samples will be collected within the treatment process (e.g., influent, post clarifier, post filtration, post lead GAC column) to inform necessary operational adjustments, such as chemical dose optimization and GAC change out. As discussed, turbidity will be monitored through online instrumentation to evaluate treatment system performance and adjust operations as needed. Actions to be taken in response to operational parameter monitoring may be incorporated into a future treatment system monitoring plan.

Determination of discharge criteria is discussed in Section 3.4.1, with specific criteria specified in Table 3-2.

5.9 Monitoring and Controls

Monitoring and controls may be implemented during the RA at the Northern Impoundment to prevent releases of impacted material to the surrounding land, water, or air. The specific controls will be developed and/or refined in conjunction with the RC and will be included in revisions or modifications to the SWMP (Appendix J; Attachment 5) and CQA/QCP (Appendix J; Attachment 6). A summary is included in the following sections.

ED_014247_00001351-00085

5.9.1 Dust Control

During implementation, the RC will be required to use methods that minimize production of dust from construction operations. The RC may be instructed to use potable water for potential misting operations to prevent airborne dust from dispersing into the atmosphere. Further detail is included in the SWMP (Appendix J; Attachment 5).

5.9.2 Stormwater Pollution Prevention Plan and Controls (SWPPP) and BMPs

Prior to beginning construction activities on the Northern Impoundment, soil erosion and sediment controls may be implemented. These structures would either be put and remain in place and be maintained throughout the implementation of the RA or may be put in place and maintained for a given work season.

When removing waste material, the excavation will need to be maintained to be free of water as much as possible. Within the confines of the BMP around the seasonal cell, measures that may be taken to keep water out of the open excavation include grading the excavation to drain stormwater water away from the excavation and/or berm construction to prevent water from entering the excavation. To the extent possible, measures will be put in place to segregate non-contact water (water that falls on the TCRA armored cap, BMP Soil Buttress area, and/or areas that have been confirmed clean) from contact water (water that has come into direct contact with waste material). In addition to stormwater controls outside of the excavation limits, the RC will provide, operate, and maintain dewatering equipment appropriately sized to maintain an excavation to be free of water, to the extent possible. The RC may be required to ensure that the pumping equipment, machinery, and tankage be in good working condition for potential emergencies, including power outages, and that appropriately trained workers be employed to operate the pumping equipment. All contact water will be pumped to the water storage tanks for eventual treatment and discharge.

The RC will also be responsible for managing any stormwater that may come into contact with temporarily staged and stockpiled excavated material. The dewatering pads and decontamination pads will be maintained by the RC to contain, collect, and transfer contact water to the water storage tanks for treatment. Stormwater that has not been in contact with impacted material would be discharged in accordance with the SWPPP that the RC will be required to develop. Details of the dewatering pads, overburden stockpiles, and decontamination pads are shown on Drawings C-24 through C-26 in Appendix G.

Excavation dewatering may employ methods such as sheeting and shoring; groundwater control systems; surface or free water control systems employing ditches, diversions, drains, pipes and/or pumps; and any other measures necessary to enable the removal of waste material in as dry of a condition, as possible. The RC will be required to use best management practices for the provision of all dewatering and water removal activities. A SWPPP will be developed for the Northern Impoundment excavation program prior to commencement of any waste material removal work. Further detail is included in the SWMP (Appendix J; Attachment 5)

5.9.3 Odors

There is potential for odors resulting from the Northern Impoundment RA or associated activities. Odors are most likely to occur during excavation activities when previously buried material are unearthed and exposed to air. As needed, the RC will implement odor mitigation and suppression measures during the implementation of the Northern Impoundment RA. Further detail is included in the SWMP (Appendix J; Attachment 5)

5.9.4 Turbidity Controls and Monitoring

The BMP will be placed outside the TCRA armored cap, and thus will not be installed through waste material. Turbidity controls (e.g., turbidity curtains) are planned to be utilized during installation and removal of the BMP wall as a construction best practice to limit the potential for off-site migration of turbidity. Turbidity monitoring is also planned to be utilized during installation and removal of the sheet piles as a construction best practice to compare downstream

ED_014247_00001351-00086

turbidity values with upstream values to monitor any significant contribution from BMP wall installation and removal to downstream turbidity.

It is anticipated that BMP installation would proceed incrementally in segments from upstream to downstream locations so that vessel movement is aided by the downstream currents. The turbidity curtains would be employed at locations where water flow is away from the work and has the potential for turbidity to be transported with the flow away from the work site. This would be the case for much of the area around the Northern Impoundment, from the northwest corner, along the north and down on the eastern side. On the western side of the Northern Impoundment, flow appears to be towards the impoundment at the corner furthest from I-10. Flow then decreases in location closer to I-10 where water depths are low and a backwater condition exists. The configuration of the turbidity curtain would be such that turbidity migration is mitigated and flow is parallel to the curtain to the extent possible.

During the SDI, and as required by the EPA, turbidity curtains were deployed in the northwest corner of the Northern Impoundment while soil borings were being installed. The initial plan was to utilize impermeable curtains that spanned the full extent of the water column (6 to 14 ft), but due to higher-than-expected water velocities in that area, it was not possible to maintain that configuration and the curtains had to be realigned to use shorter curtains across the deeper areas (ones that did not extend to the river bottom). In light of these challenges, a single layer, permeable Type III curtain extending to one-half the water column depth is being proposed for use during BMP installation and removal. The Type III silt curtain is the most robust class that is commercially available. The use of a permeable curtain of manageable length is expected to help maintain placement and alignment of the curtain.

In addition to the use of silt curtains, monitoring will be performed to confirm that elevated levels of turbidity are not being generated during installation and removal of the sheet piles. Details of this monitoring are provided in the SWMP (Appendix J; Attachment 5). The turbidity monitoring equipment will consist of a buoy with solar charging capabilities, a water quality sonde for collecting turbidity readings, and a dual anchor to the riverbed. Turbidity measurements will be collected in NTUs using a data logger and transmitted in intervals to a database using cellular telemetry. The equipment will also contain a built-in GPS to record and transmit its location.

One turbidity monitoring buoy would be placed upstream of the work to collect background turbidity levels and another one would be placed downstream. Turbidity levels from both monitors would be compared to determine whether the downstream values exceed the upstream by a set threshold. If levels above the thresholds persist, the RC will investigate the source of the turbidity and address it as appropriate (if within RC's control). Another monitor would be utilized as an early warning monitor that will be maintained in close proximity to the work as it progresses. The data will be used internally by the RC to provide an early indication of changes in typical turbidity readings as part of an adaptive management approach. Turbidity monitoring data would be collected twice per day at the start of work. if turbidity levels are below the thresholds included in the SWMP (Appendix J; Attachment 5), the monitoring frequency will be reduced to once per day thereafter.

5.10 Site Restoration

5.10.1 Removal of the BMP

Prior to removal of the BMP, the recently excavated and exposed bank along the southern extent of the impoundment will need to be supported. A soil embankment will be placed along the southern edge of the excavation limit by sloping back into the river at an approximate 4:1 slope. Once the buttress is established, erosion and scour protection (i.e., rip rap) will be placed at specified locations to protect the buttressed shoreline and prevent washout. Hydrodynamic modelling was performed to evaluate the potential scour along the end-state southern edge of the excavation to support the design of the armament of the backfilled slope. The results of the modelling are included in a Hydrodynamic Modelling Report, included as Appendix F.

Following backfill of the southern slope, the BMP wall would be removed. The BMP will be disassembled in a similar but inverse sequence to how it was installed (further explained in Section 5.5.7). If a pile cannot be removed, additional measures for removal such as cutting or driving the pile below the mudline will be considered. Discussions

ED_014247_00001351-00087

may continue with stakeholders or interested parties regarding potential beneficial end use involving leaving all or portions of the BMP in place.

5.10.2 TxDOT Access Road

Upon completion of the RA activities and removal of the BMP, the TxDOT access road would be restored to pre-construction conditions. This would include removing the access ramp over the BMP, removing additional aggregate fill used to raise the grade of the access road, and grading areas adjacent to the access road. Any modifications to the end-state of the access road will be coordinated through TxDOT.

5.11 Uncertainties Associated with Design and Implementation

The remedial alternative for the Northern Impoundment outlined in the ROD was based upon data collected during the RI in 2011 and 2012. At the time the ROD was issued, a limited amount of subsurface data had been collected from the Northern Impoundment. Analytical results from the post-ROD PDI and SDI demonstrate that the remedial alternatives considered in the Feasibility Study (FS) and the ROD were not informed by the actual conditions that have since been determined to exist at the Northern Impoundment. Those actual conditions include dioxins and furans at concentrations greater than the 30 ng/kg $TEQ_{DF,M}$ clean-up level that extend further vertically and to a much deeper elevations than was understood at the time the ROD was issued. The actual conditions have in turn had a significant impact on a number of elements of the RD, including: (1) the type and alignment of the BMP wall required to enclose the Northern Impoundment; (2) the inability to safely excavate impacted material "in the dry" without the risk of hydraulic heave in locations across the Northern Impoundment and particularly in the northwest corner; and (3) a significant extension of the time required to implement the RD from the two years stated in the ROD to a minimum of 7 years.

For areas of the Northern Impoundment other than the northwest corner, efforts have been made to address these technical challenges, as detailed in the preceding sections. Even so, significant technical uncertainties remain that could render the remedial alternative outlined in the ROD technically impracticable and not implementable. For the northwest corner, additional design considerations need to be addressed for an implementable design.

In addition, there are uncertainties and potential obstacles to implement the 90% RD associated with external factors that are outside the control of the RD process. The most significant of those external factors relates to TxDOT's willingness to allow use of its ROW for the Northern Impoundment RA, given its plans to replace and widen the I-10 Bridge during the same period that the RA is anticipated to be completed and the need for the southern wall of the BMP to be constructed on the ROW. The ROW will be needed over a minimum 7-year RA implementation period to access the Northern Impoundment, as well as to serve as the location of the southern portion of the BMP wall.

The major elements of uncertainty associated with the RD are summarized in the sections below.

5.11.1 Technical Uncertainties

5.11.1.1 Use of the TxDOT ROW

There are two aspects of site access involving the TxDOT ROW that create technical uncertainties with respect to the implementation of the 90% RD. One involves whether the TxDOT ROW road that borders the Northern Impoundment to the south and is essential to the execution of the RA, as designed, will be available to provide access for vehicles into the Northern Impoundment. This issue involves whether TxDOT will grant the necessary access and the impact of TxDOT's current plans to replace the I-10 Bridge on the timing and scope of that access. The second involves whether TxDOT will allow the southern extent of the BMP wall to be constructed on its ROW.

ED_014247_00001351-00088

Use of TxDOT ROW to Access the Site

The TxDOT ROW road is the only route to access the Northern Impoundment by land. During the RA, an estimated 13,2,000 haul trucks (accounting for bulking and not including the additional truck trips required to haul material from the northwest corner) will be required to drive onto the Northern Impoundment to transport the waste material off-site for disposal. This is in addition to access and egress of general site equipment and personnel. To support these activities, the TxDOT ROW road will need to be widened, and the elevation will be increased such that the road will serve as a ramp up over the +9 ft NAVD88 BMP wall into the Northern Impoundment to allow trucks to drive in and out. Even if TxDOT were to provide alternative access (i.e., from the south and under the 1-10 Bridge), it is not clear that there would be sufficient space for trucks to travel and to accommodate the access ramp.

Plans by TxDOT to replace and widen the 1-10 Bridge were not known or addressed in the ROD. TxDOT has not completed its design of the replacement bridge or established a construction schedule. Over the course of the RD, the Respondents have been in regular contact with TxDOT about plans for the Northern Impoundment RD, and learned from TxDOT's design engineers in late February 2022 that construction of a replacement bridge could begin as soon as late 2024 or 2025 and could last three to 5 years (depending on the specific design selected).[3] Given the minimum 7-year period for the RA, the implementation of the two projects will likely overlap. Until TxDOT better defines timing for its bridge replacement project, the location of the replacement bridge, and how much the ROW it will utilize during construction of the new bridge and whether it will allow use of the ROW for access and for the construction of the southern portion of the BMP wall, a fundamental uncertainty exists as to the implementability of the 90% RD.

Even if TxDOT can provide the Respondents with access to the ROW during the time its bridge replacement project is taking place, TxDOT's replacement of the I-10 Bridge will create logistical issues for the remedy, due to changes in access routes to I-10, closures of I-10 and the like. In addition, there would be an increased safety risk to personnel and equipment with two major construction projects taking place in such close proximity concurrently. Concurrent implementation of the two projects would require extensive coordination, changes to current plans for the implementation of the remedy and would result in a loss of efficiency in RA activities. The congestion and simultaneous operations of the two major projects being conducted in tandem may limit the size of haul trucks, and with the increased traffic and detours that will result from the bridge replacement project, traffic on the I-10 Bridge itself and on all surrounding roadways will be significantly impacted and slowed throughout the duration of the project. The 90% RD is premised on a production rate of approximately 600 CY per day; that production rate is in turn the basis for the 90% RD's identification of the amount of material that can be excavated in a given construction season (a season that is limited to the period from November to April to reduce risk of storm events that could result in overtopping of the BMP) and the estimated 7-year period for implementation of the RD. That production rate is based on unrestricted access to the Northern Impoundment using the TxDOT ROW, and the absence of any significant impacts from concurrent work on the TxDOT Bridge replacement project. A loss of efficiency from either on-site congestion or constant heavy traffic on the roads to and from the landfills may result in additional working seasons to complete the RA, extending its length beyond 7 years. Until TxDOT's plans are further developed, it is unknown whether the currently estimated production rate on which the 90% RD timeframe is based, can be achieved.

Use of TxDOT ROW to Anchor Southern Extent of the BMP Wall

Along its southern boundary, the Northern Impoundment shares a border with the TxDOT ROW road and conditions along that border significantly restrict the type of BMP that can be installed along that stretch. Sampling during the PDI and SDI identified impacted material along the southern edge of the Northern Impoundment at elevations as deep as -20 ft NAVD88. This is four times deeper than the excavation elevation for that area that was known at the time of the ROD. As detailed in in the BMP Design Structural Report (Appendix I), multiple BMP wall types were evaluated in an attempt to design a structurally sound BMP wall in that area that would minimize the necessary encroachment onto the TxDOT ROW. The wall types evaluated included:

[3] GHD participated in a call with TxDOT and LJA on February 23, 2022, that was scheduled to answer questions from TxDOT about some design drawings GHD provided to TxDOT, but turned into a discussion of TxDOT's bridge replacement plans. GHD then notified EPA of the information provided by TxDOT, and TxDOT was invited to attend a TWG Meeting on March 10, 2022. Following the TWG Meeting, GHD made submissions to TxDOT of preliminary structural drawings of the southern wall BMP and hydrodynamic modelling files.

ED_014247_00001351-00089

- Single cantilever wall (proposed in the 30% RD and shown to be technically impracticable).
- Combination wall with tieback anchors.
- Cantilever concrete secant pile wall.
- Concrete secant pile wall with tieback anchors.
- Combination wall with brace piles.
- Double wall system with no bench.
- Double wall system with a bench/slope.

Ultimately, the only wall type that proved to be structurally sound and to meet the target SFs was a double wall system that is the same as the wall proposed for the remainder of the BMP. This system on the southern extent includes a gradual slope out of the excavation and a double sheet pile wall. Due to space constraints, the entirety of the BMP wall along the southern extent will need to be installed on the TxDOT ROW, as shown on Figure 5-J, below. The BMP wall would occupy the majority of the ROW along the length of the southern BMP segment. To date, no other solution has been identified that is structurally sound and allows sufficient access (assuming full use of the ROW) to excavate the waste material.

Figure 5-J South BMP Wall Alignment

Prior discussions with TxDOT about the BMP design for the southern boundary did not include this final wall design and placement. TxDOT will have the opportunity, as part of its evaluation and comments on this 90% RD package, to address whether it will permit construction of the BMP on its ROW. TxDOT may have concerns about the placement of the BMP relative to the current bridge alignment as well as with respect to the design of the replacement I-10 Bridge.

In addition, the BMP wall on the TxDOT ROW will be a double-walled structure 30 ft in width and with pile depths of up to -52 ft NAVD88 that will run for approximately 1,000 ft along the TxDOT ROW. The proposed location and alignment of the BMP (assuming it is acceptable to TxDOT) will need to be reviewed with ExxonMobil Pipeline, which owns pipelines in the vicinity of the ROW, and other stakeholders to ensure that the proposed BMP wall's construction would not pose any concerns with respect to the pipelines or other utilities.

5.11.1.2 Excavation Limits

The absence of pre-defined excavation bottom elevations present uncertainties in relation to the BMP design and the schedule. Undefined and deeper excavation limits also present significant risk of hydraulic heave across the impoundment. This risk is most pronounced in the northwest corner, in which there are also other implementation challenges associated with the BMP design. All uncertainties presented herein would be more significant in the event that the excavation elevations are deeper than those included in this 90% RD. Critical to the 90% RD is the identification of excavation bottoms and post-excavation confirmation sampling using area-based average concentrations, as is detailed in Section 5.3.4 and the FSP (Appendix J, Attachment 3).

Effects of Undefined Excavation Limits on BMP Design

The absence of a pre-defined excavation bottom elevation, due to the requirement to conduct post-excavation confirmation sampling, remains a technical uncertainty in relation to the BMP design.

The elevation (or depth) of the required excavation has a direct effect on the design of the BMP and dictates the type, size, and tip elevations of the pilings. While the double wall system included in the 90% RD can better accommodate variable excavation elevations than the single cantilever wall proposed in the 30% RD, there is still a limit to how many feet of additional excavation it can support without creating conditions (such as hydraulic heave) that could impair the structural integrity of the BMP. This is particularly true along the southern side of the Northern Impoundment, where waste material was identified at an elevation of approximately -20 ft NAVD88 versus -5 ft NAVD88 originally identified in the ROD. Due to the space constraints of the abutting TxDOT ROW property, there is limited room along this stretch of the BMP to accommodate deeper excavations. That said, the entire BMP has been designed to accommodate at least two feet of over-excavation past the deepest elevations of material above 30 ng/kg $TEQ_{DF,M}$, though over-excavation may not be possible in many places due to the risk of hydraulic heave.

Effects of Undefined Excavation Limits on Schedule

The absence of a pre-defined excavation bottom elevation also presents a technical uncertainty in relation to the schedule.

The tentative five-excavation-season schedule proposed for the RA is dependent upon maintaining a certain production rate each excavation season, which in turn is based on an excavation bottom elevation based upon area-based average concentrations. In the absence of an area-based average excavation bottom elevation, there could be an increase in the volume of the material to be excavated, such that the projected production rates for each excavation season could not be achieved. In addition, if post-excavation confirmation sampling requires significant over-excavation each season, that additional excavation work (and further confirmation sampling), assuming it can safely be completed given the considerations addressed above, will have the potential to extend the schedule for completing work beyond the currently estimated number of excavation seasons. The schedule could be further extended if the excavated material has a higher than expected moisture content and requires more reagent than has been assumed in this RD. This could increase the volume and time required for excavation, solidification, and load-out.

Risk of Hydraulic Heave Associated with Deeper and Undefined Excavation Limits

As described in Section 5.1, following the receipt of unfavorable results from the Approach B Filtration Treatability Testing, the RD shifted to a design that would allow for excavation in the dry, even in the areas of deepest impacts. With that shift in focus, one of the main objectives of the SDI was to evaluate the potential for hydraulic heave.

Based on data from the SDI (combined with RI and PDI data), it was found that waste material extends to much deeper depths than was known at the time of the ROD (see Section 5.3.4). Considering these deeper impacts, significant geotechnical evaluation work was conducted to better understand the stratigraphy and geological conditions and how they could affect implementation of the remedy during excavation in the dry, as it is prescribed by the ROD. Specifically, the potential for hydraulic heave during excavation in the dry was evaluated across the entire Northern Impoundment, focusing on the northwest corner where the areas of deepest impact are found. In the northwest corner, the excavation would have to be designed to reach a target elevation of at least -28.4 ft NAVD88.

ED_014247_00001351-00091

Hydraulic heave was identified as a significant concern throughout the northwest corner, exacerbated by the fact that the work would be performed immediately adjacent to the San Jacinto River, which could be at an elevation as high as +9 ft NAVD88, resulting in as much as 37 ft of differential hydraulic head between the bottom of the excavation and the adjacent river. Additional excavation areas located outside the northwest corner were also identified as being at risk of or sensitive to hydraulic heave (See Figure 5-A).

The concern Is that removal of the soils and water during excavation in the deeper areas would reduce the downward forces to the extent that the upward hydraulic pressures in the underlying strata caused by the differential in hydraulic head would cause a failure of the excavation bottom. Failure of the excavation due to hydraulic heave, also referred to as hydrostatic "blowout," would cause the bottom of the excavation to become "quick" and unable to support any personnel or equipment in the excavation. There is significant risk in putting personnel and equipment in the bottom of an excavation with a high risk of hydraulic heave and a differential head of up to 37 ft between the bottom of the excavation and the river. Failure of the excavation could lead to serious injury or death of remediation workers. It could also lead to creating an interconnection between the waste material and the lower sands.

Northwest Corner

As previously stated, the risk of hydraulic heave in the northwest corner is significant. It is so significant, in fact, that just by dewatering the excavation to the elevation of the existing mudline in that area may put the area at risk of hydraulic heave, let alone, after an additional 15 ft of excavation. In addition to the risk of hydraulic heave in the northwest corner, the BMP wall design along that section of the BMP (Cross-Section C2 shown on Figure 5-I in Section 5.5) proved to be problematic under the assumption that the excavation would be completed in the dry. The design of the BMP along Cross-Section C2 must be constructed of a thicker steel (AZ-40 piles), as opposed to the AZ-26 piles specified for the remainder of the BMP wall. In addition, in Cross-Section C2, a Raised Bench must be constructed on the inside of the wall along that extent to an elevation of -10 ft NAVD88 to further buttress the BMP and the tie-rods would have to be installed at an elevation of -5 ft NAVD88, which would likely involve risky diving operations to complete.

Due to the significant risk of hydraulic heave and the inability to identify a remedy that satisfies the requirements of the ROD (to complete the work in the dry and to remove all material greater than 30 ng/kg $TEQ_{DF,M}$), a detailed description of the excavation methodology for the areas in the northwest corner has not been included in this 90% RD package, and as reflected in Respondents' extension request dated June 21, 2022 (IPC and MIMC, 2022b), will be addressed separately.

As noted in Section 5.2, the early completion of the RA in the northwest corner is critical to the overall sequencing of the project. This 90% RD has been prepared to be "implementable" as designed excluding the northwest corner, but in reality, the northwest corner would likely be completed in the first excavation season due to access issues and bathymetric conditions. It will be critical to eventually combine the RD for the northwest corner with the RD for the remainder of the Northern Impoundment in the 100% RD submittal. Certain elements of the 90% RD, such as the civil excavation contouring transitioning into the northwest corner will need to be revised once a RD for the northwest corner is selected and a wholistic design is presented in the 100% RD submittal.

Acceptance of the Design Excavation Surface

As detailed in Section 5.3.4, to address the hydraulic heave risk and/or sensitivity in the Northern Impoundment (outside the northwest corner), an area-based average concentration approach has been used as the basis to demonstrate compliance with the clean-up standard. This approach utilizes the same risk-based approach used to develop the clean-up standard as the basis to demonstrate compliance with it (see Appendix E) and to present the excavation contours presented in this 90% RD. A major uncertainty in the success of the RD, as set forth in the 90% RD, is the acceptance of this excavation methodology. Many of the uncertainties presented in this Section 5.11 are applicable specifically to the design excavation elevations included in this RD. If the target excavation elevations were to become deeper (through application of the clean-up standard on a point-by-point basis, both for purposes of establishing excavation elevations or post-confirmation sampling), the uncertainties discussed in this Section 5.11 would become more significant. The volume of material for removal and target excavation elevations would increase significantly, and as a result, the risk of hydraulic heave would become more pronounced in areas outside the

ED_014247_00001351-00092

northwest corner. This can be seen visually by comparing the heat maps showing hydraulic heave risk for the area-based average approach (figure on the left) and the point-by-point excavation approach (figure on the right) shown on Figure 5-K, below. For the area outside of the northwest corner, excavation using area-based average concentrations will result in removal of an estimated 99.82 of the total mass of dioxins and furans above the clean-up level. For that same area, implementation of a point-by-point excavation approach would result in excavation of an estimated additional 46,000 CY of waste material, but would only account for the removal of an estimated 0.18 percent of the total mass of dioxins and furans above the clean-up level.

The duration and cost of the project would also increase and the impact on the community would be greater, due to an increase in truck traffic and a likely longer duration for the RA activities.

Figure 5-K Comparison of Hydraulic Heave Risk

5.11.2 BMP

There are significant uncertainties related to the BMP including the risk of overtopping during high water events, the larger footprint in the river associated with the revised BMP alignment, the risk of barge strikes, and the availability of materials.

Risk of Overtopping and Release During Excavation

The proposed top elevation of the BMP is +9 ft NAVD88, an elevation which exceeds historical water levels since 1994 during the excavation season. Even using this top elevation for the BMP, there is an inherent risk of a flooding event during excavation which could cause overtopping of the BMP and result in a release of waste material into the river and/or potentially put worker safety at risk. Simply put, when digging in and working below the river surface, the dynamics of the weather and associated river levels create an inherent risk of releases to the river, and there is no guarantee that future river levels during the excavation season will not exceed historical levels.

This risk is even more significant in light of the CWA's currently ongoing design to increase flow rate capacity (gates) of the Lake Houston control structure upriver of the Northern Impoundment. Despite multiple attempts made by the

ED_014247_00001351-00093

EPA and GHD to obtain the modelled flow data associated with this project, the CWA has yet to provide any definitive information and this remains an uncertainty in the design top elevations of the BMP wall.

BMP Alignment

The current plans for the installation of the BMP place it outside the perimeter of the Northern Impoundment and TCRA armored cap that covers the Northern Impoundment. In that location, installation and removal of the BMP is not anticipated to result in any releases of dioxin-impacted material, consistent with RAO 1 of the ROD, which states that the remedy must "prevent releases of dioxins and furans above clean-up levels from the former waste impoundments to sediments and surface water of the San Jacinto River." Placing the BMP outside the footprint of the TCRA armored cap also alleviates challenges with controlling turbidity that were encountered while deploying turbidity curtains in the northwest corner during the SDI, as outlined in a letter to the EPA dated September 28, 2021 (GHD, 2021e). Studies and analyses performed since the ROD was issued show that resuspension of sediments containing background levels of various contaminants may occur during installation and removal of the BMP and that measures such as turbidity curtains may be ineffective to control them when water and wind velocities are elevated.

TxDOT has raised specific concerns about the size and placement of the BMP in the river channel on river velocities that could impact the stability of its bridge structures. These concerns extend to the proposed installation of structures to protect the BMP from barge strikes. Per TxDOT's request, hydrodynamic modelling was performed to evaluate the effects of the BMP structure in the river on the velocity and shear stress of the river on the current system protecting the bridge piers. TxDOT requested and on April 11, 2022, was provided with the results of this modelling. The modelling indicated that effects of the BMP structure should be minimal (see Appendix F), but TxDOT has not indicated whether it agrees with that conclusion.

TxDOT has also raised concerns about possible effects to the current and/or future I-10 Bridge caused by the end-state condition of the Northern Impoundment area following completion of the RA and removal of the BMP. A deep hole will remain where the Northern Impoundment once was, which could affect the flow of the river in that area and the potential for scour along the bank of the river north of I-10. TxDOT requested and was provide with hydrodynamic modelling performed for the 90% RD in order to evaluate the potential for scour of the end-state condition. The detail and results of that modelling, as provided to TxDOT, are included in Appendix F. TxDOT is expected to further address its concerns in its comments on the 90% RD package.

Barge Impact Analysis

The increased depth and horizontal extent of waste material has required a more robust BMP design with an expanded footprint that projects further into the channel of the San Jacinto River than was contemplated in the ROD. This new alignment of the BMP will require extensive coordination with the USCG and will increase the risk of barge strikes that could cause BMP failure. In 2019, flooding associated with Tropical Storm Imelda caused 11 barges upstream of the Northern Impoundment to break free. Six of the barges struck the pier columns supporting the I-10 Bridge resulting in over $5 MM in damages. One of the barges also struck the berm on the northeast side of the Northern Impoundment. To the extent extreme weather events become more common, the likelihood of a barge impacting the BMP structure protruding into the river channel over the projected 7-year minimum duration of the project is high.

As described in Section 5.5.8, a barge impact analysis was performed for purposes of the 90% RD. The analysis was performed using ASHTO guidance to inform the level of protection to be put in place to protect the BMP wall, given that a breach or damage to the wall could result in potential releases to the river or loss of life of workers inside the excavation. The analysis concluded that the current BMP wall design could withstand contact with a 54 ft barge in laden condition at an impact velocity of 2.2 ft/s without sustaining global failure. The velocity assumptions used in this barge strike analysis were based upon modeled velocities in the vicinity of the Northern Impoundment obtained from the hydrodynamic model (see Appendix F). These velocities should be protective of typical marine vessel activity in the vicinity of the Northern Impoundment, which is off-set to the west of the highest river flows in the main channel, however, damage requiring repairs and work stoppage could still occur. Although not required, any additional protective structures that may be considered would likely further expand the footprint of the BMP and will encroach upon the main channel of the river.

ED_014247_00001351-00094

The risk of barge strikes remains an uncertainty in the RD and a risk with respect to the safe implementation of the RA.

Availability of Materials

While the types of pilings proposed in the current BMP design are more readily available than those considered in the 30% RD, the RA will still require a significant amount of steel sheet piles and other materials for construction of the BMP. Since the beginning of the COVID-19 Pandemic, there have been challenges worldwide associated with supply chain and availability and shipping of goods and materials. Assuming this trend continues, the schedule of the RA could be affected. Variables such as international tariffs and steel prices will also have significant effects on the availability, schedule, and feasibility of acquiring the BMP materials.

5.11.2.1 Water Treatment

There are significant uncertainties with respect to water treatment, including how well bench-scale treatability testing will translate to the RA and the unresolved location of the WTS.

Translation of Laboratory Testing to Field Implementation

It remains uncertain how well the laboratory-controlled treatability testing for water treatment will translate to field-scale implementation during the RA. The water treatment methodology included in this RD is established, proven technology, and the treatability testing performed to date (summarized in Sections 3.4 and 3.6), has yielded favorable results, but these tests were completed in much smaller, controlled settings that may not translate to full-scale implementation. Further, the significant volume of water requiring treatment and the long turn-around-time for dioxins and furans analysis will necessitate continuous discharge of effluent water. Though start-up testing will be performed, and real-time operational and quality assurance parameters will be constantly monitored, there is not expected to be sufficient retention capacity that would allow for sampling prior to discharge. Consistently meeting the water quality standards will also be challenging due to the extremely low dioxins and furans water quality standard (even using the ML to demonstrate compliance).

Access to Property for Water Treatment System

Due to lack of usable land in the vicinity of the Northern Impoundment, the WTS will have to be located off-site on a separate piece of property. All told, approximately 8 to 9 acres of upland property will be necessary to support RA activities, including water storage and treatment, materials storage, office trailers and parking, truck staging and scales, and sheet pile load-out to marine vessels. Though several properties are being evaluated for long-term access and extensive discussions with property owners have occurred, an agreement for use of such an upland property has not yet been secured. Ideally, the off-site property would be located as close to RA activities as possible (and north of the I-10 Bridge), to minimize the distance that contact water would need to be conveyed for treatment and to minimize the travel distance between the Northern Impoundment and the WTS for site personnel. The details of the future TxDOT bridge replacement project will also affect the options available, as TxDOT's use of its ROW may cut off access to properties located to the west and TxDOT's bridge construction activities could eliminate any option of conveying impacted water to the south under the I-10 Bridge.

5.11.3 Other Uncertainties

5.11.3.1 Stakeholders

Impacts on the Community and Environment

Execution of a project of this magnitude and duration will have a significant impact on the surrounding community. Activities associated with construction and removal of the BMP wall, and excavation and transport of 184,800 CY of waste material (accounting for bulking and excluding material from the northwest corner), will require a significant number of truck trips with associated impacts on the surrounding area extending over the minimum 7-year duration of

ED_014247_00001351-00095

the RA. Even without included additional truck trips associated with excavation of material from the northwest corner, it is estimated that 13,200 truck trips and approximately 3.1 million miles will need to be driven to complete the RA. This truck traffic will not only have a significant effect on the traffic and congestion in the surrounding residential and commercial areas, but will have an impact on greenhouse gas (GHG) emissions and the potential for traffic accidents. These impacts will only be further exacerbated if the TxDOT bridge replacement work is performed in tandem with the remedy, as it could result in additional congestion and delays which would increase GHG emissions and impacts on local communities.

The adjusted alignment of the southern extent of the BMP wall places work within 50 ft horizontally of the current I-10 Bridge structure, and within 10 feet vertically, as the TxDOT ROW road will need to be built up to ramp over the BMP wall at an elevation of +9 ft NAVD88. Work in such close proximity to the I-10 freeway could create a physical safety hazard and/or a distraction hazard for drivers in passing vehicles on nearby I-10, potentially necessitating the closure of the outer westbound lane of traffic during installation of that portion of the BMP.

Obstruction in the Floodway

As part of the RA, an approximately 3,000 ft long +9 foot NAVD88 BMP will be present in the San Jacinto River for a minimum of approximately 7 years. The presence of an impermeable steel structure in the waterway could impede maritime activities in a heavily utilized industrial river. Hydrodynamic modelling was performed at the behest of the HCFCD to evaluate the effect of the BMP wall on the course of flood waters in the proximity of the Northern Impoundment (see Appendix F). While modelling results indicated that the effects would not be significant, this modelling did not take into account any increase in the flows of the river associated with the CWA Lake Houston Dam expansion project discussed above.

5.11.3.2 Cost

The 90% RD detailed in this document was developed in response to significant changes in understanding of site conditions since the ROD was issued. Those changes include the presence of material requiring removal at much deeper elevations, which has impacted nearly every element of the 90% RD. This 90% RD is also subject to significant uncertainties, as detailed in this Section (Section 5.11). In light of those uncertainties, the impact of these changes in the understanding of site conditions on the overall remedy costs has not yet been defined, but the increase in costs above the EPA estimate included in the ROD could be significant.

6. Sand Separation Area (SSA)

6.1 2019 Sediment Sampling Program

The ROD identifies MNR as the preferred remedial alternative for San Jacinto River sediments in the SSA. The rationale for selection of MNR as the preferred alternative was that the $TEQ_{DF,M}$ concentrations in the SSA are relatively low and there are data indicating that the area is subject to sediment deposition. Modelling of hydrodynamics and sediment transport conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) suggests that the reach of the river adjacent to the SSA is an area of sediment deposition.

In accordance with the PDI-2 Work Plan (GHD, 2019d), sediment samples were collected during PDI-2 field activities from the SSA to meet the following objectives:

- Provide further characterization of the dioxin and furan concentrations in sediment of the SSA.
- Provide a radioisotope analysis of ^{210}Pb and ^{137}Cs to estimate the natural rate of sediment deposition.

^{137}Cs was released into the environment as a result of atmospheric testing of nuclear devices beginning in 1954 with a peak in 1963. Because natural occurrence is extremely rare and its presence can be related to a specific period of

ED_014247_00001351-00096

time, ^{137}Cs detections are useful in dating sediments. ^{210}Pb is used to calculate deposition rates because it occurs naturally.

Samples were collected from the locations shown on Figure 2-4 using Vibracore sampling devices and a dive team. Collection and analysis of samples were carried out in accordance with the PDI-2 Work Plan (GHD, 2019d).

6.1.1 SSA Analytical Sampling

Thirty-six sediment samples were collected for analysis of dioxins and furans. Samples were collected at the nine locations identified on Figure 2-4. At each location, samples were collected at depth intervals of 0 to 1 foot, 1 to 2 ft, 2 to 4 ft, and 4 to 6 ft below the sediment/surface water interface. Eurofins TestAmerica analyzed the samples for dioxins and furans by EPA Method 1613B and for percent solids by ASTM D2216.

6.1.2 SSA Isotope Sampling

Ninety-nine sediment samples were collected for analysis of ^{137}Cs and ^{210}Pb. Samples were collected at the same nine locations sampled for analysis of dioxins and furans. Samples were collected at depth intervals of 2.5 cm (0.98 inches) from the sediment/surface water interface to a depth of 82.5 cm (32.5 inches). Eleven intervals were sampled at each location. Teledyne Brown Engineering, Inc. analyzed all of the sediment samples for ^{137}Cs and ^{210}Pb by EPA Method 901.1.

6.1.3 SSA Investigation Results

6.1.3.1 SSA Analytical Results

Concentrations of $TEQ_{DF,M}$ are below the risk-based protective level of 30 ng/kg (as determined by the EPA in the ROD) in the top 24 inches of all but one of the SSA sampling locations - SJSSA06 (see Table 6-1 and Figure 2-4).

The laboratory report and data validation report for dioxins and furans are provided in Appendix K.

6.1.3.2 SSA Isotope Results

Cesium-137

^{137}Cs was not detected in any of the 99 samples. Because it was not detected, it can be concluded that sediment to a depth of 82.5 cm (2.71 feet) has been deposited in all areas of the SSA since the mid-1960s. This corresponds to an overall deposition rate of approximately 1.5 cm per year (cm/year).

The laboratory report and data validation report for ^{137}Cs are provided in Appendix K.

Lead-210

Radioactivity of ^{210}Pb decreases with depth at SJSSA01, SJSSA04, SJSSA07, and SJSSA02. The decrease in activity indicates that deposition is occurring at estimated rates ranging from 0.77 cm/year to 3.5 cm/year.

Radioactivity of ^{210}Pb at near shore location SJSSA05 increases with depth, indicating that erosion has occurred at this location. Radioactivity of ^{210}Pb at SJSSA08, SJSSA03, SJSSA06, and SJSSA09 is variable. This variability could be due to alternating periods of erosion and deposition caused by boat traffic, storm events, and/or natural river flows.

Table 6-1 summarizes the results for ^{210}Pb. The laboratory report and data validation report for ^{210}Pb are provided in Appendix K.

6.1.4 SSA Conclusions

Results of the 2019 sampling event indicate that, due to no radioactivity of ^{137}Cs above detection limits, the SSA has generally been depositional since the mid-1960s. Radioactivity of ^{210}Pb indicates that deposition is occurring in

ED_014247_00001351-00097

four locations at estimated rates of approximately 0.77 cm/year to 3.5 cm/year but that activities may be occurring in the SSA that are affecting deposition in other locations in the area. Concentrations of $TEQ_{DF, M}$ are below the risk-based protective level of 30 ng/kg (as determined by the EPA in the ROD) in the top 24 inches of all but one of the SSA sampling locations - SJSSA06 (see Table 6-1 and Figure 2-4).

6.2 Monitored Natural Recovery

The ROD selected MNR as the remedy for sediments in the SSA. The EPA selected MNR on the basis of the relatively low concentrations of dioxins and furans in sediment, low potential for risk to human and ecological receptors, and evidence of net deposition of sediment. Data generated from the PDI-2 sampling event indicate that varying degrees of deposition are occurring in most of the mid shore and far shore areas. With the exception of the one near shore area (location SJSSA06), concentrations of $TEQ_{DF, M}$ at depths less than 24 inches are at or below the level that EPA identified in the ROD as being protective of human and ecological receptors. In one of the mid shore sample locations (SJSSA05), erosion appears to be occurring, however concentrations of $TEQ_{DF, M}$ at all depths at this location are below EPA's protective level of 30 ng/kg. In summary, eight out of nine total sample locations at depths less than 24 inches have $TEQ_{DF, M}$ concentrations below 30 ng/kg. This is consistent with the results observed during the RI. MNR activities moving forward include additional monitoring at the nine locations sampled for PDI-2 to (1) confirm that concentrations of $TEQ_{DF,M}$ remain below 30 ng/kg at depths less than 24 inches at the eight locations identified in PDI-2 and (2) and further monitoring of concentrations at sample location SJSSA06.

The MNR Plan is included as Attachment 9 in Appendix J. The MNR Plan discusses the processes of MNR as related to dioxins and furans, the site-specific characteristics considered in further development of the plan, parameters for monitoring MNR, sampling frequency, and the decision rule for evaluating the effectiveness of MNR. The implementation of ICs will also be considered for the area around SJSSA06 (Appendix J, Attachment 7).

7. Environmental Footprint (Greener Clean-Ups)

EPA's *Principals for Greener Clean-Ups* (EPA, 2009) have been considered in the development of the Northern Impoundment RD. The EPA and state agencies have developed a framework outlining the desired outcomes of a potential standard for greener clean-ups. The framework focuses on five principals associated with a clean-up project's environmental footprint. These principals are listed below along with the potential methods by which they may be incorporated into the Northern Impoundment RA.

Minimizing Total Energy Use and Maximizing Use of Renewable Energy. This includes reducing total energy use while also identifying means to increase the use of renewable energies throughout the clean-up. The selected RC may incorporate this principle into the RD by:

- Limiting traffic at the Northern Impoundment by requiring workers to carpool.
- Requiring the RC to, if appropriate, to use energy efficient equipment or vehicles.

Minimizing Air Pollutants and Greenhouse Gas Emissions. This includes reducing total air emissions, including emissions of air pollutants and GHGs, throughout the RA. The selected RC may incorporate this principle into the RD by:

- Implementing an Air Monitoring Plan to control dust in and around the Northern Impoundment.
- Requiring air emission control devices on equipment that deliver solidification agents.
- Specifying the use of electricity at the laydown and staging areas, where available, rather than portable diesel generators.

ED_014247_00001351-00098

Minimizing Water Use and Impacts to Water Resources. This includes minimizing the use of water and impacts to water resources throughout the RA. The selected RC may incorporate this principle into the RD by:

- Employing best management practices for stormwater, erosion, and sedimentation control, as detailed in a SWPPP to be developed prior to the RA.

Reduce, Reuse, and Recycle Materials and Waste. This includes minimizing the use of virgin materials and generation of waste throughout the RA as well as maximizing the use of recycled materials. The selected RC may incorporate this principle into the RD by:

- Using recycled rock from the TCRA armored cap for restoration of the Northern Impoundment area.
- Using recycled non-impacted material from the historic central and southern berms on-site to construct site features and/or SWPPP controls.
- Using recycled aggregate from inside the two walls of the BMP as cover at the completion of the RA.
- Implementing a recycling program for workers.
- Considering recycled material when purchasing material for the RA.
- Reuse of SWPPP controls, where possible.

Protect Land and the Environment. This includes reducing impacts to land and the environment throughout the clean-up. The selected RC may incorporate this principle into the RD by:

- Minimizing the footprint of disturbed areas at the laydown and support areas, to the extent practicable.

8. Drawings and Specifications

8.1 Design Drawings

The 90% RD design drawings are presented in Appendix G and include the following:

- Drawing G-01 - Cover Sheet.
- Drawing C-01 - Overall Plan.
- Drawing C-02 - Existing Conditions.
- Drawing C-03 - SSA Area and Northern Impoundment Works.
- Drawing C-04 - Soil Erosion and Sediment Control Plan - Overall.
- Drawing C-05 - Soil Erosion and Sediment Control Plan - Seasonal.
- Drawing C-06 - Soil Erosion and Sediment Control Details.
- Drawing C-07 - Project Traffic Control Plan.
- Drawing C-08 - Excavation Plan - Overall.
- Drawing C-09 - Excavation Plan Northwest.
- Drawing C-10 - Excavation Plan Northeast.
- Drawing C-11 - Excavation Plan Southeast.
- Drawing C-12 - Excavation Plan Southwest.
- Drawing C-13 - Excavation Section - 1 of 6.
- Drawing C-14 - Excavation Section - 2 of 6.
- Drawing C-15 - Excavation Section - 3 of 6.
- Drawing C-16 - Excavation Section - 4 of 6.
- Drawing C-17 - Excavation Section - 5 of 6.

ED_014247_00001351-00099

- Drawing C-18 - Excavation Section - 6 of 6.
- Drawing C-19 - Typical Seasonal Excavation Sequencing.
- Drawing C-20 - Typical Excavation Sequencing - 1 of 2.
- Drawing C-21 - Typical Excavation Sequencing - 2 of 2.
- Drawing C-22 - Restoration Plan.
- Drawing C-23 - Typical Construction Sequencing - 1 of 2.
- Drawing C-24 - Typical Construction Sequencing - 2 of 2.
- Drawing C-25 - Typical Details - 1 of 3.
- Drawing C-26 - Typical Details - 2 of 3.
- Drawing C-27 - Typical Details - 3 of 3.
- Drawing C-28 - Pile Wall Layout Plan.
- Drawing C-29 - Double Pile Wall Plan and Profile - 1 of 4.
- Drawing C-30 - Double Pile Wall Plan and Profile - 2 of 4.
- Drawing C-31 - Double Pile Wall Plan and Profile - 3 of 4.
- Drawing C-32 - Double Pile Wall Plan and Profile - 4 of 4.
- Drawing C-33 - South Wall Plan and Profile - 1 of 2.
- Drawing C-34 - South Wall Plan and Profile - 2 of 2.
- Drawing C-35 - Double Pile Wall Sections - 1 of 7.
- Drawing C-36 - Double Pile Wall Sections - 2 of 7.
- Drawing C-37 - Double Pile Wall Sections - 3 of 7.
- Drawing C-38 - Double Pile Wall Sections - 4 of 7.
- Drawing C-39 - Double Pile Wall Sections - 5 of 7.
- Drawing C-40 - Double Pile Wall Sections - 6 of 7.
- Drawing C-41 - Double Pile Wall Sections - 7 of 7.
- Drawing C-42 - South Wall Sections - 1 of 3.
- Drawing C-43 - South Wall Sections - 2 of 3.
- Drawing C-44 - South Wall Sections - 3 of 3.
- Drawing S-01 - Structural Notes.
- Drawing S-02 - Structural Layout Plan.
- Drawing S-03 - Structural Sections.
- Drawing S-04 - Structural Details 1 of 2.
- Drawing S-05 - Structural Details 2 of 2.
- Drawing P-00A - Water Treatment System Process Flow Diagram Symbols.
- Drawing P-00B - Water Treatment System Process Flow Diagram Schedules.
- Drawing P-01 - Water Treatment System Process Flow Diagram/Mass Balance.
- Drawing P-02 - Water Treatment System P&ID (1 of 4).
- Drawing P-03 - Water Treatment System P&ID (2 of 4).
- Drawing P-04 - Water Treatment System P&ID (3 of 4).
- Drawing P-05 - Water Treatment System P&ID (4 of 4).
- Drawing P-06 - Site Plan Water Treatment System Season 3-6.

ED_014247_00001351-00100

These drawings, insofar as they reflect use of specific means and methods for carrying out the Northern Impoundment remedy selected in the ROD, may be modified as the means and methods for performing the Northern Impoundment remedy selected in the ROD are further defined.

8.2 Technical Specifications

To supplement the Northern Impoundment 90% RD design drawings, technical specifications are presented in Appendix H and include the following:

- Section 00 01 10 - Table of Contents.
- Section 00 01 20 - Seals.
- Section 01 10 00 - Summary.
- Section 01 30 00 - Administrative Requirements.
- Section 01 33 00 - Submittal Procedures.
- Section 01 35 00 - Temporary Traffic Controls.
- Section 01 35 29 - Health and Safety Requirements.
- Section 01 40 00 - Quality Requirements.
- Section 01 50 00 - Temporary Facilities and Controls.
- Section 01 57 13 - Temporary Soil Erosion and Sediment Controls.
- Section 01 57 19 - Temporary Environmental Controls.
- Section 01 60 00 - Product Requirements.
- Section 01 70 00 - Execution and Closeout Requirements.
- Section 01 91 00 - Water Treatment Consumables.
- Section 01 91 20 - Facility Testing and Commissioning.
- Section 02 55 00 - Waste Material Solidification.
- Section 02 61 14 - Material Handling and Transportation.
- Section 02 61 16 - Off-Site Transportation and Disposal.
- Section 22 05 03 - Pipe Data Sheet-PVDF Tubing and Carrier Piping.
- Section 23 05 53 - Identification for Piping and Equipment.
- Section 31 05 19.13 - Geotextiles for Earthwork.
- Section 31 10 00 - Site Clearing.
- Section 31 23 16 - Excavation.
- Section 31 23 19 - Dewatering.
- Section 31 23 23 - Fill.
- Section 31 35 26.16 - Geomembranes.
- Section 31 37 00 - Riprap.
- Section 31 41 16 - Sheet Piles.
- Section 32 31 13 - Chain Link Fences and Gates.
- Section 32 92 19 - Seeding.
- Section 35 49 25 - Turbidity Curtain.
- Section 40 05 13 - Common Work Results for Process Piping.
- Section 40 05 33 - High Density Polyethylene Process Pipe.
- Section 40 05 51 - Common Requirements for Process Valves.
- Section 40 70 00 - Instrumentation for Process Systems.

- Section 46 07 01 - Water Treatment System (WTS).
- Attachment A - Process Control Narrative.

9. Supporting Deliverables

Pursuant to the SOW, supporting deliverables have been prepared as part of the 90% RD, as summarized below. As required in the January 12, 2022, letter from the EPA (EPA, 2022a), seven of supporting deliverables (identified below) have already been submitted to the EPA.

- ***HASP*** - submitted to the EPA January 17, 2022.
- ***ERP*** - submitted to the EPA January 17, 2022.
- ***TODP*** - submitted to the EPA January 17, 2022.
- ***MNR Plan*** - submitted to the EPA January 17, 2022.
- ***QAPP*** - submitted to the EPA March 31, 2022.
- ***FSP*** - submitted to the EPA May 31, 2022.
- ***SWMP*** - submitted to the EPA May 31, 2022.

Most of these plans consider that the RC will be required to prepare its own plans that address the topics covered by these plans and detail the means and measures to be implemented to accomplish the objectives of such plans.

9.1 Health and Safety Plan

The Construction HASP (Attachment 1 in Appendix J) has been prepared in accordance with 29 CFR 1910 and 1926 to provide protection of human health and the environment during activities performed to implement the Northern Impoundment RA. It includes all physical, chemical and all other hazards posed by the work required to perform the Northern Impoundment RA.

9.2 Emergency Response Plan

The ERP (Attachment 2 in Appendix J) describes procedures to be used in the event that there is an emergency while work to implement the Northern Impoundment RA is being performed. The ERP includes procedures with respect to the entity(ies) responsible for responding to an emergency, the plan for meeting with those involved in the response, contingency plans for spills, and release reporting and response. The ERP also includes a High-Water Preparedness Plan that describes the weather monitoring procedures and the emergency actions that will be taken during a potential high-water event.

9.3 Field Sampling Plan

The FSP (Attachment 3 in Appendix J) describes the sampling activities for all media to be sampled during work to implement the Northern Impoundment RA. The FSP provides the rationale for sample collection and describe the protocol for sample handling and analysis.

9.4 Quality Assurance Project Plan

The QAPP (Attachment 4 in Appendix J) provides an explanation of the quality assurance and quality control procedures and chain-of-custody procedures for all sampling to implement the Northern Impoundment RA. This includes quality assurance during data generation and acquisition and during data validation and review.

ED_014247_00001351-00102

9.5 Site-Wide Monitoring Plan

The SWMP (Attachment 5 in Appendix J) describes the procedures for monitoring to prevent the potential spread or off-site migration of contaminated media from the Northern Impoundment during and following implementation of the Northern Impoundment RA.

9.6 Construction Quality Assurance/Quality Control Plan

The CQA/QCP (Attachment 6 in Appendix J) describes the planned and systematic activities that verify that the remedial construction to implement the Northern Impoundment RA will meet requirements consistent with clean-up goals and performance requirements set forth in the ROD.

9.7 Institutional Controls Implementation and Assurance Plan

The ICIAP (Attachment 7 in Appendix J) describes the institutional controls expected to be applicable to the SSA and the process for developing and implementing them.

9.8 Transportation and Off-Site Disposal Plan

The TODP (Attachment 8 in Appendix J) details, for the Northern Impoundment RA, waste characterization activities and disposal options. It addresses the transportation routes for off-site shipments of waste material during implementation of the Northern Impoundment RA, identifies procedures to protect any communities that may be affected by such truck shipments, and describes the procedures for on-site management and loading of the waste materials.

9.9 Monitored Natural Recovery Plan (Operations & Maintenance Plan)

The MNR Plan (Attachment 9 in Appendix J), describes for the SSA the routine monitoring and testing to be conducted and procedures for data collection and evaluation, record keeping and reporting of data to be followed, after completion of the Northern Impoundment RA. As discussed with the EPA on May 7, 2020, the MNR Plan takes the place of the O&M Plan referred to in the SOW.

9.10 Operations & Maintenance Manual

Per discussion with the EPA, this plan is not anticipated to be necessary.

10. References

- EPA, 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Updates I to V. SW-846. NTIS publication no. PB97-156111 or GPO publication No. 955-001-00000 1. Office of Solid Waste. September 1986 (with all subsequent revisions).
- EPA, 1998. Management of Remediation Waste Under RCRA. EPA530-F-98-026. Office of Solid Waste. October 1998.
- EPA, 2002. RCRA Waste Sampling Draft Technical Guidance - Planning, Implementation, and Assessment. EPA530-D-02-002. Office of Solid Waste. August 2002.

- EPA, 2009. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. *Principles for Greener Clean-Ups*. August 27, 2009.
- EPA, 2010. Administrative Settlement Agreement and Order on Consent for Removal Action. U.S. Environmental Protection Agency Region 6 CERCLA Docket No. 06-12-10. In the matter of San Jacinto River Waste Pits Superfund Site Pasadena, Harris County, Texas. International Paper Company and McGinnes Industrial Management Corporation, Respondents.
- EPA, 2017. Record of Decision, San Jacinto River Waste Pits. Harris County, Texas. EPA ID: TXN000606611. U.S. Environmental Protection Agency, Region 6. Dallas, Texas. October 2017.
- EPA, 2018a. Administrative Settlement Agreement and Order on Consent for Remedial Design. U.S. EPA Region 6, CERCLA Docket. No. 06-02-18. In the matter of: San Jacinto Waste Pits Superfund Site, Harris County, Texas. International Paper Company and McGinnes Industrial Maintenance Corporation, Respondents. April 2018.
- EPA, 2018b. Letter to C. Patmont, Anchor QEA, regarding approval of First Phase Pre-Design Investigation Work Plan, dated September 12, 2018. U.S. Environmental Protection Agency.
- EPA, 2018c. Letter to C. Munce, GHD Services Inc., regarding approval of Submission Date for Draft Second Phase Pre-Design Investigation Work Plan and Draft Treatability Study Work Plan, dated December 18, 2018. U.S. Environmental Protection Agency.
- EPA, 2019a. Letter to C. Munce, GHD Services Inc., regarding comments on the Draft Second Phase Pre-Design Investigation Work Plan, dated April 18, 2019. U.S. Environmental Protection Agency.
- EPA, 2019b. Letter to C. Munce, GHD Services Inc., regarding comments on the Draft Treatability Study Work Plan, dated April 18, 2019. U.S. Environmental Protection Agency.
- EPA, 2019c. Letter to C. Munce, GHD Services Inc., regarding approval of Final Second Phase Pre-Design Investigation Work Plan, dated August 8, 2019. U.S. Environmental Protection Agency.
- EPA, 2019d. Letter to C. Munce, GHD Services Inc., regarding approval of Final Treatability Study Work Plan, dated August 27, 2019. U.S. Environmental Protection Agency.
- EPA, 2019e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Refinement Notice, dated October 11, 2019. Approval received from G. Baumgarten on October 22, 2019. GHD Services Inc.
- EPA, 2019f. Letter to C. Munce, GHD Services Inc., regarding approval of Force Majeure Event, dated October 30, 2019. U.S. Environmental Protection Agency.
- EPA, 2019g. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Additional Refinement Notice, dated November 1, 2019. Approval received from G. Baumgarten on November 8, 2019. GHD Services Inc.
- EPA, 2019h. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Fourth Refinement Notice, dated December 4, 2019. Approval received from G. Baumgarten on December 9, 2019. GHD Services Inc.
- EPA, 2020a. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding *Treatability Study Work Plan Refinement Notice*, dated January 10, 2020. Approval received from G. Baumgarten on January 17, 2020. GHD Services Inc.
- EPA, 2020b. Baumgarten, Gary, U.S. Environmental Protection Agency. "Regarding San Jacinto River Waste Pits - Surface Water Quality Standard." Received by Judy Armour, Nicholas Casten, Katie Delbecq, Satya Dwivedula, Anne Foster, Karl Gustavson, Monica Harris, Ashley Howard, John Meyer, Charles Munce, Brent Sasser, Paul Schroeder, Phillip Slowiak, Janie Smith. February 18, 2020. E-Mail.
- EPA, 2020c. Letter to C. Munce, GHD Services Inc. regarding comments on the *Additional Treatability Testing Notice*, dated May 5, 2020. U.S. Environmental Protection Agency.
- EPA, 2020d. Letter to C. Munce, GHD Services Inc. regarding approval of the June 4, 2020, Revised Additional Treatability Testing Notice, dated June 11, 2020. U.S. Environmental Protection Agency.

ED_014247_00001351-00104

- EPA, 2020e. Letter to C. Munce, GHD Services Inc. regarding comments on the Preliminary 30% Remedial Design - Southern Impoundment, dated June 26, 2020. U.S. Environmental Protection Agency.
- EPA, 2020f. Letter to C. Munce, GHD Services Inc. regarding comments on the Preliminary 30% Remedial Design - Northern Impoundment, dated July 16, 2020. U.S. Environmental Protection Agency.
- EPA, 2020g. Letter to C. Munce, GHD Services Inc. regarding approval of the August 21, 2020, Request for Northern Impoundment Schedule Extension, dated September 10, 2020. U.S. Environmental Protection Agency.
- EPA, 2020h. Letter to C. Munce, GHD Services Inc. regarding the Waste Characterization Evaluation, dated November 19, 2020. U.S. Environmental Protection Agency.
- EPA, 2021a. Letter to C. Munce, GHD Services Inc. regarding approval of the February 3, 2021 Request for Northern Impoundment Schedule Extension, dated March 29, 2021. U.S. Environmental Protection Agency.
- EPA, 2021b. Letter to C. Munce, GHD Services Inc. regarding comments on the *Supplemental Design Investigation Sampling Plan*, dated March 29, 2021. U.S. Environmental Protection Agency.
- EPA, 2021c. Letter to C. Munce, GHD Services Inc. regarding approval of the *Supplemental Design Investigation Sampling Plan - Revision 1*, dated June 4, 2021. U.S. Environmental Protection Agency.
- EPA, 2021d. Letter to A. Howard, U.S. Environmental Protection Agency, regarding SDI Sampling Plan Refinement Notice - 1, dated June 26, 2021. Approval received from A. Howard on August 4, 2021. GHD Services Inc.
- EPA, 2021e. Letter to C. Munce, GHD Services Inc. regarding approval of the October 6, 2021, *Revised Ambient Turbidity Measurements Plan*, dated October 15, 2021. U.S. Environmental Protection Agency.
- EPA, 2022a. Letter to C. Munce, GHD Services Inc. regarding approval of the October 1, 2021 Request for Northern Impoundment Schedule Extension, dated January 12, 2022. U.S. Environmental Protection Agency.
- EPA, 2022b. Letter to Chris Kotara (International Paper Company [IPC]) and Steve Joyce (McGinnes Industrial Maintenance Corporation [MIMC]) regarding San Jacinto River Waste Pits Superfund Site; Administrative Settlement Agreement and Order on Consent for Remedial Design, Docket No. 06-02-18, dated April 15, 2022. U.S. Environmental Protection Agency.
- GHD, 2018. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Schedule Extension and Approval of Submission Date - Draft Treatability Study Work Plan and Draft Second Phase Pre-Design Investigation Work Plan, dated December 7, 2018. GHD Services Inc.
- GHD, 2019a. *Draft Second Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. February 11, 2019.
- GHD, 2019b. *Draft Treatability Study Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. February 11, 2019.
- GHD, 2019c. *Final Treatability Study Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 20, 2019.
- GHD, 2019d. *Final Second Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. June 3, 2019.
- GHD, 2019e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Written Notification of Force Majeure Event, dated September 27, 2019. GHD Service Inc.
- GHD, 2019f. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Refinement Notice, dated October 11, 2019. GHD Services Inc.
- GHD, 2019g. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Additional Work Plan Refinement Notice, dated November 1, 2019. GHD Services Inc.

ED_014247_00001351-00105

- GHD, 2019h. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Second Phase Pre-Design Investigation Work Plan Fourth Refinement Notice, dated December 4, 2019. GHD Services Inc.
- GHD, 2020a. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Treatability Study Work Plan Refinement Notice, dated January 10, 2020. GHD Services Inc.
- GHD, 2020b. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Additional Treatability Testing Notice, dated April 16, 2020. GHD Services Inc.
- GHD, 2020c. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Revised Additional Treatability Testing Notice, dated June 4, 2020. GHD Services Inc.
- GHD, 2020d. *Preliminary 30% Remedial Design - Northern Impoundment*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 28, 2020.
- GHD, 2020e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension, dated August 21, 2020. GHD Services Inc.
- GHD, 2020f. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Refinement Notice - Revised Additional Treatability Testing Notice, dated October 15, 2020. GHD Services Inc.
- GHD, 2020g. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding the Waste Characterization Evaluation, dated October 20, 2020. GHD Services Inc.
- GHD, 2021a. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension, dated February 3, 2021. GHD Services Inc.
- GHD, 2021b. *Supplemental Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company and U.S. Environmental Protection Agency, Region 6. February 19, 2021.
- GHD, 2021c. *Supplemental Design Investigation Work Plan - Revision 1*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 21, 2021.
- GHD, 2021d. Letter to A. Howard, U.S. Environmental Protection Agency, regarding SDI Sampling Plan Refinement Notice - 1, dated July 26, 2021. GHD Services Inc.
- GHD, 2021e. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Turbidity Curtain Deployment During the Supplemental Design Investigation, dated September 28, 2021. GHD Services Inc.
- GHD, 2021f. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension, dated October 1, 2021. GHD Services Inc.
- GHD, 2021g. *Revised Ambient Turbidity Measurements Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. October 6, 2021.
- GHD, 2021h. Letter to A. Howard, U.S. Environmental Protection Agency, regarding Request for Northern Impoundment Schedule Extension - Addendum, dated November 9, 2021. GHD Services Inc.
- GHD, 2021i. Hydraulic Heave Analysis, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 9, 2021.
- GHD, 2021j. Concerns Regarding Hydraulic Heave, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 22, 2021.
- GHD, 2022a. Letter to S. Najda, Harris County Flood Control District, regarding Floodplain Drainage Impact Analysis, dated March 30, 2022. GHD Services Inc.
- GHD, 2022b. Revised Letter to S. Najda, Harris County Flood Control District, regarding Floodplain Drainage Impact Analysis, dated May 6, 2022. GHD Services Inc.

ED_014247_00001351-00106

- Harris County Flood Control District (HCFCD), 2022. E-Mail to GHD, regarding comments on March 30, 2022, Floodplain Drainage Impact Analysis, e-mail dated April 8, 2022.
- Integral and Anchor QEA, 2013a. *Baseline Human Health Risk Assessment*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 2013.
- Integral and Anchor QEA, 2013b. *Remedial Investigation Report*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 2013.
- Integral and Anchor QEA, 2018a. *Draft First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. June 2018.
- International Paper Company [IPC] and McGinnes Industrial Maintenance Corporation [MIMC], 2022a. Letter to Earthea Nance and Lisa Price, U.S. Environmental Protection Agency, regarding Request Pursuant to 40 CFR 300.825(c) to Alter Response Action for the Northern Impoundment, San Jacinto River Waste Pits Superfund Site, Harris County, Texas ("Site"), dated March 24, 2022.
- IPC and MIMC, 2022b. Letter to Lisa Price and John Meyer, U.S. Environmental Protection Agency, regarding Extension Request for Northwest Corner Component, dated June 21, 2022.
- Integral and Anchor QEA, 2018b. *First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. August 2018.
- Integral and Anchor QEA, 2018c. *Draft Remedial Design Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. September 2018.
- Integral and Anchor QEA, 2018d. *Addendum to the First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. October 2018.
- Integral and Anchor QEA, 2018e. *Remedial Design Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 2018.
- Integral and Anchor QEA, 2019. *Northwest Slope Enhancement Completion Report*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. August 2019.
- TCEQ, 2010. Texas Commission on Environmental Quality, Water Quality Division. *Procedures to Implement the Texas Surface Water Quality Standards*. RG-194. June 2010.

ED_014247_00001351-00107

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
General Comments from the EPA			
1		The acronym list identifies $TEQ_{DF,M}$ as TCDD Toxicity Equivalent for Mammals. The analytical tables (Tables 2-1, 2-3 and 6-1) present various TEQ values in addition to the $TEQ_{DF,M}$ values. Please verify that the Total WHO Dioxin TEQ (Human/Mammal)(ND=0.5) is the TEQ value being used for comparison to the 30 ng/kg DWA dioxin cleanup level in the ROD. The 90% Design should clearly identify the TEQ value being used to determine areas of excavation to meet the ROD cleanup value for the southern impoundment. In addition, all figures should include the TEQ acronym ($TEQ_{DF,M}$) when presenting dioxin concentrations.	The Total WHO Dioxin TEQ (Human/Mammal)(ND=0.5) is the TEQ value being used for comparison. All figures have been revised to include the TEQ acronym ($TEQ_{DF,M}$) when presenting dioxin concentrations.
Specific Comments from the EPA			
1	Page 24 Clarifier Underflow Solids Test Results	Photographs of the settling tests are showing in the photographic log included in Appendix C. Appendix D is the vibratory analysis.	Section 3.4.3.3 of the main text of the Pre-Final Northern Impoundment 90% Remedial Design (90% RD) Package has been revised to state the photographic log is included in Appendix C.
2	Page 29 3rd Full Paragraph	The first sentence states: *Notwithstanding the above, GHD has, as directed by EPA, developed a preliminary design for the remedy as it is outlined in the ROD in order to meet the approved schedule for submission of the 30% design package for the Northern Impoundment.* The sentence should be revised as follows: *Notwithstanding the above, GHD has, as required by the Administrative Settlement Agreement and Order on Consent for Remedial Design ~~directed by EPA~~, developed a preliminary design for the remedy as it is outlined in the ROD in order to meet the approved schedule for submission of the 30% design package for the Northern Impoundment.*	Section 5.2 of the main text of the 90% RD has been revised as requested.
3	Page 32 1st Paragraph	The first sentence says Approach A is technically impracticable due to the engineering limitation of the BMP. Approach A could be technically practicable, but due to safety issues, removal difficulties, and schedule issues, the Agency agreed during the Technical Working Group meetings that the design could consider an alternative approach for excavation of waste from cells 1, 2 and 3. The text should be revised to more clearly explain why Alternative B is the design approach for cells 1, 2 and 3.	This comment is not applicable as the 90% RD does not include Approach B excavation methodology.
4	Page 40 Section 5.3.5.3	The last sentence states that the geotextile and geomembrane barrier of the armored cap may be disposed of off-Site. Please clarify where the geotextile and geomembrane barrier will be disposed of if it is not disposed of off-Site.	Section 5.6.2.2 of the main text of the 90% RD has been revised to state that the geotextile and geomembrane will be disposed of off-site.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
5	Page 40 Section 5.3.5.4	The pre-final design should provide the criteria that will determine whether the waste will require solidification.	Following dewatering (and natural draining), if the waste material is still too wet for off-site transport (i.e., does not pass the paint filter test), the material will be staged on-site and mixed with either drier material or a solidification reagent to further reduce the water content. This is discussed in Sections 3.3.5 and 5.6.3 of the main text of the 90% RD. In addition, Section 5.7.1 of the main text of the 90% RD states that the remedial contractor (RC) may conduct additional tests to determine the appropriate reagent dose at the time of the RA. In generally, the paint filter test will determine whether solidification is necessary or not.
6	Page 41 Section 5.3.6	The pre-final design should provide details about whether the waste material will need to be solidified prior to transport to an off-Site disposal facility. The 30% design only uses a general condition of waste not being dry enough for direct load out.	The 90% RD includes a specification for soil solidification. The intent is not to solidify the waste material into a hard mass, but simply to add enough reagent to reduce the water content so the material passes the paint filter test and can be loaded into trucks for transport to the disposal facilities. A treatability study was performed to demonstrate how much reagent might be required and these results are included in Sections 3.3.5 and 5.6.3 of the main text of the 90% RD. In addition, Section 5.7.1 of the main text of the 90% RD states that the RC may conduct additional tests to determine the appropriate reagent dose at the time of the RA.
7	Page 41 Section 5.3.7.2:	The design states that rock that is readily accessible and can be segregated without disturbing the underlying liner may be salvaged for re-use. Under Approach B the operator will not be able to see the rock. The design should provide additional detail on how the operator of the excavator will know how much rock to excavate without disturbing the liner.	This comment is not applicable as the 90% RD does not include Approach B excavation methodology.
8	Page 43 Section 5.3.8:	Post-excavation confirmation sampling is an essential step in the Superfund cleanup process that provides EPA the ability to verify that the remedial action objectives have been achieved. The pre-final design needs to include a post-excavation confirmation sampling program. Discussions about the confirmation sampling program needs to be included as part of future TWG meetings.	The post-excavation confirmation sampling program for the Northern Impoundment (excluding the northwest corner) has been discussed during multiple Technical Working Group (TWG) meetings and is included in the Field Sampling Plan (FSP; Appendix J, Attachment 3) and also is discussed in Section 5.6.4 of the main text of the 90% RD.
9	Page 45 Section 5.4.1.1	The design states that no special considerations for corrosion protection are being considered since the BMP structure is expected to be for temporary, short-term use. However, Section 5.3.9.1 states that the BMP will be removed or abandoned in place. Further discussion regarding corrosion protection is warranted since the BMP may be left in place following completion of the RA.	The in-water best management practice (BMP), a double wall, will be removed following completion of the remedial action (RA). The wall along the southern extent of the impoundment may be left in place at or slightly below the existing ground surface elevation. A soil embankment will be placed on the water side of the southern wall sloping back into the river, along with riprap for mitigating erosion. This soil embankment will provide structural stability to the southern wall: therefore, the minor corrosion of the in-place southern wall will be irrelevant once the soil buttress is in place.
10	Page 60 Section 5.6.3.4:	The sections discussing “Spent Filter Elements” and “Exhausted GAC Media” need to provide additional detail regarding the applicable federal and state requirements that will be followed for disposal.	Section 5.8.3.4 of the main text of the 90% RD discusses the WTS residuals and references the Transportation and Off-Site Disposal Plan (TODP; Appendix J, Attachment 8) that outlines how spent materials from the system will be handled.
11	Page 60 Section 5.6.4	The design states that TSS may also be used as a performance indicator. Further information about the potential use of TSS as a performance indicator needs to be expanded and discussed with the Agency during future TWG meetings.	Treatability testing overall has repeatedly shown that the levels of dioxins and furans in water generated from the excavation activities are associated with solids. Specifically, results from both the initial 2019 contact water pilot testing (Section 3.4.3 of the main text of the 90% RD) and the 2021 additional treatment treatability testing (Section 3.6.3 of the main text of the 90% RD) showed that total suspended solids (TSS) concentrations less than 2 mg/L correspond to dioxins and furans levels below Minimum Levels (MLs).
12	Page 75 Section 6.2	The last sentence of the first paragraph states that MNR activities moving forward will focus on the half acre surrounding sample SJSSA06. The remedy for the Sand Separation Area (SSA) in the Record of Decision was monitored natural recovery. Although the Phase 2 PDI indicated a large area of the SSA had dioxin levels below the ROD cleanup goal in the upper 24 inches, ongoing monitoring of the SSA needs to include the entire SSA as described in the ROD.	Monitored Natural Recovery (MNR) activities planned for the Sand Separation Area (SSA) are discussed in the Monitored Natural Recovery Plan - Sand Separation Area, included as Attachment 9 in Appendix J (MNR Plan) and in Section 6 of the main text of the 90% RD. The text in both has been updated to include future monitoring at all nine locations within the SSA.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
13	Attachment 2 Emergency Response Plan Page 1 Section 2.1	Other authorities that may need to be contacted include the National Response Center and the Local Emergency Planning Committee.	Section 2.1 of the Emergency Response Plan (ERP; Appendix J, Attachment 2) was revised to include the National Response Center and the Harris County Hazardous Materials Response Team.
14	Attachment 2 Emergency Response Plan Page 2 Section 2.3, Table 1	The table should include contact information for all of the parties identified in Section 2.1.	Section 2.3, Table 1 of the ERP (Appendix J, Attachment 2) has been revised to include contact information for all of the parties identified in Section 2.1.
15	Attachment 2 Emergency Response Plan Page 5 Section 4.3	The plan says the Site Supervisor may be responsible for directing the on-site personnel in emergency response operations. If the Site Supervisor is not responsible for these activities, the plan should identify who is responsible for implementing the emergency response operations.	The text of the ERP (Appendix J, Attachment 2) has been revised to state "The Site Supervisor will be responsible for directing the on-site personnel in emergency response operations."
16	Attachment 2 Emergency Response Plan Page 8 Section 6	Table 2 should be referenced rather than Table 1.	The text in Section 6 of the ERP (Appendix J, Attachment 2) has been revised to reference Table 2.
17	Attachment 3 Field Sampling Plan Page 1 Section 3.1	The first sentence states: *This section will provide a general overview of the soil and sediment sampling during the Northern Impoundment RA, if necessary. It will present a rationale for choosing each sampling location or sampling area and the depths at which the samples are to be collected, if relevant.* Soil and sediment sampling will be necessary and relevant during the Northern Impoundment RA. As discussed above, post-excavation confirmation sampling is an essential step in the Superfund cleanup process that provides EPA the ability to verify that the remedial action objectives have been achieved. The pre-final design needs to include a post-excavation confirmation sampling program. Discussions about the confirmation sampling program need to be included as part of future TWG meetings.	The FSP (Appendix J, Attachment 3) has been revised to include a post-excavation confirmation sampling program for the Northern Impoundment (excluding the northwest corner), as discussed in multiple TWG meetings. This is also discussed in Section 5.4.6 in the main text of the 90% RD.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
18	Attachment 3 Field Sampling Plan Page 2 Section 3.2	The plan only gives a general overview of the contact water sampling rationale. In addition to sampling contact water, the plan needs to describe the sampling approach for discharging treated water to the San Jacinto River.	The FSP (Appendix J, Attachment 3) has been revised to describe the sampling approach for sampling treated effluent water that will be discharged to the river.
19	Attachment 5 Site Wide Monitoring Plan Page 1 Section 2.2	The plan discusses the monitoring of waste, air, storm water and post- construction that will be implemented during construction. In addition, monitoring of treated effluent to the San Jacinto River needs to be included in the plan. The design may need to consider monitoring of noise levels given the potential use impact hammers to drive pilings.	The FSP (Appendix J, Attachment 3) has been revised to describe the sampling approach for sampling of treated effluent water that will be discharged to the river. The Site-Wide Monitoring Plan (SWMP; Appendix J, Attachment 5) includes a discussion about noise monitoring.
20	Attachment 5 Site Wide Monitoring Plan Page 2 Section 2.2.4	As discussed above, post-excavation confirmation sampling is an essential step in the Superfund cleanup process that provides EPA the ability to verify that the remedial action objectives have been achieved. The pre-final design needs to include a post-excavation confirmation sampling program. Discussions about the confirmation sampling program need to be included as part of future TWG meetings.	The FSP (Appendix J, Attachment 3) has been revised to include a post-excavation confirmation sampling program for the Northern Impoundment (excluding the northwest corner), as discussed in multiple TWG meetings. Post-excavation confirmation sampling is also discussed in Section 5.6.4 of the main text of the 90% RD.
21	Attachment 7 Transportation and Off-Site Disposal Plan Page 2 Section 6.2	The plan should also discuss decontamination of trucks following loading before the trucks leave the Site.	The TODP (Appendix J, Attachment 8), has been revised to include a section discussing measures to control and mitigate tracking of waste beyond work areas.
22	Attachment 9 Monitored Natural Recovery Plan-Sand Separation Area Page 4, 2nd Full Paragraph Section 5.1	The plan states that monitoring and possible institutional controls (ICs) will focus on the area surrounding sample SJSSA06. The remedy for the Sand Separation Area (SSA) in the Record of Decision was monitored natural recovery. Although the Phase 2 PDI indicated a large area of the SSA had dioxin levels below the ROD cleanup goal in the upper 24 inches, ongoing monitoring of the SSA and placement of ICs needs to include the entire SSA as described in the ROD.	The MNR Plan (Appendix J, Attachment 9) and the Institutional Controls Implementation and Assurance Plan (ICIAP; Appendix J, Attachment 7), have been revised to include institutional controls for the entire SSA.
Comments from the TCEQ			
1	Page iii	The abbreviation µg/L is defined as nanograms per liter. It should be micrograms per liter.	The abbreviation in the "List of Acronyms" Section has been revised to reflect that µg/L is defined as micrograms per liter.
2	Section 2.2.4 Sand Separation Area Sampling	Please explain why EPA Method 8290 was used for Dioxin analysis in SSA sampling while the method 1613B was used in both Northern and Southern impoundments sampling during PDI-2.	The reference was incorrect. EPA Method 1613B was also used for dioxins analysis in the SSA sampling. This has been corrected in Section 6.1.1 of the main text of the 90% RD.
3	Section 3.3.1 Treatability Testing Sampling Collection	Please verify the volume of composite samples, 20 gallons or 30 gallons per sample? The volumes of composite water samples mentioned in Figure 3-1 and this section are not consistent.	The text in Section 3.3.1 of the main text of the 90% RD has been revised to be consistent with Figure 3-1 and to state that the volume is approximately 30-gallons.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
4	Section 3.4.1 Water Discharge Criteria	A small inaccuracy in the middle of page 18 of the report referring to mixing zones. The report states "...and 4% for Human Health Mixing Zone (Chronic)." The "(Chronic)" part is not correct, and should either be deleted, or it could be replaced with "(Fish Tissue)."	The word "(Chronic)" has been removed and the text now reads "4 percent for Human Health Mixing Zone."
5	Section 5.1 BMP Alignment and Excavation Extent	Please clarify that while the excavation depth has increased by an average of 6 feet compared to the ROD estimations, the area of the impoundments to be excavated is now smaller than in the ROD based on additional PDI sampling results.	The horizontal and vertical extents of impacted material have been better defined through data collection in the Pre-Design Investigation (PDI) and Supplemental Design Investigation (SDI) sampling events. Based on the information gathered during these sampling events, the excavation depth has greatly increased from what was known at the time of the Record of Decision (ROD). The horizontal extent has reduced marginally due to clean boring samples collected, particularly along the east side.
6	Section 5.1	This section states that based on PDI-2 data, it appears that construction of BMP may be infeasible and technically impracticable. Please contrast this site construction with large coffer dams successfully constructed in other parts of the US and the world.	This comment is not applicable as the 90% RD includes a different BMP design than what was discussed in the Preliminary (30%) Remedial Design (30% RD).
7	Section 5.1 Removal Approaches A and B	It appears that there is a potential for small portions of waste material to be deposited on to the public roads via tires of the vehicles (esp. the trucks that haul the waste material) and tracks of the track-mounted equipment. Please consider installing a decontamination station for washing the tires and tracks of the vehicles before they leave the site or provide an explanation.	A typical equipment decontamination pad is shown on the 90% RD drawings. Activities involving the decontamination pad will be performed in accordance with 29 CFR 1910.120 (k) and 29 CFR 1926.65 (k) regulations. The TODP (Appendix J, Attachment 8) also discusses vehicle decontamination.
8	Section 5.1 Approach B	A very large volume of water is expected to be contained within the BMP for an extended period in Approach B. Please consider using interlocking sealants at sheet pile joints or explain why sealants are not necessary.	This comment is not applicable as the 90% RD does not include Approach B.
9	Section 5.2.3 Geotechnical Conditions	Regarding the potential for sloughing of the waste material due to vibration from driving sheet piles: please evaluate if the risk could be reduced to acceptable levels by a combination of: (a) moving the BMP (esp. in the northwestern and southeastern portions) away from the toe of the slope, (b) using commercially available bentonite-based sealant material to create a low-permeability seal over the waste material, (c) applying sorbent mats to the slope, and (d) installing two or three layers of concentric silt curtains.	This comment is not applicable as the 90% RD does not include installation of sheet piles through waste material.
10	Section 5.2.4 Vertical Extent	Please discuss how the overburden material and interbedded material with dioxin $TEQ_{DF,M}$ below 30 ng/kg will be treated during excavation. This Section mentioned of four boring locations with >30 ng/kg in the deepest intervals. Please add more details of how the preliminary excavation bottom contours were chosen in these locations. It is noted that two of the four borings, SJGB012 and SJSB046-C1, had high dioxin concentrations at the bottom of the boring; underestimating the excavation bottom at these locations could miss significant mass of contaminants.	Section 5.3.4 of the main text of the 90% RD discusses the vertical extent of excavation. At the referenced locations where the deepest sample collected had concentrations in excess of the 30 ng/kg $TEQ_{DF,M}$ clean-up level, the design considered the adjacent co-located borings to determine the appropriate excavation elevations to complete the excavation bottom contours. For example, SJGB012 was sampled to a depth of 8 feet below ground surface (elevation - 7.57), with the bottom sample having a dioxin concentration of 17,740 ng/kg. However, SJSB072 is co-located with SJGB012 and this boring reported a dioxin concentration of 1.3 ng/kg at the 12-14 feet depth range (elevation -10.58). Therefore, excavation at SJGB012 would be conducted to a depth of approximately 13 feet, for a similar bottom elevation to SJSB072.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
11	Section 5.3.6 Solidification and Load out	Please explain how it will be determined if the waste material is dry enough and how much reagent is needed to make it qualify for load out if not dry (e.g. visual observation or by on site measurements).	The intent of waste solidification is to simply add enough reagent to reduce the water content so the waste material passes the paint filter test (administered in the field) before it can be loaded into trucks for transport to the disposal facilities. A treatability study was performed to demonstrate how much reagent might be required and these results are included in Section 3.3.5 of the main text of the 90% RD. The soil solidification specification will simply be used as a guideline for the RC to estimate the volume of reagent required during bidding, while the actual volume of reagent would be determined in the field (i.e., sufficient to pass the paint filter test). This is discussed in Sections 3.3 and 5.6.3 of the main text of the 90% RD. In addition, Section 5.7.1 of the main text of the 90% RD states the RC may conduct additional tests to determine the appropriate reagent dose at the time of the RA.
12	Section 5.3.7.3 Excavation Procedures	In this subsection, it stated that for approach B, the volume of water inside the cell will be pumped out of the cell, and through the WTS, and then pumped back into the cell. However, it was stated in previous sections that water will be treated in-situ in the cell via a recirculation and filtration system. Please clarify how the water will be treated for approach B, and where water treatment system and geotubes will be located.	This comment is not applicable as the 90% RD does not include Approach B.
13	Section 5.3.8	This Section listed the following constraints for post-excavation sampling. a. *Excavation beyond the design depth could cause BMP failure - please quantify the risk;* b. *If additional excavation becomes necessary, schedule could extend into non-excavation season* – please determine if this can be addressed by a combination of using larger trucks (within the weight limit) and extended workdays and work hours; c. *Volume increase may become too large to handle during the excavation season* – please determine if this can be addressed through longer work hours and workdays. Also, consider whether barge transport is feasible (we understand that multiple loads and unloads could increase costs); d. *If additional excavation is involved, there may not be enough time for water treatment during the excavation season* – determine if this constraint can be overcome by designing a larger treatment system; e. This section identified the constraints associated with post-excavation confirmation sampling. Please discuss the procedures proposed to ensure that waste material with dioxin TEQDF,M concentration greater than 30 ng/kg is adequately removed.	A post-excavation confirmation sampling program for the Northern Impoundment (excluding the northwest corner) is included in the FSP (Appendix J, Attachment 3), and is discussed in Sections 5.2 and 5.6.4 of the main text of the 90% RD. Many of the noted constraints are still applicable: a) This is less of a concern than it was with the approach included in the 30% RD, but significant over-excavation (the BMP is designed to accommodate an additional two feet of over-excavation) along the perimeter of the excavation area due to post-excavation confirmation sampling could cause the excavation slope to start encroaching on the 30-ft bench of soil necessary to support the double-wall system. b) The 90% RD does not pre-define seasonal cells as did the 30% RD. This makes it less likely that excavation would extend into the non-excavation season, as the work can be terminated and capped at any time. However, significant over-excavation due to post-excavation confirmation sampling could increase the overall volume of waste and constraints on off-site disposal of waste could result in extensions into additional excavation seasons. The size and number of trucks available for the RA will be limited due to the size of the site. Work schedule (days and hours) will be up to RC discretion and availability of personnel, etc. c) See the response to b) above. Barging was considered in the preliminary stage of design but was not pursued due to complicated logistics, scarcity of offloading terminals, and risk of loss of material or release during transit. d) With the changes in the design methodology included in the 90% RD, this should no longer be an issue. e) A program for post-excavation confirmation sampling was designed to address removal of waste material with TEQ concentrations greater than the cleanup level. See Section 5.6.4 of the text and the FSP (Appendix J, Attachment 3).
14	Section 5.3.9 Excavation Area Restoration	Please clarify if excavation area restoration will be conducted when the excavation of the whole cell is completed or will be restored sequentially before the next section is uncovered.	Excavation area restoration may be performed during the excavation, at the end of a working season, or after the completion of all excavation activities as discussed in Section 5.6.5 of the main text of the 90% RD.
15	Section 5.4.1.3 Design load for Wind	Please explain the selection basis for the wind velocity of 115 miles per hour.	The design wind velocity of 115 mph represents the 100-year wind speed for the approximate location of the Northern Impoundment per ASCE 7-16. The wind velocity has been updated to include a site-specific value using ASCE's web based tool. A hurricane level wind speed of 154 mph has also been evaluated.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
16	Section 5.4.1.4 Load Combinations	Please add a brief description of the scenarios behind each of the four listed loading combinations.	The number of load combinations have been revised since the 30% RD and descriptions have been added.
17	Section 5.4.2.5 Deflection & Section 5.4.3 BMP Wall Analysis	It is stated that structural steel deformation cannot be used as a limiting parameter for the design; please clarify how design decisions will be made if deflection exceeds the highest allowable limit while stability and strength requirements are met? Will the deflection exceedance alone trigger the change of the sheet pile design?	Deflection exceedance alone will not trigger a change in sheet pile design for the BMP presented in the 90% RD. Overturning is not a failure mode for the new BMP (double wall) so deflection for stability is not a concern. With regards to structural strength, larger deflections induce larger stresses. The total allowable stress is limited to section capacity. Sections are chosen such that stress component from deflections are within allowable section capacity.
18	Section 5.5.2 Loading, Transportation and Disposal	Please note that if the 212,000 CY does not include the volume of the amendment that may be needed for solidification, adding solidification reagents will increase the volume of waste that needs be disposed and increase the loadings for transportation.	It is understood that the actual volume sent for disposal may be larger than the in-place volume of waste material due to bulking caused by the addition of solidification agents. As discussed in Section 5.7.2 of the main text of the 90% RD, an estimated 10% bulking factor has been included in the total volume of material for disposal.
19	Section 5.6.1.4 Water Volume and Storage	Has it been considered to use a covered storage tank to prevent catching rainwater in the tank and reduce the total volume that needs be treated?	The water storage tanks are shown as being located inside the secondary containment area to mitigate potential leaks. All rainfall into the containment area (in or outside of the tanks) will be processed through the WTS. Rainfall falling on top of tank covers would still flow into the containment area and be managed through the WTS. Because of this, no covers are proposed. Moreover, the water volumes generated by rainfall inside the tanks will comprise a small fraction of the total flow to be treated. Finally, the lake tanks being proposed for water storage have a large diameter that does not support the installation of a cover.
20	Section 5.6.4 Monitoring	Please specify the monitoring frequency for each listed parameter.	Table 5-J has been added to Section 5.8.4 of the main text of the 90% RD to show monitoring parameters and frequencies.
21	Section 5.7.1.3 Water Volume and Treatment Process	Please clarify if the estimated maximum water volume of six million gallons accounted for the total seasonal accumulated rainwater.	All water captured behind the BMP and within the WTS containment area was included in estimated surface areas for contact water calculations. The BMP area is approximately 730,000 ft^2, and the WTS containment is approximately 53,000 ft^2. Total area is 783,000 ft^2. The average total rainfall from November through April for the years 1888 to present is 22.16 inches. The expected rainfall volume for the season is 17.4 million gallons. This is a significantly higher volume than the six million gallons included in the 30% RD. This is due to the fact that the BMP wall has been pushed out to encircle the entire Northern Impoundment and there are no longer interior partition walls. All other flows (e.g., equipment decontamination, pore water) are insignificant compared to rainfall volume.
22	Section 5.9.1.1 Excavation Limits	The TCEQ recommends conducting a sensitivity analysis on elevation of excavation bottoms to evaluate how the required wall depth or tip elevation and stability would change based on adjustments to the excavation depth.	This comment is no longer relevant to the BMP presented in the 90% RD. The BMP (double wall) alignment presented in the 90% RD is offset by a minimum bench width of 30-ft from the excavation area. If the bench width and slope at toe is maintained, a change in excavation bottoms will not affect the design or stability. If significant over-excavation is required based upon post-excavation confirmation sampling, the slope could begin to encroach upon that 30-ft bench.
23a	Appendix E Design Drawing Package Sheet C-03 SSA Area and Northern Impoundment Works	Please clarify if the proposed locations for dewatering facility and overburden stockpile are for cell 5 only or for the other cells as well. For cell 5, please explain how the waste material under the surface of the proposed areas will be treated within the cell during excavation?	The 90% RD no longer includes predefined cells. The RC will propose locations for the dewatering facility and overburden stockpile area as part of its identification of means and methods for completing the excavation activities. The locations will likely be temporary and will change each excavation season in order to better address the work being completed. A conceptual layout is included in Drawing C-03.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
23b	Appendix E Design Drawing Package Sheet C-04 Soil Erosion and Sediment Control	Please explain why the proposed turbidity curtain around the eastern cell will be installed around the perimeter of the cap not close to the boundary of the BMP?	The BMP alignment has been revised since the 30% RD and the current alignment in the 90% RD places the BMP outside of the perimeter of the TCRA cap. Turbidity controls will likely be installed in a manner that "follows" the work as the BMP is installed/removed.
23c	Appendix E Design Drawing Package Sheet C-06 Soil Erosion and Sediment Control Details	Please clarify in the text why a gap of a approximately 12" is maintained between the turbidity curtain bottom and the riverbed (e.g. pressure relief).	The text on the drawing has been revised to state that a gap of at least 12" is maintained to allow some flow below the curtain (i.e. pressure relief) and to prevent the bottom of the curtain from interacting with the riverbed thus causing sediment resuspension.
23d	Appendix E Design Drawing Package Sheet P-01	At the end of the treatment train, before discharging to the river, include a block to specify that the treated water will be tested prior to its discharge.	Both the Process Flow Diagram (Sheet P-01) and the P&ID (Sheet P-04) show a discharge compliance sampling point for testing prior to discharge.
24	Appendix G Attachment 7	No details are provided on off-site transportation and disposal. The TCEQ realizes that specifics of the design elements will be provided in the detailed design. Information such as the basis for waste material haul times and estimated production rates for waste removal will aid in the evaluation of constraints involved in post- excavation sampling. Will the 30% design be revised to include this information?	Section 5.7.2 of the main text of the 90% RD provides greater detail on the various constraints related to production rates and efficient excavation, loading, and transport of the waste materials. Due to the expected distance from the Northern Impoundment to potential disposal facilities, the design assumes a maximum of two roundtrips, or “turns”, per working day. As such, the actual volume of waste moved each day will be dependent upon the number of trucks available. The 90% RD assumes a maximum of 15 trucks may be available, but also recognizes that there will be breakdowns, weather delays, traffic problems, etc., so the production rate was based on only 20 truck loads per day (average 10 trucks making two turns). Other constraints to efficient productivity include the limitations on site access along the Texas Department of Transportation (TxDOT) right-of-way (ROW) access road where one-way traffic is all that is possible and the potential impact of any concurrent TxDOT bridge replacement project.
General Comments from the Port of Houston			
1		The information in the Preliminary 30% Remedial Design for the Northern Impoundment (P30RD-NI) is generally consistent with our understanding of site conditions and substantially advances the remedial design. Key issues that should require clarification are: • No quantification of the anticipated leakage rate through the BMP Wall are provided or integrated into the discussions.	The BMP wall design presented in the 90% RD includes a double wall system filled with aggregate that should not be subject to significant leakage. The sheet pile surfaces are impervious and only the interlocks are viable means of any flow. The interlocks of the sheet pile are generally considered watertight with insignificant permeability even at high pressure gradients across the interlocks. Any potential leakage would be from the river into the excavation area where all water will be treated. This is discussed in the Northern Impoundment BMP Structural Design Report (Appendix I).
Specific Comments from the Port of Houston			
1	Section 2.2.7.2 p. 14, top paragraph	Section 2.2.7.2, p. 14, top paragraph refers to the interpretation that sands may not be continuous. Similarly, other interpretations are not definitive on leakage anticipated if the deep sand layers are not cut off by the BMP Wall.	The walls of the BMP system presented in the 90% RD will be terminated in the Beaumont Clay layer above the anticipated sand layers. Hydraulic heave has been thoroughly explored and limitations on excavation elevation have been established.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
2	Section 5.1 p. 32	Approach B describes a wet removal alternative to the dry removal required by the ROD. While dry removal from all areas would be very challenging, use of Approach B should be refined. For example, where dry removal is not feasible, when using Approach B, water treatment and discharge should be initiated at the outset to maintain water levels in the cell below ambient river levels to minimize possible releases through the BMP or via groundwater. If the intake for water treatment is near the removal area, the most contaminated water will be treated, saving treatment time at the end of the season.	This comment is not applicable as the 90% RD does not include Approach B excavation or water treatment methodology.
3	Section 5.5.2 p. 54, 4th paragraph	Section 5.5.2, p. 54, 4th paragraph assumes that only two trucks would be used for transport. The design should consider more intensive trucking possibilities.	Section 5.7.2 of the main text of the 90% RD states that based on the varying distances of potential off-site disposal facilities from the Northern Impoundment, ranging from 60 to 120 miles, it is estimated each haul truck can only make up to two roundtrips, or turns, per day. The number of haul trucks is not specified and will be determined by the RC. It should be noted that the 90% RD assumes a production rate based on 20 truck loads per day (i.e., 10 trucks making two turns). This does not account for potential restrictions and delays that could be imposed due to TxDOT's proposed bridge replacement project.
4	Section 5.6.4 p. 60, 2nd paragraph	Section 5.6.4, p. 60, 2nd paragraph suggests only TSS for routine monitoring since it is correlated to TEQ, but TSS is a secondary variable. Routine effluent compliance monitoring requires a rigorous and ongoing validation of TEQ levels associate with continuous TSS monitoring.	Table 5-J has been added to Section 5.8.4 of the main text of the 90% RD to show monitoring parameters and frequencies; TSS would be monitored twice per week, and metals and dioxins and furans will be monitored once per week.
Specific Comments from the U.S. Army Corps of Engineers			
1	Section 5.2.1	The San Jacinto River Elevation measured on site should be presented as well as the gauge location. How many observations, over what interval, were recorded at the Northern Impoundment site? What type of sensor was used and where was it located? Is the sensor still collecting data? How does the recorded data, other than that used in the hindcasting, compare to the hindcasting results? It would be beneficial to include this type of information so that the accuracy of the hindcasting can be interpreted.	GHD has installed and is maintaining a transducer (In-Situ Aqua Troll 200) staged in the staff gauge recording the San Jacinto River water level, temperature, Specific Conductivity, and salinity once every 15 minutes. The sensor is housed in the staff gauge driven into the river sediment and is connected to a telemetry system. The location of the transducer can be seen on Figure 2-3. The transducer is still collecting data. The data is evaluated periodically to confirm that the established correlation is still accurate. The data was particularly useful during 2019 Tropical Storm Imelda - site personnel were able to better anticipate localized flood water levels by examining the real-time water levels reported at the Sheldon gauge upriver. In addition, the data has also been used to observe the connectivity between alluvial and Beaumont Sand aquifers and the river by matching tidal fluctuations.
2	Section 5.2.3 Second paragraph	A description of the soils lithology are presented but no cross-section. It would add transparency to show a cross-section of the site with the interpreted soil stratigraphy including the borings used to make the interpretation.	Soil stratigraphy borings are included as Figures 2 and 3 of the Hydraulic Heave Analysis Report, which is attached to the Geotechnical Engineering Report as Appendix B.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
3	Section 5.2.4 Vertical Extent Page 37	The four borings listed (SGGB010, SJGB012, SJSB046-C1, SJSB071) reported that the sample collected from the bottom of the boring had contaminate levels greater than acceptable. The text mentions that the nearest boring was used to estimate the appropriate excavation elevation. For SJSB071, SJSB036, and SJSB046- C1 the surrounding borings indicate a shallower contamination depth; how was this taken into account? A better description for the excavation extents needs to be provided for this boring and others similar to it. In general this is a key component to the design, more effort needs to be put forth in the description of the methods used to reach the reported excavation depths. • SJSB046-C1 depth of bogging -20.4, closest boring SJSB046 depth of contaminant -20 • SJSB036 depth -10.75ft closest borings SJGB0101 bottom of boring -6.3 and boring SJGB011 depth of contaminant -9.6 ft • SJSB071 depth -18.8, closest borings SJSB058 depth of contaminant -17.4ft and SJSB070 depth of containment -17.4 ft	Following submittal of the 30% RD, the SDI was completed in 2021 to further delineate impacted material horizontally and vertically across the Northern Impoundment, reducing uncertainty between boring locations. Collocated borings were installed at the four locations noted to fully delineate the vertical extent of impact at those locations. The SDI field event is discussed in Section 2.3 of the main text of the 90% RD and the excavation extent is discussed in Section 5.3.4 of the main text of the 90% RD.
4	Section 5.7.1.1 Page 61	The contact waters for Approach A and Approach B are likely to be rather different in terms of suspended solids and may be dependent on the withdrawal method.	The 90% RD does not include Approach B. What was previously referred to as Approach A is the water treatment approach basis that is provided in this 90% RD.
5	Section 5.9.1.2 BMP Removal Page 68	It is unclear why the BMP walls could not be cut off if they cannot be removed. As such, this does not appear to be a large uncertainty with the feasibility of utilizing this BMP.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP in the 90% RD specifies removal of the BMP wall.
6	Section 5.9.1.2 Risk of Overtopping and Release Page 68	Releases from overtopping would be minimal due to water depth within BMP and the BMP would limit resuspension of residuals and prevent erosion within the cell.	Section 5.3.2 of the text discusses how historic peak water surface elevations were used in the selection of the BMP height to mitigate the risks of overtopping. This risk is now discussed in Section 5.11.2 of the main text of the 90% RD. Not only could overtopping cause a release but it could put worker safety at risk and cause scour along the inside of the BMP.
7	Appendix B Geotechnical Report Section 1.3 Geology	According to figure 2 the foundation is Holocene Alluvium but was listed as Pleistocene Beaumont Formation in the text.	Figure 2 displays surface materials, which are holcene alluvium. The holocene alluvium is underlain by the Pleistocene Beaumont formation.
8	Appendix B Geotechnical Report Section 6.2.3 Design Strength Parameters	How were the values assigned in Tables 7 - 11 arrived at? How do they compare to the UU and CU triaxial and the drained direct shear tests? A plot of measured values versus depth as well as assumed values would be appropriate? For a project this size and with the amount of data available plots of lab results versus elevation or depth as well as water contents, Altenburg limits, and SPT values should be shown. A comparison of assumed shear strengths with those measured would then be easily ascertained. In addition, geologic cross-sections with boring locations would provide transparency. Note: UU testing show that samples were not fully saturated during testing which may overestimate shear strength. GeoTesting Express lab sheets.	The values assigned in Tables 7-11 were arrived at by plotting the data graphically with respect to depth, using the UU data and CU triaxial data and drained direct shear tests. These plots which included water content, Atterberg limits and SPT values have been superseded by CPTs taken along the new BMP alignment. The BMP presented in the 90% RD has been developed based on the data gathered during the SDI and accounts for revised geotechnical design parameters that are contained within the SDI Geotechnical Report (Appendix B; Attachment C). Geologic cross-sections are included in the Geotechnical Engineering Report (Appendix B).

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
9	Appendix B Geotechnical Report Section 6.2.4	Summary tables of sheet pile tip elevations and stratigraphy should be included. Additionally, the assumed excavation depth on the protected side should be reported	The sheet pile tip elevations and associated stratigraphy are included in the Northern Impoundment BMP Structural Design Report (Appendix I). The revised BMP presented in the 90% RD will be terminated in the Beaumont Clay layers.
10	Appendix B Geotechnical Report Section 6.2.6	The horizontal accelerations greater than 0.1g should be further researched and justification provided.	A range of horizontal acceleration (0 to 0.3) were used for a parametric study evaluating the potential impact of pile driving activities. However, 0.1-g is considered representative of accelerations from pile driving in stiff clays. Since sheet pile tips will not penetrate into Beaumont sands, additional evaluation of accelerations greater than 0.1-g will not be necessary.
11	Appendix B Geotechnical Report General Pile Analysis Comment	All failure modes should be listed and if they are not considered proper justification should be made, worst condition analyzed and if it exhibits a high factor of safety then that would justify not analyzing further. For example bottom heave and global stability.	The 90% RD Geotechnical Report (Appendix B) addresses failure modes and the conditions under which they were analyzed.
12	Appendix B Geotechnical Report Section 6.2.6	Stability figures need to identify what borings were used to build the stratigraphy, this can be shown on the figure. (Figures 13-20). It appears that the capping layer was neglected? It is unclear on the stage when the capping layer is to be removed.	This comment is no longer relevant. The revised BMP presented in the 90% RD will be terminated in the Beaumont Clay layer and vibrations are no longer identified as an uncertainty with respect to the BMP's implementability.
13	Appendix B Geotechnical Report Tables 7 -11	The minimum cohesion listed in Tables 7 -11 for near surface material is 200 psf. The soft soils shear strength in the stability analysis is listed as 100 psf, this should be justified. If this is unconsolidated sediments then why is it discontinuous at the Station 22 + 00 section (Figures 17 – 20)?	This comment is no longer relevant. The revised BMP presented in the 90% RD will be terminated in the Beaumont Clay layer and vibrations are no longer identified as an uncertainty with respect to the BMP's implementability.
14	Appendix D Preliminary Vibration Analysis Section 4.1 Analysis Approach	The cap material nor the geotextile or geomembrane were included in the analysis. There seems to be ambiguity as to the extents of the cap material, if it extends down the slope it would also provide a confining pressure and increase the vertical stress which would be beneficial to the factor of safety. The limits of the capping material should be better defined and included in the analysis with the addition of the geotextile or geomembrane. This will have an impact on the analysis and should be modeled accordingly.	The BMP presented in the 90% RD is realigned farther away from edges of steep slopes. The Z-shaped sheet piles are smaller than the large diameter pipe piles evaluated in the 30% RD and will be terminated in the Beaumont Clay layer. They are therefore not expected to result in significant vibration.
15	Appendix D Preliminary Vibration Analysis Figure 2 Effects of Sediment Properties	Why weren't the locations and stratigraphies from borings SJGB058 and SJGB037 included in cross-section A-A'? There is a wealth of stratigraphy data available, cross-sections should be considered that rely on available data and not extrapolated when data exists. SJGB019 is referenced in this figure, a separate interpretation should be made at SJGB019and boring SJGB013 should be used to interpret the data.	The BMP presented in the 90% RD is realigned farther away from edges of steep slopes. The Z shaped sheet piles are smaller than the large diameter pipe piles evaluated in the 30% RD and will be terminated in the Beaumont Clay layer and will not result in significant vibration.
16	Appendix D Preliminary Vibration Analysis Figure 3	The 10 ft thick layer reports a FS of 1.01 with a 10' layer of surface material and a friction angle of 20 degrees. This is not marginally stable but indicates shallow failure and should be reflected as such in the text.	The FS 1.01 in Figure 3 relates to the parametric evaluation of soil slopes with cohesionless soils of varying friction angles but same thickness of material. The report concludes that "if a low friction angle cohesionless material is on the slope in the northwest portion of the Northern Impoundment (at any thickness), the slope would be marginally stable for a shallow slip failure under static conditions." The reviewer's comment is only applicable to a specific case of 20-degree material. The report, however, is intended to present a broader conclusion that slope stability correlates to the friction angles of the material independent of the thickness.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
17	Appendix D Preliminary Vibration Analysis Figure 6	Figure 6 shows the thickness of waste material to be 5 ft thick, in the text it is referred to being 10 ft thick. Please clarify the apparent discrepancy.	The text has been revised to match the figure.
18	Appendix D Preliminary Vibration Analysis Figure 6	Previously a factor of safety of 1.1 (and 1.01) were referred to as marginally stable in the paragraph following Figure 6 there is the potential for a factor of safety of 1.13 causing slope failure. Interpretations should be made in a consistent manner.	Figure 6 is another parametric study to evaluate the effect of change in Excess Pore Pressure (EPP). Comparing the results for increasing the EPP from 0.33rumax to 0.38rumax, the SF was reduced from 1.36 to 1.13. This shows that increasing EPP increases the potential for slope failure. Thus, the stated interpretation that "there is a potential that the generation of EPP could cause slope failure" is correct.
19	Appendix E Design Drawing Package	Limits of capping material and geotextile should be shown in drawings C-01 to C-05, C-08.	Figure 3-5 shows the approximate area for TCRA cap reuse which is the approximate extent of geotextile and/or geomembrane.
20	Appendix E Design Drawing Package	Drawing C-09 does not appear to have an accurate ground surface near station 05+00.	This comment is not applicable due to the change in design from 30% RD to 90% RD.
21	Appendix E Design Drawing Package	It is difficult to identify where the Pile Profiles (drawing C-12, C-16, C-20, and C-24) are located with reference to the Pile Layout Plan drawings (C-11, C-15, C-19, and C-23)). These profiles should be better identified in the pile layout plan drawings.	This comment is not applicable due to the change in design from 30% RD to 90% RD.
22	Appendix E Design Drawing Package	Drawing C-18, is the ground surface elevation correct. It does not appear to match drawing C-17. Is the location of the capping material shown correctly?	This comment is not applicable due to the change in design from 30% RD to 90% RD. The ground surface elevations presented in the 30% RD drawings were correct and are currently shown in revised cross-sections provided in the 90% RD drawings.
23	Appendix E Design Drawing Package	It would be beneficial to have an accurate cross-section cut at the steepest slope in the northwest portion of cell 1.	Revised excavation cross-sections have been included in the 90% RD drawing package. Section D cuts through the northwest corner of the impoundment from north to south, although the 90% RD does not include a remedial design and excavation for the northwest corner.
24	Appendix F BMP Wall-Type Analysis	It would be beneficial to have summary tables of design stratigraphy referenced to borings and material properties referenced to lab testing. This would provide justification for stratigraphy and property assumptions, as it stands this is not provided.	The information requested can be found in the Geotechnical Engineering Report, included as Appendix B.
25	Appendix F BMP Wall-Type Analysis	Rotational stability was basis for design but global stability and bottom heave should be investigated, as part of due diligence.	Hydraulic heave has been evaluated and limitations on dry excavation elevations have been established. The Hydraulic Heave Analysis Report is included in the Geotechnical Engineering Report (Appendix B).
Specific Comments from the Harris County Technical Review Team			
1a	Waste Handling	40 CFR §261.24 requires that the determination of toxicity characteristic is based on the extract from “a representative sample of the waste.” As they were collected primarily around the periphery of the site, only four of the fourteen borings used in the composite treatability samples contained dioxin-contaminated wastes. Thus, the composite samples are not representative of wastes that will be excavated and requiring disposal. We suggest that these tests need to be repeated with samples better representing waste materials that will be excavated.	During the 2021 SDI, six additional waste characterization discrete samples were collected from targeted locations in the Northern Impoundment that were known to have high concentrations of dioxins (as high as 47,000 ng/k and 52,000 ng/kg TEQDF,M). Waste characterization results from the sampled collected during the SDI support the conclusions of the PDI-1 and PDI-2 characterization sampling (that the waste can be classified as RCRA non-hazardous).

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
1b	Waste Handling	While the wastes are not a listed hazardous waste under RCRA subtitle C, we suggest that they should be handled in a manner largely consistent with such wastes to prevent releases. The design needs to describe measures to prevent losses of liquid and solid waste materials and leachates thereof during handling and transportation to the landfill.	The Health and Safety specification states the parameters for how waste material is to be handled and transported. The ERP (Appendix J, Attachment 2) addresses any spills or releases that may occur during transport. All of the waste handling procedures will be performed in accordance with 29 CFR 1910.120 (k) and 29 CFR 1926.65 (k) regulations, which are intended for hazardous waste operations and emergency response.
1c	Waste Handling	Please explain why it is reasonable to assume that wastes must be transported 120 miles to a disposal facility. There are a number of closer facilities.	The 90% RD does not assume a specific off-site disposal facility but provides an estimated range of 60-120 miles one-way based on the location of potential approved disposal facilities that may be utilized during the RA.
2a	Spatial Uncertainty in Extent of Waste Materials	The observed soil borings (and dioxin analyses thereof) are irregularly spaced both horizontally and with depth. This produces substantial spatial uncertainties regarding the location of the boundaries of waste material deposits. The design drawings apply linear interpolation between observed waste depths in borings. The linear interpolations require assumptions about the distribution of wastes that we do not have sufficient data or historical information to confirm.	The 2021 SDI included the installation of an additional 35 analytical chemistry soil borings to provide better spatial coverage (vertically and horizontally) for delineation of impacted material. The 90% RD incorporates reasonable interpolations of the extent of impacted material between boring locations, which is an industry standard and accepted practice for defining the limits of remedial excavations. In addition, a post-confirmation sampling program for the Northern Impoundment (excluding the northwest corner) is included as part of the 90% RD (FSP - Appendix J, Attachment 3) to confirm analytical levels upon completion of the excavation.
2b	Spatial Uncertainty in Extent of Waste Materials	The extent of exceedances of cleanup levels on the western side has not been delineated. An assumption has been made that the western extent of the capped area defines the western extent of removal. Consistent with prior comments, further delineation of the extent of contamination, even if it extends beyond the capped area should be completed, or a technical valid discussion regarding why they do not believe there is contamination beyond the extent of the cap should be provided. Data shows some extremely high levels in this area and should be removed.	The remedy, as described in the EPA ROD, only requires excavation of material within the TCRA cap.
2c	Spatial Uncertainty in Extent of Waste Materials	In many borings, dioxin levels > 30 ng/kg were observed at multiple depth intervals, with relatively clean layers in between. Some examples include SJSB071, SJSB032, SJSB037, SJSB036, SJSB054, SJSB028, SJSB047-C1, and SJSB048-C1. It appears there was some mixing or layering of dioxin-containing wastes and non-dioxin containing materials, which is common in landfills. Thus, it is insufficient to extend the dioxin analysis of a boring only to the first depth interval where dioxin levels fall below 30 ng/kg TEQ and assume that dioxin-containing wastes do not occur below that depth. If borings are used to delineate the lower extent of waste, the dioxin analyses of those cores should extend to at least -25 ft, where waste materials have been observed. In addition, removal action should take place in these deeper areas as well.	The 2021 SDI was completed after PDI-2 to further refine the horizontal and vertical extent of impact. The sampling methodology conducted in accordance with the EPA-approved SDI Work Plan (and detailed in Section 2.3.2 of the main text of the 90% RD) included installation of soil borings from 0 to 24 ft bgs. The intervals from 0 to 18 ft bgs were first sampled and the intervals from 18 to 24 were held by the analytical laboratory pending results of the 16-18 ft interval. If that interval result was above the cleanup level, it triggered the analysis of the deeper intervals. Thus, the additional 35 analytical borings installed during the SDI effectively covered the suggested depths. During the RA, target excavation elevations would be verified through post-excavation confirmation sampling.
2d	Spatial Uncertainty in Extent of Waste Materials	Systematic sampling on a regular grid to a uniform depth would have controlled the spatial uncertainty in determining the extent of wastes. To reduce the uncertainty, as well as to ensure the management of dredging residuals where “in-the-wet” excavation is performed, we re-emphasize the need for confirmation sampling along the sides and bottom of excavated areas to confirm that wastes exceeding cleanup levels are not left in place. After excavation, at least one multi-part composite sample should be collected from the bottom and each side of excavated 0.25-acre certification units (CUs). It should be possible to procure expedited analysis with turnaround times of 10 days or less, thus reducing the impacts on schedule, especially if CUs are sampled as they are completed.	A post-excavation confirmation sampling program for the Northern Impoundment (excluding the northwest corner) is included in the FSP (Appendix J, Attachment 3), and is discussed in Sections 5.2 and 5.6.4 of the main text of the 90% RD. The intent will be to collect composite samples over up to 1/2-acre Decision Units (DUs) to compare to the clean-up level.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
2e	Spatial Uncertainty in Extent of Waste Materials	The 30% RD argues that due to the limitations of the cofferdam, it will not be possible to excavate deeper than the design depth if post-excavation confirmation sampling reveals high levels of dioxins below the excavated volume. If the cofferdam cannot be designed with a factor to permit minor adjustments to excavation depth, then the uncertainties in the spatial distribution of wastes should be reduced prior to cofferdam design through higher-resolution systematic sampling to a depth of -25'.	As stated in the response to Item No. 2c, the 2021 SDI included installation of 35 additional analytical borings to further delineate the vertical extent of impacted material. Further, the BMP design included in the 90% RD is designed to accommodate excavation of soils to the deepest interval exceeding the cleanup level plus an additional two feet. That said, significant over-excavation at locations around the perimeter of the Northern Impoundment has the potential to push the excavation slope out and cut into the 30-ft bench of soil necessary to support the wall. This is an uncertainty in the implementation of the design.
3	Spatial Uncertainty in Extent of Waste Materials	It is assumed that removal of the armored cap will be required along the sheet pile alignment to allow driving of the sheet pile. Details should be provided regarding how this will be accomplished without release of contamination from the underlying material, as well as providing whether the sheet piles will be driven from land-based or water-based equipment.	The BMP alignment included in the 90% RD has been amended to remain outside of the limits of the TCRA Cap, to address the potential for a release during installation and removal of the BMP. Based on the design of the BMP and existing conditions in the Northern Impoundment, it is anticipated that sheet piles will be driven from both land-based and water-based equipment.
4	Spatial Uncertainty in Extent of Waste Materials	A significant potential restriction identified relates to temporary road access and potential conflicts related to TxDOT bridge upgrades. Has loading of materials into barges and transport to an alternative shoreline unloading and processing area been considered to alleviate these concerns and potential significant schedule impacts?	GHD has been engaged in discussions with EPA, and TxDOT regarding the TxDOT bridge replacement project and its potential impacts on the RA. Barging was considered in the preliminary stage of design but was not pursued due to complicated logistics, scarcity of offloading terminals, and risk of loss of material or release during transit. Congestion of marine vessels in the vicinity of the Northern Impoundment due to the TxDOT bridge construction would further preclude barging as an option.
5	Spatial Uncertainty in Extent of Waste Materials	Regarding the Sand Separation MNR program, ICs should be required for the entire area, not just the area around SJSSA06, to ensure future activities such as dredging do not expose buried contamination.	The MNR Plan (Appendix J, Attachment 9) and the ICIAP (Appendix J, Attachment 7), have been revised to include institutional controls for the entire SSA.
6	Geotechnical comments Summary	The Geotechnical report provided in Appendix B and the 30% Remedial Design Report (30% RDR) were reviewed to provide the following specific comments. It is our general impression that additional backup material is warranted to support the geotechnical analysis in terms of basis for the selected design parameters and loading conditions. A distinction should be made between short-term and long-term construction conditions while developing the design criteria along with desired factor of safety values. The design conclusion of wall analysis and slope stability focus on the worst case scenarios applicable in isolated areas and apply them globally for the entire site.	Since the 30% RD, and as part of the SDI, additional cone penetrating tests (CPTs) have been taken along the revised alignment of the BMP. The analyses conducted used both drained and undrained conditions, with consideration for construction sequence and time delays. The additional geotechnical data obtained during the SDI is provided in Appendix B of the 90% RD.
7	Geotechnical comments Appendix B	In Appendix B, the seismic site class was reported as Class E per Table 20.3-1 of IBC. However, additional details on the basis for this conclusion should be provided.	The Geotechnical Engineering Report (Appendix B) has been revised to include any profile with more than 10 feet of soil having the following characteristics: Plasticity index PI >20, Moisture > 40%, and Undrained Shear Strength < 500 psf.
8	Geotechnical comments Appendix B Table 7 - 11	Appendix B Tables 7 to 11 summarize the design strength parameters used in the analysis for each Cell. The relevant test borings used to create the generic subsurface profile for each Cell should be summarized. Additionally, Figure 8 should include labeling for all 5 cells to allow the reader to know their locations and be able to identify relevant test borings. This will also allow checking the generalized profile presented in Tables 7 to 11 for each cell.	This comment is no longer relevant to the BMP presented in the 90% RD. Since the 30% RD, as part of the SDI, additional CPTs have been taken along the revised alignment of the BMP. The data used in the analysis is provided in the Northern Impoundment BMP Structural Design Report (Appendix I).

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
9	Geotechnical comments Table 6	Appendix B Table 6 summarizes the water surface levels considered on both sides of the BMP for analyses. However, the ground level on both sides which determines the cantilevered height of the wall should also be included. This will allow determining the earth pressures acting on the wall.	The analysis cross-section for each section along the BMP alignment is provided in the Northern Impoundment BMP Structural Design Report (Appendix I).
10	Geotechnical comments Appendix B Table 7 - 11	What is the basis for the design strength parameters summarized in Appendix B Tables 7 to 11? Is this based on engineering experience or a combination of SPT N values and lab results? Based on a quick review of the test borings, some of the selected values seem very conservative considering the SPT N values observed at test borings. The selected parameters directly impact the wall design and if better parameters can be justified then the design can be optimized.	This comment is no longer relevant to the BMP presented in the 90% RD. Since the 30% RD, as part of the SDI, additional CPTs have been taken along the revised alignment of the BMP. The data used in the analysis is provided in the Northern Impoundment BMP Structural Design Report (Appendix I).
11	Geotechnical comments	Very stiff to hard cohesive soils or medium dense granular soils were encountered in several test borings at depths as shallow as 25 feet. It is difficult to determine the elevations corresponding to these depths as many test borings did not include the surface elevation on the logs. The height of the cantilevered portion of the wall is variable based on excavation depth. However, the presence of these very stiff to hard cohesive and medium granular soils should have a significant impact on the wall embedment determination. The geotechnical report seems to indicate that the primary layer which determines embedment is below El. -50 feet. However, considering the excavation depths the piles could be potentially embedded within the very stiff to hard cohesive and medium dense granular soils and the report should indicate that piles could be tipped in either of these soils.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP will be terminated in the Beaumont Clay layer.
12	Geotechnical comments	The vibration analysis which provided the acceleration inputs for slope stability analysis assumed the user of an impact hammer. Why was the use of a vibratory hammer not considered in evaluation as it tends to generate lower PPV values based on published literature? The use of vibratory hammer and other means to minimize the vibrations resulting from pile driving operation could change the input, output, and conclusions of the slope stability analysis.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP will be terminated in the Beaumont Clay layer and vibrations are not a concern.
13	Geotechnical comments Appendix B Figure 12	Based on the cross-sections provided in Appendix B Figure 12, the existing slope at Sta. 5+00 is between 2.5H:1V and 3H:1V and at Sta. 22+00 is about 7H:1V. Sta. 5+00 is the steepest slope on the site based on a quick review of Figure 5E shown in the 30 percent Remedial Design report (30%RDR). It also extends for a relatively small portion of the BMP alignment when compared with the overall length of the BMP wall. Similarly, Sta. 22+00 represents potentially the next steepest slope on site and also represents a very small portion of the alignment of BMP wall. However, the 30%RDR identifies the potential instability during pile driving as an inherent risk to the implementation of selected remedy in ROD based on these two isolated areas. The report could explore alternate means to prevent slope instability in these isolated areas to allow the implementation of the selected remedy.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP will be terminated in the Beaumont Clay layer.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
14	Geotechnical comments	The geotechnical report recommends additional efforts to evaluate the correlation between pile driving energy, PPV, and horizontal acceleration and also indicates that 0.1g as a representative value for horizontal forces due to pile driving. The reported low factor of safety values are based on a 0.3g horizontal force which can be anticipated at a distance of 20 feet from the pile driving per Appendix D. The anticipated slope instability seems like a localized issue which can be contained with some precautionary measures.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP will be terminated in the Beaumont Clay layer.
15	Geotechnical comments	The slope stability analysis applies 0.3g horizontal force globally, however it should be noted that the initial few feet of the sheet pile is driven under its own weight and the full use of impact energy is only anticipated in deeper depths which should result in attenuated peak particle velocities and horizontal forces for soils along the slope that are reported to potentially slide into the river. The analyzed condition may not be true representation of conditions in field during pile driving and therefore the analysis conclusions may not be reliable.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP will be terminated in the Beaumont Clay layer.
16	Geotechnical comments	The reported failure surface for Sta. 22+00 with 0.3g horizontal force is deep seated and extends up to 75 feet from the BMP wall. Per vibration analysis report the peak ground acceleration attenuates to 0.01g at a distance of 100 feet from the location of pile driving. The slope stability analysis does not account for attenuation with distance and applies 0.3g for the entire cross-section. Therefore, the reported failure surface is unrealistic and should be re-evaluated.	This comment is no longer relevant to the BMP presented in the 90% RD. The revised BMP will be terminated in the Beaumont Clay layer.
17	Geotechnical comments Section 5.4.2.5	The allowable deflection discussed in Section 5.4.2.5 of 30% RDR should be re-evaluated considering the project construction sequencing and impacts. Rather than using a rule of thumb for setting the maximum deflection criterion, a serviceability approach could be implemented. What are the potential hazards from a wall deflecting more than the reported allowable limit of 4.4 inches? The wall will be at its maximum height of 37 feet for a relatively short period of time prior to backfilling. Additionally, the walls are deflecting towards the excavation due to the high-water level outside the cell. It is unclear how this could impact its desired performance. Setting a reasonable tolerable deflection and modeling the wall and excavation accurately may yield more favorable analysis results.	The deflection criteria / limitation of 30% RD is no longer relevant to the design presented in the 90% RD. The revised BMP double wall system will not be limited by the deflection in the sheet piles. By use of a soil-structure interaction method of analysis, the deflections are translated to bending stresses in sheet pile and tensile stresses in the tie-rod. The stresses will be the governing criteria, limited to allowable stress within elastic range.
18	Geotechnical comments Table 5-A	The reported deflections in Table 5-A of up to 20 inches are considering highest water level on outside of the cell (flood condition) and the lowest water level on the inside of the cell (after dewatering) and using drained properties. Please provide justifications for using drained properties.	The comment is no longer relevant to the current design presented in the 90% RD. The revised BMP double wall system is evaluated for both drained and undrained conditions. The deflection criteria is revised as noted in Item No. 17 above.
19	Geotechnical comments	Considering the variable height of wall along its alignment and the nature of the analyzed conditions, it seems like the construction of wall in isolated portions with heights resulting in excessive deflections could be controlled by better planning the construction activities (dewatering and immediate backfilling for example). Therefore, the conclusion of BMP wall being technically infeasible is premature.	This comment is no longer relevant as the conclusion of the 30% RD is superseded by the revised design of the BMP as a double wall system presented in the 90% RD. The analyses evaluated stresses and stability for different stages of the BMP construction and excavation within the impoundment.

Table 1

Response to EPA Comments on 30% Remedial Design
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Reference	Comment	Response
20	Geotechnical comments Section 5.4.4	Section 5.4.4 of 30% RDR quotes that piles would need to be advanced 15-25 feet of sand with SPT N values up to 100 blows per foot. Additional details should be provided on what loading and excavation conditions were provided in the model to determine the embedment depths.	This comment is no longer relevant. The revised BMP presented in the 90% RD will be terminated in the Beaumont Clay layer.
21	Geotechnical comments Section 5.9.1.2	Section 5.9.1.2 of 30% RDR indicates presence of steep slopes within Northern impoundment. Based on Figure 5E, the steepest slope is between 2.5H:1V to 3H:1V. Need further clarification on the reported steep slopes.	This comment is no longer relevant. The revised BMP presented in the 90% RD will be terminated in the Beaumont Clay layer.
22	Geotechnical comments	Based on Figures 2-5 and 2-6 of 30% RDR the bottom elevation of material with > 30 ng/kg varies between El. -4 and El. -25. However, the deepest excavation analyzed in Appendix B is El. -28 feet. How was this excavation elevation selected for DEEPEX analysis?	The -28 ft elevation was chosen to allow for some over-excavation.
23	Geotechnical comments	Upstream protection of the barrier wall from impact loading due to potential barge strikes and other objects in the river was not included in the considered design loading and should seriously be considered. Please add a discussion on this topic and add appropriate barrier protection system.	Barge impact is considered in the 90% RD and is discussed in the BMP Structural Design Report (Appendix I) and in Section 5.5.7 of the main text of the 90% RD.
24	Geotechnical comments	Were other wall types such as Open Cell Wall considered for this site?	Following the submittal of the 30% RD which included an optimized cantilever wall system with significant challenges, the design pivoted to evaluate other BMP options. Based upon the suggestion from the USACE, the next wall type considered was a double wall system. The double wall proved to be successful, so no further wall types were considered (apart from the southern extent of the wall where several different wall types including combination walls and secant walls were considered before deciding upon the double wall system). An open cell wall was not considered.

Table 2-1

First Phase Pre-Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits
Sample Location:		SJSB028	SJSB028	SJSB028	SJSB028	SJSB028	SJSB028	SJSB028	SJSB028	SJSB028	SJSB028	SJSB029	SJSB029	SJSB029	SJSB029	SJSB029
Sample Identification:		SL0580	SL0581	SL0582	SL0583	SL0584	SL0589	SL0585	SL0586	SL0587	SL0588	SL0500	SL0501	SL0502	SL0503	SL0504
Sample Date:		11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/19/2018	11/6/2018	11/6/2018	11/6/2018	11/6/2018	11/6/2018
Sample Type:							Duplicate									
Sample Depth:		(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs
Integral Sample ID:		SJSB028-C1	SJSB028-C2	SJSB028-C3	SJSB028-C4	SJSB028-C5	SJSB028-C10	SJSB028-C6	SJSB028-C7	SJSB028-C8	SJSB028-C9	SJSB029-C1	SJSB029-C2	SJSB029-C3	SJSB029-C4	SJSB029-C5
Dioxins/Furans																
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ng/kg	28.1	1.24 J	64	4.82 J	2.4 J	5.86 J	2.19 J	1.34 U	1.2 U	0.349 U	44.1	5.19 U	2.95 J	1.45 J	2 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ng/kg	2130	1680	2570	2260	948	3270	683	1070	856	985	4720	2750	2110	690	791
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ng/kg	19.2	0.34 J	6.55	1.33 U	0.94 J	2.1 U	0.183 U	0.26 U	0.333 U	0.072 U	9.89	1.25 J	0.39 J	0.349 U	0.46 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	46	23.5	38.6	32	13	39.9	9.57	16.8	16.3	20.9	104	42.5	37.5	11.3	20.1
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ng/kg	2.14 J	3.07 U	0.798 U	0.181 U	0.19 J	0.261 U	3.32 U	3.27 U	3.32 U	3.23 U	0.706 U	3.21 U	3.23 U	3.86 U	3.17 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	5.9 U	0.144 U	3.37 U	0.93 J	0.993 U	1.71 U	0.288 U	0.243 U	0.262 U	3.23 U	1.89 J	0.208 U	3.23 U	0.22 J	3.17 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	2.97 U	0.352 U	3.32 U	3.33 U	3.34 U	0.605 U	0.26 J	0.284 U	0.192 U	0.26 J	0.845 U	0.486 U	0.504 U	3.86 U	0.286 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	2.83 J	0.09 J	1.27 U	0.259 U	0.214 U	0.7 J	0.0887 U	3.27 U	0.0543 U	3.23 U	0.78 J	3.21 U	3.23 U	0.137 U	3.17 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	1.72 J	0.562 U	0.94 U	0.93 J	3.34 U	1.2 U	0.399 U	0.439 U	0.53 J	0.582 U	2.46 J	0.752 U	0.804 U	3.86 U	0.67 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.933 U	0.1 J	0.435 U	0.203 U	0.112 U	0.0976 U	0.075 U	0.0823 U	3.32 U	3.23 U	0.59 J	3.21 U	3.23 U	3.86 U	0.082 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	1.47 J	1.08 U	1.31 J	1.48 J	0.358 U	1.89 J	0.6 J	0.766 U	0.71 J	0.674 U	3 J	1.78 U	1.84 J	0.57 J	0.96 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	3.06	3.07 U	1.87 U	0.62 J	0.495 U	1.26 J	0.21 J	3.27 U	0.16 J	3.23 U	1.09 U	3.21 U	3.23 U	3.86 U	3.17 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	0.75 J	0.28 J	0.384 U	0.39 U	0.23 J	0.229 U	0.164 U	3.27 U	0.0787 U	0.153 U	0.542 U	0.341 U	0.33 J	3.86 U	3.17 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	3.72	3.07 U	0.46 U	0.23 J	0.2 J	0.42 J	3.32 U	3.27 U	3.32 U	3.23 U	1.05 J	3.21 U	3.23 U	3.86 U	3.17 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	4.55	0.094 U	1.63 U	0.397 U	0.63 J	1.17 U	0.177 U	3.27 U	0.179 U	3.23 U	1.4 U	3.21 U	3.23 U	3.86 U	3.17 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ng/kg	124	4.51	74.1	21.6	16	40.8	4.49	7.04	6.74	1.84	45.9	5.03	1.81 U	2.81 U	2.26
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	41.9	1.64 U	26.3	8.45	4.55	14.9	2.36	2.4 UJ	2.16 U	0.647 U	12.5 U	1.55 U	0.749 U	1.37 U	0.648 U
Octachlorodibenzofuran (OCDF) 13C12	ng/kg	28.1	1.24 J	64	4.82 J	2.4 J	5.86 J	2.19 J	1.34 U	1.2 U	0.349 U	44.1	5.19 U	2.95 J	1.45 J	2 U
Total dioxin/furan	pg/g	2410	1710	2780	2330	986	3380	703	1090	880	1010	4930	2800	2150	704	815
Total dioxin/furan (ND*0.5)	pg/g	2410	1710	2790	2330	987	3380	703	1100	883	1010	4940	2800	2160	707	817
Total dioxin/furan (ND*1)	pg/g	2420	1710	2790	2330	989	3380	704	1100	885	1010	4950	2810	2160	710	819
Total heptachlorodibenzofuran (HpCDF)	ng/kg	36.8	0.71 J	14	1.71 J	2.29 J	3.5	0.31 J	3.27 U	0.66 J	3.23 U	31.2	2.3 J	0.38 J	3.86 U	0.71 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	132	69.4	119	90	38.4	120	27.3	52.3	54	68.7	466	121	106	32.1	68.6
Total hexachlorodibenzofuran (HxCDF)	ng/kg	21.1	0.19 J	4.64	1.68 J	0.66 J	1.91 J	0.19 J	3.27 U	0.16 J	3.23 U	13	0.65 J	3.23 U	0.35 J	0.12 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	27.8	14.6	15	23.3	7.62	19.3	4.85	12.4	15.5	20.5	59.5	15.4	22.4	6.35	18.8
Total pentachlorodibenzofuran (PeCDF)	ng/kg	19.4	3.07 U	1.67 J	0.62 J	0.63 J	4.12	0.21 J	3.27 U	0.16 J	3.23 U	6.09	3.21 U	3.23 U	3.86 U	3.17 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	3.51	1.24 J	1.34 J	3.33 U	0.71 J	1.57 J	0.24 J	3.27 U	0.88 J	2.51 J	3.47	3.16 J	1.74 J	3.86 U	2.72 J
Total TEQ 1998 (Avian) (ND*0.5)	ng/kg	173	6	102	31.1	21.7	57.3	7.21	8.6	8.16	2.45	54.6	6.63	2.22	2.59	3.06
Total TEQ 1998 (Fish) (ND*0.5)	ng/kg	52.9	2	31.4	10.3	6.17	18.2	2.96	1.89	1.69	0.77	10.6	1.79	1.24	1.2	0.829
Total TEQ Dioxin 1998 (Bird) (ND=0)	ng/kg	173	5	101	30.6	21.5	56.5	7.02	7.16	6.93	1.97	47.3	5.36	0.767	0.159	2.47
Total TEQ Dioxin 1998 (Bird) (ND=1)	ng/kg	174	6.9	104	31.5	21.8	58.1	7.41	10	9.39	2.93	61.9	7.9	3.68	5.02	3.64
Total TEQ Dioxin 1998 (Fish) (ND=0)	ng/kg	52.4	0.7	30.4	9.96	6.03	17.5	2.81	0.476	0.459	0.341	3.46	0.582	0.601	0.106	0.233
Total TEQ Dioxin 1998 (Fish) (ND=1)	ng/kg	53.3	3	32.3	10.7	6.3	18.8	3.11	3.31	2.91	1.2	17.7	2.99	1.88	2.29	1.43
Total TEQ Dioxin Texas TEF (ND=0)	ng/kg	58.1	0.6	33.8	11	6.6	19.3	2.91	0.704	0.806	0.21	5.57	0.503	0.349	0.079	0.389
Total TEQ Dioxin Texas TEF (ND=0.5)	ng/kg	58.4	2	34.7	11.2	6.72	19.9	3.03	2.08	1.97	0.657	12.4	1.64	0.969	1.11	0.859
Total TEQ Dioxin Texas TEF (ND=1)	ng/kg	58.8	2.5	35.6	11.4	6.83	20.4	3.16	3.46	3.14	1.1	19.2	2.78	1.59	2.15	1.33
Total tetrachlorodibenzofuran (TCDF)	ng/kg	222	6.2	124	39.2	24.4	70.6	6.89	9.89	8.48	1.84	72.1	6.94	0.647 U	0.771 U	2.74
Total tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	46.7	0.615 U	29.9	8.45	0.669 U	16.1	2.36	0.779 U	0.56 J	0.647 U	1.22	0.73 U	0.749 U	1.37 U	0.71
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	ng/kg	58.8	1.5	35.1	12	7.02	20.7	3.2	1.19	1.22	0.714	8.14	1.77	1.53	0.399	0.832
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	ng/kg	59.2	2.4	35.9	12.3	7.13	21.2	3.35	2.59	2.39	1.19	14.9	2.95	2.12	1.48	1.35
Total WHO Dioxin TEQ(Human/Mammal)(ND=1)	ng/kg	59.5	3.4	36.7	12.6	7.24	21.7	3.5	3.99	3.57	1.67	21.7	4.14	2.71	2.56	1.87
Asbestos																
Asbestos	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs																
Aroclor (unspecified)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1262 (PCB-1262)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1268 (PCB-1268)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (7)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0.5)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Total Petroleum Hydrocarbons	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C12-C28)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C25-C36) ORO	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C28-C35)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
General Chemistry																
Cyanide (total)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flash point (closed cup)	Deg C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent solids	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reactive cyanide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total solids	%	80.2	76.6	71.7	69.4	71.6	70.4	72.9	72.2	75.1	72.1	76	72.1	70.7	62.2	75.8

Notes:
ng/kg - nanograms per kilogram
ug/kg - microgram per kilogram
pg/kg - picogram per kilogram
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
Dup - indicates the result from a duplicate sample
-- Data not available

ED_014247_00001351-00125

Table 2-1

First Phase Pre-Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits
Sample Location:		SJSB029	SJSB029	SJSB029	SJSB029	SJSB030	SJSB030	SJSB030	SJSB030	SJSB030	SJSB030	SJSB030	SJSB030	SJSB030	SJSB031	SJSB031
Sample Identification:		SL0505	SL0506	SL0507	SL0508	SL0571	SL0572	SL0573	SL0574	SL0575	SL0576	SL0577	SL0578	SL0579	SL0509	SL0518
Sample Date:		11/6/2018	11/6/2018	11/6/2018	11/6/2018	11/18/2018	11/18/2018	11/18/2018	11/18/2018	11/18/2018	11/18/2018	11/18/2018	11/18/2018	11/18/2018	11/8/2018	11/8/2018
Sample Type:																Duplicate
Sample Depth:		(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(0-2) ft bgs
Integral Sample ID:		SJSB029-C6	SJSB029-C7	SJSB029-C8	SJSB029-C9	SJSB030-C1	SJSB030-C2	SJSB030-C3	SJSB030-C4	SJSB030-C5	SJSB030-C6	SJSB030-C7	SJSB030-C8	SJSB030-C9	SJSB031-C1	SJSB031-C10
Dioxins/Furans																
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ng/kg	2 J	15.7	0.505 J	13.1	55.7	2.84 U	0.822 J	9.54	5.66 U	0.293 J	9.72	0.976 U	1.27 J	2.98 UJ	8.35
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ng/kg	3470	1040	296	1320	1290	2130	329	744	175	108	163	195	424	155 J	168
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.25 J	0.86 J	3.09 U	3.21	9.23	0.71 J	0.154 U	2.06 J	0.0432 U	0.044 U	1.01 J	0.13 U	0.545 U	0.65 J	0.917 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	49.3	21.8	12	30.5	68.1	28.2	6.45	15	3.31	2.19 J	2.85 J	5.33	14.5	5.77	6.03
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ng/kg	3.83 U	3.22 U	3.09 U	0.299 U	0.87 J	2.83 U	3.04 U	0.171 U	2.83 U	2.86 U	0.113 U	3.02 U	0.0813 U	0.102 U	2.7 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	3.83 U	0.125 U	0.0639 U	1.2 U	1.6 J	0.23 U	0.0628 U	0.424 U	0.0231 U	0.03 U	0.34 J	3.02 U	0.26 J	0.66 J	0.45 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.641 U	0.311 U	3.09 U	3.12 U	0.261 U	2.83 U	3.04 U	0.28 J	0.1 J	0.12 J	0.124 U	0.176 U	0.303 U	2.6 U	0.07 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	3.83 U	0.13 J	3.09 U	0.508 U	0.82 J	0.119 U	0.0429 U	0.124 U	0.0181 U	0.0299 U	0.0872 U	3.02 U	0.0909 U	0.0948 U	0.159 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	1.38 J	0.538 U	0.324 U	3.12 U	2.04 J	0.91 J	0.257 U	0.45 J	0.16 J	0.1 J	0.2 U	0.3 U	0.65 J	0.239 U	0.22 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ng/kg	3.83 U	3.22 U	3.09 U	3.12 U	0.178 U	0.0854 U	0.0674 U	0.135 U	0.0215 U	2.86 U	2.95 U	3.02 U	3.21 U	0.071 U	0.0935 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	1.98 J	1.14 J	0.372 U	1.1 J	1.12 J	1.23 U	0.38 J	0.65 J	0.134 U	0.31 J	0.3 J	0.372 U	1.08 J	0.23 J	0.35 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	3.83 U	3.22 U	3.09 U	0.708 U	1.08 J	0.202 U	3.04 U	0.193 U	2.83 U	2.86 U	2.95 U	3.02 U	3.21 U	0.292 U	0.193 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	3.83 U	0.308 U	3.09 U	0.131 U	0.269 U	0.184 U	3.04 U	0.188 U	2.83 U	2.86 U	2.95 U	3.02 U	0.201 U	0.125 U	0.104 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	3.83 U	3.22 U	3.09 U	0.328 U	0.68 J	0.13 U	0.0353 U	0.16 J	2.83 U	2.86 U	2.95 U	3.02 U	0.109 U	2.6 U	0.0789 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	3.83 U	3.22 U	3.09 U	0.528 U	1.44 J	2.83 U	3.04 U	0.14 U	2.83 U	2.86 U	0.128 U	3.02 U	3.21 U	0.285 U	0.144 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ng/kg	1.21 U	0.89	0.644 U	21	11.1	2.34	1.13	2.83	0.966 U	0.65	0.59 U	0.604 U	0.641 U	5.34	3.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.766 U	0.728 U	0.834 U	5.87	4.01 U	0.867 U	0.607 U	1.83	0.453 U	0.59	0.59 U	0.604 U	0.641 U	1.59	1.06
Octachlorodibenzofuran (OCDF) 13C12	ng/kg	2 J	15.7	0.5 J	13.1	55.7	2.84 U	0.82 J	9.54	0.115 U	0.29 J	9.72	0.976 U	1.27 J	2.98 UJ	8.35
Total dioxin/furan	pg/g	3520	1080	308	1390	1440	2160	338	777	200	110	177	200	442	169	188
Total dioxin/furan (ND*0.5)	pg/g	3530	1080	310	1400	1450	2170	339	777	200	110	178	202	443	171	189
Total dioxin/furan (ND*1)	pg/g	3530	1080	311	1400	1450	2170	340	778	200	110	179	204	445	174	190
Total heptachlorodibenzofuran (HpCDF)	ng/kg	0.49 J	0.86 J	3.09 U	9.05	35.5	1.94 J	0.27 J	4.96	2.83 U	0.05 J	1.01 J	3.02 U	0.2 J	0.65 J	1.39 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	139	60.8	25.3	103	160	86.7	24.1	44.6	12.5	8.71	11	24.7	49.6	19.1	19.7
Total hexachlorodibenzofuran (HxCDF)	ng/kg	0.24 J	0.13 J	3.09 U	2.02 J	12.9	0.5 J	3.04 U	1.12 J	2.83 U	2.86 U	0.34 J	3.02 U	0.26 J	0.66 J	0.86 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	28.7	13.8	2.12 J	16.1	20.1	17	7.72	11.1	2.32 J	2.15 J	0.62 J	2.28 J	16.4	3.58	3.89
Total pentachlorodibenzofuran (PeCDF)	ng/kg	3.83 U	3.22 U	3.09 U	2.71 J	7.36	2.83 U	3.04 U	2.82 U	2.83 U	2.86 U	2.95 U	3.02 U	3.21 U	0.39 J	2.7 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	3.08 J	0.78 J	0.72 J	0.73 J	1.43 J	0.53 J	0.63 J	1.29 J	0.08 J	2.86 U	2.95 U	2.27 J	3.21 U	2.6 U	2.7 U
Total TEQ 1998 (Avian) (ND*0.5)	ng/kg	1.77	1.79	0.921	27.7	15.5	3.29	1.66	5.07	0.812	1.4	0.489	0.803	1.05	7.28	4.72
Total TEQ 1998 (Fish) (ND*0.5)	ng/kg	1.12	0.862	0.588	7.56	4.18	1.05	0.545	2.41	0.38	0.762	0.39	0.507	0.673	2.12	1.45
Total TEQ Dioxin 1998 (Bird) (ND=0)	ng/kg	0.611	1.15	0.0416	27.2	13.4	2.6	1.21	4.87	0.027	1.3	0.0942	0.0248	0.198	7.05	4.57
Total TEQ Dioxin 1998 (Bird) (ND=1)	ng/kg	2.93	2.43	1.8	28.1	17.7	3.99	2.12	5.28	1.6	1.46	0.983	1.58	1.91	7.5	4.87
Total TEQ Dioxin 1998 (Fish) (ND=0)	ng/kg	0.433	0.205	0.0416	7.13	1.97	0.374	0.0997	2.25	0.07	0.7	0.0672	0.0248	0.1	1.95	1.34
Total TEQ Dioxin 1998 (Fish) (ND=1)	ng/kg	1.81	1.52	1.13	8	6.39	1.72	0.99	2.58	0.68	0.824	0.713	0.989	1.25	2.29	1.56
Total TEQ Dioxin Texas TEF (ND=0)	ng/kg	0.336	0.216	0	8.08	2.51	0.325	0.151	2.27	0.03	0.7	0.064	0	0.199	2.21	1.51
Total TEQ Dioxin Texas TEF (ND=0.5)	ng/kg	0.699	0.759	1.1	8.41	4.6	0.943	0.55	2.39	0.34	0.8	0.341	0.919	0.675	2.35	1.59
Total TEQ Dioxin Texas TEF (ND=1)	ng/kg	1.46	1.3	1.1	8.75	6.69	1.56	0.948	2.5	0.66	0.8	0.619	0.919	1.15	2.48	1.67
Total tetrachlorodibenzofuran (TCDF)	ng/kg	2.61	0.42 J	0.619 U	31	22.2	3.86	1.6	3.99	0.45 J	0.39 J	0.59 U	0.604 U	0.45 J	7.97	5.57
Total tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.766 U	0.728 U	0.834 U	5.87	0.586 U	0.8	0.607 U	2.38	0.566 U	0.59	0.59 U	3.31	0.641 U	1.95	1.06
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	ng/kg	1.87	0.759	0.209	8.82	3.39	1.25	0.314	2.66	0.11	0.76	0.154	0.112	0.472	2.32	1.62
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	ng/kg	2.45	1.36	0.769	9.13	5.54	1.9	0.735	2.81	0.44	0.82	0.453	0.592	0.982	2.46	1.72
Total WHO Dioxin TEQ(Human/Mammal)(ND=1)	ng/kg	3.02	1.96	1.33	9.44	7.7	2.55	1.16	2.96	0.77	0.87	0.751	1.07	1.49	2.59	1.81
Asbestos																
Asbestos	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs																
Aroclor (unspecified)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1262 (PCB-1262)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1268 (PCB-1268)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (7)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0.5)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Total Petroleum Hydrocarbons	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C12-C28)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C25-C36) ORO	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C28-C35)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
General Chemistry																
Cyanide (total)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flash point (closed cup)	Deg C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent solids	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reactive cyanide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total solids	%	62.3	74.6	76.8	76.2	85	86.5	81.8	82.9	81.7	82.4	81.1	80.6	74	88.5	88.4

Notes:
ng/kg - nanograms per kilogram
ug/kg - microgram per kilogram
pg/kg - picogram per kilogram
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
Dup - indicates the result from a duplicate sample
-- Data not available

Table 2-1

First Phase Pre-Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits
Sample Location:		SJSB031	SJSB031	SJSB031	SJSB031	SJSB031	SJSB031	SJSB031	SJSB031	SJSB032	SJSB032	SJSB032	SJSB032	SJSB032	SJSB032	SJSB032
Sample Identification:		SL0510	SL0511	SL0512	SL0513	SL0514	SL0515	SL0516	SL0517	SL0561	SL0562	SL0563	SL0570	SL0564	SL0565	SL0566
Sample Date:		11/8/2018	11/8/2018	11/8/2018	11/8/2018	11/8/2018	11/9/2018	11/9/2018	11/9/2018	11/17/2018	11/17/2018	11/17/2018	11/17/2018	11/17/2018	11/17/2018	11/17/2018
Sample Type:													Duplicate			
Sample Depth:		(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Integral Sample ID:		SJSB031-C2	SJSB031-C3	SJSB031-C4	SJSB031-C5	SJSB031-C6	SJSB031-C7	SJSB031-C8	SJSB031-C9	SJSB032-C1	SJSB032-C2	SJSB032-C3	SJSB032-C10	SJSB032-C4	SJSB032-C5	SJSB032-C6
Dioxins/Furans																
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ng/kg	1.17 U	1.88 U	1.84 U	2.9 U	4.65 J	1.58 J	2.9 J	0.801 J	56.7	102	31.4	21.5	2.21 J	3.22 J	0.521 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ng/kg	650	449	331	375	416	113	239	165	1630	2730	1090	839	432	496	97.4
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.161 U	0.27 J	0.25 J	0.449 U	1.07 U	0.42 J	0.7 J	0.16 U	79	134	46.7	29.6	0.66 J	2.6 J	0.722 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	9.75	7.96	6.85	7.86	11.4	3.98	6.96	6.29	69.6	134	40.8	31.7	9.37	12.1	2.59 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ng/kg	2.76 U	3.01 U	2.88 U	2.89 UJ	3 U	2.83 U	0.136 U	3.25 U	25.4	40.7	16	9.94	0.0833 U	0.81 J	0.26 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.1 J	0.0778 U	0.0583 U	2.89 U	0.213 U	0.147 U	0.131 U	3.25 U	236	400	159	87.8	0.6 J	6.84	1.95 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	2.76 U	3.01 U	0.21 J	2.89 U	0.188 U	0.0841 U	2.99 U	0.11 J	0.48 J	0.66 J	2.86 UJ	0.24 J	0.151 U	0.4 J	2.93 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	2.76 U	3.01 U	2.88 U	2.89 U	0.143 U	0.0677 U	0.0986 U	3.25 U	57.2	94.9	40.1	21	0.24 J	1.72 J	0.66 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.43 J	0.23 J	0.243 U	0.262 U	0.53 J	0.139 U	0.26 J	0.32 J	2.58 J	4.16	1.43 J	1.19 J	0.36 U	0.391 U	0.106 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.125 U	3.01 U	0.105 U	2.89 U	3 U	2.83 U	0.128 U	0.0837 U	15.7	24.6	14.8	5.72	3.05 U	0.513 U	0.203 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.431 U	0.342 U	0.42 J	0.62 J	0.449 U	0.199 U	0.29 J	0.374 U	0.813 U	1.25 U	0.701 U	0.578 U	0.418 U	0.69 J	0.101 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	2.76 U	3.01 U	2.88 U	2.89 U	0.17 J	0.12 U	0.105 U	3.25 U	141	233	92.4	48	0.27 J	3.96	1.28 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	2.76 U	3.01 U	0.13 J	0.177 U	0.152 U	0.0601 U	0.141 U	0.104 U	14.3	28.1	6.72	6.25	0.174 U	0.68 J	0.239 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	2.76 U	3.01 U	0.0634 U	2.89 U	0.11 J	0.0743 U	0.16 J	3.25 U	9.79	16.9	8.72	3.61	0.1 U	0.49 J	0.12 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	2.76 U	3.01 U	2.88 U	2.89 U	3 U	2.83 U	0.116 U	3.25 U	123	226	79.6	46.6	0.267 U	4.05	1.14 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ng/kg	0.553 U	0.602 U	0.576 U	1.35 U	0.99	0.97	0.546 U	0.65 U	5210	10500	4620	2450	8.96	157	43.9
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.553 U	0.602 U	0.576 U	0.501 U	0.41 J	0.163 U	0.598 U	0.65 U	2800	6450	2650 J	1460	4.79	66.7	21.4
Octachlorodibenzofuran (OCDF) 13C12	ng/kg	1.17 U	1.88 U	1.84 U	2.9 U	4.65 J	1.58 J	2.9 J	0.8 J	56.7	102	31.4	21.5	2.21 J	3.22 J	0.52 U
Total dioxin/furan	pg/g	700	457	339	383	434	120	250	173	10500	21100	8900	5060	459	757	169
Total dioxin/furan (ND*0.5)	pg/g	700	460	341	387	436	121	251	173	10500	21100	8900	5060	460	758	171
Total dioxin/furan (ND*1)	pg/g	700	462	343	390	437	121	252	174	10500	21100	8900	5060	461	758	173
Total heptachlorodibenzofuran (HpCDF)	ng/kg	2.76 U	0.46 J	0.46 J	0.4 J	1.96 J	1.16 J	1.91 J	3.25 U	146	245	83.4	53.5	0.66 J	4.94	0.26 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	40.9	31	28.1	33.8	41.1	12.5	24	22.2	156	258	91.2	71.8	30.5	37.4	10.7
Total hexachlorodibenzofuran (HxCDF)	ng/kg	0.1 J	3.01 U	2.88 U	2.89 U	1.07 J	0.12 J	0.61 J	0.05 J	350	589	241	127	1.51 J	9.25	0.96 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	11.6	7.81	7.43	8.94	7.5	2.74 J	4.67	8.36	18.2	27.9	16.6	15.1	6.04	10.7	2.69 J
Total pentachlorodibenzofuran (PeCDF)	ng/kg	2.76 U	3.01 U	2.88 U	2.89 U	0.17 J	2.83 U	2.99 U	3.25 U	388	686	260	2.99 U	0.8 J	12.2	2.42 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	0.71 J	0.62 J	0.44 J	1.01 J	0.56 J	0.06 J	0.49 J	0.95 J	19.9	31.6	7.65	8.48	1.06 J	0.89 J	0.42 J
Total TEQ 1998 (Avian) (ND*0.5)	ng/kg	0.8	0.786	0.864	1.23	1.68	1.17	0.801	0.323	8190	17300	7390	3980	14.2	230	66.9
Total TEQ 1998 (Fish) (ND*0.5)	ng/kg	0.54	0.487	0.623	0.522	0.718	0.235	0.511	0.276	3180	7180	2960	1630	5.59	78.7	24.6
Total TEQ Dioxin 1998 (Bird) (ND=0)	ng/kg	0.09	0.0579	0.225	0.107	1.49	0.99	0.0858	0.0316	8190	17300	7390	3980	13.9	230	66.7
Total TEQ Dioxin 1998 (Bird) (ND=1)	ng/kg	1.51	1.51	1.5	2.35	1.87	1.35	1.52	0.615	8190	17300	7390	3980	14.4	230	67.1
Total TEQ Dioxin 1998 (Fish) (ND=0)	ng/kg	0.09	0.0579	0.282	0.0516	0.538	0.0681	0.0596	0.0811	3180	7180	2960	1630	5.39	78.7	24.3
Total TEQ Dioxin 1998 (Fish) (ND=1)	ng/kg	0.99	0.917	0.965	0.993	0.698	0.403	0.961	0.472	3180	7180	2960	1630	5.79	78.7	24.8
Total TEQ Dioxin Texas TEF (ND=0)	ng/kg	0.05	0.023	0.128	0.062	0.582	0.097	0.071	0.043	3430	7690	3180	1750	5.78	86	26.5
Total TEQ Dioxin Texas TEF (ND=0.5)	ng/kg	0.46	0.437	0.494	0.505	0.702	0.247	0.48	0.232	3430	7690	3180	1750	5.94	86	26.7
Total TEQ Dioxin Texas TEF (ND=1)	ng/kg	0.87	0.851	0.86	0.949	0.823	0.398	0.889	0.421	3430	7690	3180	1750	6.11	86.1	26.9
Total tetrachlorodibenzofuran (TCDF)	ng/kg	0.553 U	0.602 U	0.576 U	0.577 U	0.99	1.38	0.598 U	0.65 U	8180	15500	4270	3300	15.3	282	85.6
Total tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.553 U	0.602 U	0.576 U	0.577 U	0.41 J	0.566 U	0.598 U	0.78	2130	4430	1200	893	4.79	67.9	21.4
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	ng/kg	0.35	0.24	0.363	0.253	0.818	0.175	0.22	0.156	3410	7660	3170	1740	6.01	85.7	26.3
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	ng/kg	0.77	0.666	0.719	0.726	0.97	0.333	0.653	0.362	3410	7660	3170	1740	6.19	85.8	26.5
Total WHO Dioxin TEQ(Human/Mammal)(ND=1)	ng/kg	1.2	1.09	1.07	1.2	1.12	0.49	1.09	0.568	3410	7660	3170	1740	6.36	85.8	26.8
Asbestos																
Asbestos	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs																
Aroclor (unspecified)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1262 (PCB-1262)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1268 (PCB-1268)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (7)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0.5)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Total Petroleum Hydrocarbons	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C12-C28)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C25-C36) ORO	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C28-C35)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
General Chemistry																
Cyanide (total)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flash point (closed cup)	Deg C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent solids	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reactive cyanide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total solids	%	84.3	79.6	84.4	84.4	82.6	82.2	81.9	75.9	84.4	81.4	82.9	83	77	80.5	82.5

Notes:
ng/kg - nanograms per kilogram
ug/kg - microgram per kilogram
pg/kg - picogram per kilogram
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
Dup - indicates the result from a duplicate sample
-- Data not available

ED_014247_00001351-00127

Table 2-1

First Phase Pre-Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits
Sample Location:		SJSB032	SJSB032	SJSB032	SJSB033	SJSB033	SJSB033	SJSB033	SJSB033	SJSB033	SJSB033	SJSB033	SJSB033	SJSB034	SJSB034	SJSB034
Sample Identification:		SL0567	SL0568	SL0569	SL0539	SL0540	SL0541	SL0542	SL0543	SL0544	SL0545	SL0546	SL0538	SL0519	SL0520	SL0521
Sample Date:		11/17/2018	11/17/2018	11/17/2018	11/12/2018	11/12/2018	11/12/2018	11/12/2018	11/12/2018	11/12/2018	11/14/2018	11/14/2018	11/15/2018	11/10/2018	11/10/2018	11/10/2018
Sample Type:																
Sample Depth:		(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Integral Sample ID:		SJSB032-C7	SJSB032-C8	SJSB032-C9	SJSB033-C2	SJSB033-C3	SJSB033-C4	SJSB033-C5	SJSB033-C6	SJSB033-C7	SJSB033-C8	SJSB033-C9	SJSB033-C1	SJSB034-C1	SJSB034-C2	SJSB034-C3
Dioxins/Furans																
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ng/kg	5.79 U	0.333 J	0.77 U	105	133	112	44.3	5.59	0.815 J	1.23 J	0.583 U	17.4	1.01 U	0.646 J	1.96 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ng/kg	80.9	49.2	32.9	481	1720	2180	829	200	90.1	127	109	588	272	319	180
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.39 J	0.06 J	0.322 U	41.1	197	201	71.5	7.5	1.05 J	0.92 J	0.51 J	6.85	0.344 U	0.0608 U	0.253 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	2.42 J	1.7 J	1.31 J	19.8	62.5	71.5	24.7	5.79	2.19 J	3.87	4.09	22.7	5.69	5.85	4.3
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.111 U	3.1 U	0.133 U	17.2	81.3	71.4	31.6	2.92	0.45 J	0.24 J	0.2 J	1.73 J	0.0928 U	0.06 J	2.93 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	1.38 J	0.159 U	1.32 J	109	651	584	241	26.3	3.21	2 J	1.65 J	12.9	0.62 J	0.158 U	0.278 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	2.89 U	3.1 U	3.08 U	0.258 U	0.57 J	0.633 U	0.257 U	2.78 U	2.94 U	0.109 U	0.21 J	0.192 U	2.79 U	2.74 U	2.93 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.34 J	0.03 J	0.295 U	24.2	144	138	54.8	6	0.743 U	0.57 J	0.361 U	3.33	0.106 U	2.74 U	0.178 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.0632 U	3.1 U	0.11 J	0.726 U	2.24 U	2.96 J	0.783 U	2.78 U	0.113 U	0.187 U	0.31 J	0.821 U	0.216 U	2.74 U	2.93 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.0691 U	0.0388 U	0.0667 U	6.5	41.5	35.5	13.5	2.27 J	0.27 J	0.15 J	0.145 U	1.18 J	2.79 U	0.0571 U	2.93 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.0782 U	0.201 U	3.08 U	0.487 U	1.03 U	1.7 U	0.717 U	0.238 U	0.13 J	0.34 J	0.26 J	0.58 U	0.279 U	0.4 J	0.19 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	0.88 J	3.1 U	0.522 U	33.3	268	230	76.8	12.1	1.63 J	1.03 J	0.73 J	8.87	0.46 J	2.74 U	2.93 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	0.156 U	0.133 U	0.17 U	3.5 U	23.8	21.9	6.89	0.975 U	0.179 U	0.3 J	3.02 U	0.805 U	2.79 U	2.74 U	2.93 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.0505 U	3.1 U	3.08 U	4.3	26	22.3	7.67 U	1.42 J	0.102 U	2.95 U	3.02 U	0.785 U	0.0489 U	2.74 U	0.07 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	0.731 U	3.1 U	0.512 U	26.8	214	186	60.7	9.37	1.14 U	0.87 J	0.53 J	6.45	0.32 J	2.74 U	2.93 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ng/kg	27.3	2.98	21.8	1420	10600	8340	2510	274	39.6	26.2	20.2	184	11.8	3.27 UJ	6.07
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	12.7	1.69	10.2 J	879	5870	4740	1390	122	19.3	14	9.83	72.2	3.53	1.35 UJ	2.09
Octachlorodibenzofuran (OCDF) 13C12	ng/kg	0.0841 U	0.33 J	0.77 U	105	133	112	44.3	5.59	0.81 J	1.23 J	0.583 U	17.4	1.01 U	0.646 J	1.96 U
Total dioxin/furan	pg/g	126	56	67.6	3170	20000	16900	5350	675	159	179	148	926	294	326	193
Total dioxin/furan (ND*0.5)	pg/g	127	56.4	69.1	3170	20000	16900	5360	676	160	179	148	927	296	329	195
Total dioxin/furan (ND*1)	pg/g	128	56.9	70.6	3170	20000	16900	5360	677	161	179	149	929	297	332	197
Total heptachlorodibenzofuran (HpCDF)	ng/kg	2.89 U	0.06 J	3.08 U	71.5	338	326	124	12.5	2.94 U	1.17 J	0.71 J	15.9	2.79 U	0.06 J	0.17 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	9.98	6.26	4.14	47.5	147	183	64.1	17.4	8.14	13.2	12.6	56	20.7	22.6	17.3
Total hexachlorodibenzofuran (HxCDF)	ng/kg	1.72 J	0.03 J	1.44 J	148	928	834	330	39.1	3.48	2.74 J	1.65 J	22	0.62 J	2.74 U	0.07 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	3.05	3.19	0.56 J	5.1	20.4	30.8	11.9	4.11	0.13 J	1.93 J	4.05	6.97	0.86 J	3.91	1.15 J
Total pentachlorodibenzofuran (PeCDF)	ng/kg	1.66 J	3.1 U	0.28 J	90.1	727	628	206	30.9	2.29 J	1.9 J	1.27 J	22.8	0.79 J	2.74 U	2.93 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	0.64 J	0.64 J	0.36 J	2.96 U	29.4	28.6	8.2	2.78 U	0.3 J	1.16 J	0.59 J	0.2 J	2.79 U	2.74 U	2.93 U
Total TEQ 1998 (Avian) (ND*0.5)	ng/kg	40.7	4.81	32.5	2350	16800	13400	4010	411	60.1	41.8	31	266	15.9	2.59	8.52
Total TEQ 1998 (Fish) (ND*0.5)	ng/kg	14.6	1.96	11.7	982	6630	5360	1590	145	22.2	16.4	11.5	87.5	4.5	0.984	2.69
Total TEQ Dioxin 1998 (Bird) (ND=0)	ng/kg	40.3	4.68	32.1	2340	16800	13400	4010	410	59.5	41.8	30.9	265	15.8	0.0784	8.21
Total TEQ Dioxin 1998 (Bird) (ND=1)	ng/kg	41.2	4.95	32.9	2350	16800	13400	4010	411	60.8	41.8	31.1	266	16	5.1	8.82
Total TEQ Dioxin 1998 (Fish) (ND=0)	ng/kg	14.3	1.85	11.4	980	6630	5360	1590	145	21.7	16.4	11.4	87	4.4	0.0424	2.42
Total TEQ Dioxin 1998 (Fish) (ND=1)	ng/kg	14.8	2.08	12	984	6630	5360	1590	146	22.6	16.5	11.7	88	4.6	1.93	2.96
Total TEQ Dioxin Texas TEF (ND=0)	ng/kg	15.6	1.99	12.5	1050	7150	5770	1710	158	23.7	17.6	12.4	96	4.96	0.04	2.72
Total TEQ Dioxin Texas TEF (ND=0.5)	ng/kg	15.9	2.07	12.7	1050	7150	5770	1710	159	24.1	17.6	12.5	96.3	5.02	1	2.9
Total TEQ Dioxin Texas TEF (ND=1)	ng/kg	16.1	2.15	12.9	1050	7150	5770	1710	159	24.5	17.6	12.5	96.6	5.09	1.96	3.08
Total tetrachlorodibenzofuran (TCDF)	ng/kg	46.2	3.28	33.5	1620	13300	12100	3430	450	61.8	38	31.7	311	17.7	0.548 U	6.63
Total tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	18.7	3.44	10.2	517	3660	3450	954	133	19.3	14	9.83	79	3.53	0.761 U	2.09
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	ng/kg	15.7	2.02	12.5	1050	7120	5740	1700	156	23.7	17.6	12.4	95	5.02	0.195	2.82
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	ng/kg	15.9	2.13	12.7	1050	7120	5740	1700	157	24	17.6	12.5	95.6	5.12	1.17	3.04
Total WHO Dioxin TEQ(Human/Mammal)(ND=1)	ng/kg	16.1	2.23	12.9	1050	7120	5740	1700	157	24.3	17.6	12.6	96.1	5.22	2.15	3.26
Asbestos																
Asbestos	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs																
Aroclor (unspecified)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1262 (PCB-1262)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1268 (PCB-1268)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (7)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0.5)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Total Petroleum Hydrocarbons	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C12-C28)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C25-C36) ORO	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C28-C35)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
General Chemistry																
Cyanide (total)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flash point (closed cup)	Deg C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent solids	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reactive cyanide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total solids	%	80.6	74.5	79.5	81	77	74.6	78.3	82.6	79.1	80.1	80	89.7	86.5	84.2	81.9

Notes:
ng/kg - nanograms per kilogram
ug/kg - microgram per kilogram
pg/kg - picogram per kilogram
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
Dup - indicates the result from a duplicate sample
-- Data not available

ED_014247_00001351-00128

Table 2-1

First Phase Pre-Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits
Sample Location:		SJSB034	SJSB034	SJSB034	SJSB034	SJSB034	SJSB034	SJSB035	SJSB035	SJSB035	SJSB035	SJSB035	SJSB035	SJSB035	SJSB035	SJSB035
Sample Identification:		SL0522	SL0523	SL0524	SL0525	SL0526	SL0527	SL0528	SL0529	SL0530	SL0531	SL0532	SL0533	SL0534	SL0537	SL0535
Sample Date:		11/10/2018	11/10/2018	11/10/2018	11/10/2018	11/10/2018	11/10/2018	11/11/2018	11/11/2018	11/11/2018	11/11/2018	11/11/2018	11/11/2018	11/11/2018	11/11/2018 Duplicate	11/11/2018
Sample Type:																
Sample Depth:		(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(12-14) ft bgs	(14-16) ft bgs
Integral Sample ID:		SJSB034-C4	SJSB034-C5	SJSB034-C6	SJSB034-C7	SJSB034-C8	SJSB034-C9	SJSB035-C1	SJSB035-C2	SJSB035-C3	SJSB035-C4	SJSB035-C5	SJSB035-C6	SJSB035-C7	SJSB035-C10	SJSB035-C8
Dioxins/Furans																
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ng/kg	2.73 U	18.8 J	0.729 U	0.441 U	0.377 U	0.362 U	12.1 U	0.564 U	0.337 U	1.46 U	1.18 U	0.299 J	1.08 J	0.544 J	0.789 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ng/kg	787	170	159	229	121	315	481	120	141	213	173	99.7	140	144	157
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.6 J	2.78 J	0.26 J	0.13 J	0.0427 U	0.11 J	2.9	0.137 U	0.148 U	0.166 U	0.166 U	0.0489 U	0.22 J	0.0688 U	0.09 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	12.6	4.77	2.68 J	3.48 U	2.36 J	5.03	20.7	3.54	3.45	5.89	5.92	2.05 J	3.02	2.49 J	3.85
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ng/kg	3.1 U	0.303 U	0.185 U	3.09 U	2.86 U	2.85 U	2.79 U	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	2.78 U	0.0462 U	0.07 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.166 U	0.42 J	0.145 U	0.0637 U	0.0756 U	0.0751 U	0.546 U	0.137 U	0.104 U	0.0955 U	2.97 U	0.0894 U	0.276 U	2.93 U	0.147 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.184 U	3.03 U	0.199 U	0.071 U	2.86 U	2.85 U	0.12 J	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	2.78 U	0.0534 U	0.195 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.16 J	0.18 J	0.12 J	3.09 U	2.86 U	0.032 U	0.29 J	2.82 U	2.9 U	0.05 J	2.97 U	2.98 U	2.78 UJ	2.93 U	2.86 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.393 U	0.152 U	0.116 U	0.121 U	0.177 U	0.21 J	0.65 J	2.82 U	2.9 U	0.28 J	2.97 U	2.98 U	0.0899 U	0.0844 U	0.193 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.11 U	0.1 U	0.25 J	3.09 U	2.86 U	2.85 U	0.107 U	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	2.78 U	0.06 J	2.86 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.638 U	0.131 U	0.24 U	0.227 U	0.278 U	0.41 J	0.43 J	0.239 U	0.132 U	0.428 U	0.33 J	0.2 J	0.33 U	0.282 U	0.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	3.1 U	0.108 U	0.126 U	3.09 U	0.114 U	2.85 U	0.35 J	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	0.202 U	2.93 U	2.86 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	3.1 U	3.03 U	2.97 U	3.09 U	2.86 U	2.85 U	2.79 U	2.82 U	2.9 U	0.0834 U	2.97 U	2.98 U	2.78 U	0.0961 U	0.144 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	3.1 U	0.0639 U	0.128 U	0.0537 U	2.86 U	2.85 U	0.108 U	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	2.78 U	0.0274 U	2.86 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	3.1 U	3.03 U	0.204 U	3.09 U	2.86 U	2.85 U	2.79 U	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	2.78 U	2.93 U	2.86 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ng/kg	2.49 U	1.55	1.87	2.01 U	1.97 J	1.34	2.41	2.72 UJ	1.43	2.6 J	1.53	2.3 UJ	3.18 J	0.585 U	2.81
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.619 U	0.54 J	0.79 U	0.618 U	1.12 J	0.48 J	0.847 U	0.564 U	0.66	0.778 U	0.511 U	1.07 U	1.49 U	0.585 U	0.882 U
Octachlorodibenzofuran (OCDF) 13C12	ng/kg	2.73 U	18.8 J	0.729 U	0.441 U	0.377 U	0.362 U	12.1 U	0.564 U	0.337 U	1.46 U	1.18 U	0.299 J	1.08 J	0.54 J	0.789 J
Total dioxin/furan	pg/g	800	199	164	229	126	323	509	124	147	222	181	102	148	147	165
Total dioxin/furan (ND*0.5)	pg/g	804	200	166	233	127	323	516	126	147	224	182	104	149	148	166
Total dioxin/furan (ND*1)	pg/g	808	200	167	237	128	324	523	129	148	225	183	106	150	149	167
Total heptachlorodibenzofuran (HpCDF)	ng/kg	1.27 J	5	0.26 J	0.2 J	2.86 U	0.11 J	11.6	2.82 U	2.9 U	0.59 J	2.97 U	2.98 U	0.22 J	2.93 U	0.07 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	41.4	16.4	9.7	11.9	9.44	21.7	56	13.2	13.8	26.3	23	8.48	12.6	10.5	14.3
Total hexachlorodibenzofuran (HxCDF)	ng/kg	0.16 J	1.19 J	0.38 J	0.17 J	2.86 U	2.85 U	3.71	0.13 J	0.03 J	0.16 J	2.97 U	2.98 U	2.78 U	0.06 J	0.14 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	8.22	2.37 J	1.4 J	3.1	0.55 J	7.1	9.06	2.82 U	2.34 J	4.96	4.08	0.2 J	1.92 J	1.61 J	0.37 J
Total pentachlorodibenzofuran (PeCDF)	ng/kg	3.1 U	3.03 U	2.97 U	3.09 U	2.86 U	2.85 U	1.84 J	2.82 U	2.9 U	2.84 U	2.97 U	2.98 U	2.78 U	2.93 U	2.86 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	0.37 J	3.03 U	2.97 U	3.09 U	2.86 U	0.32 J	0.15 J	2.82 U	2.9 U	0.35 J	2.97 U	2.98 U	2.78 U	0.07 J	2.86 U
Total TEQ 1998 (Avian) (ND*0.5)	ng/kg	1.87	2.32	2.5	1.49	3.24	2.02	3.23	1.8	2.27	3.15	1.94	1.83	4.11	0.696	3.45
Total TEQ 1998 (Fish) (ND*0.5)	ng/kg	0.659	0.827	0.706	0.495	1.35	0.701	0.889	0.474	0.884	0.667	0.468	0.708	1.05	0.405	0.768
Total TEQ Dioxin 1998 (Bird) (ND=0)	ng/kg	0.113	2.2	1.93	0.0242	3.1	1.9	2.63	0.0155	2.11	2.63	1.59	0.032	3.2	0.0229	2.86
Total TEQ Dioxin 1998 (Bird) (ND=1)	ng/kg	3.62	2.44	3.08	2.95	3.38	2.14	3.82	3.59	2.43	3.67	2.3	3.63	5.01	1.37	4.03
Total TEQ Dioxin 1998 (Fish) (ND=0)	ng/kg	0.113	0.729	0.152	0.0242	1.23	0.591	0.336	0.0155	0.749	0.165	0.103	0.014	0.178	0.0229	0.165
Total TEQ Dioxin 1998 (Fish) (ND=1)	ng/kg	1.21	0.925	1.26	0.966	1.47	0.811	1.44	0.933	1.02	1.17	0.833	1.4	1.92	0.787	1.37
Total TEQ Dioxin Texas TEF (ND=0)	ng/kg	0.016	0.755	0.224	0	1.32	0.676	0.407	0	0.803	0.293	0.186	0.02	0.318	0.006	0.311
Total TEQ Dioxin Texas TEF (ND=0.5)	ng/kg	0.597	0.829	0.733	0.997	1.41	0.743	0.934	1.01	0.898	0.763	0.505	0.738	1.17	0.386	0.85
Total TEQ Dioxin Texas TEF (ND=1)	ng/kg	1.18	0.903	1.24	0.997	1.5	0.81	1.46	1.01	0.992	1.23	0.824	1.46	2.03	0.766	1.39
Total tetrachlorodibenzofuran (TCDF)	ng/kg	1	2.43	1.87	1.01	1.97	1.34	3.5	0.564 U	1.43	2.6	1.68	1.21	4.57	0.585 U	4.15
Total tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.619 U	0.605 U	0.594 U	0.618 U	1.12	0.57 U	0.559 U	0.564 U	0.66	0.567 U	1.01	0.595 U	0.746 U	0.585 U	0.572 U
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	ng/kg	0.384	0.887	0.301	0.07	1.38	0.822	0.781	0.0714	0.88	0.416	0.297	0.0705	0.393	0.0743	0.398
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	ng/kg	0.988	0.98	0.812	0.592	1.5	0.897	1.32	0.585	0.995	0.896	0.64	0.801	1.26	0.471	0.962
Total WHO Dioxin TEQ(Human/Mammal)(ND=1)	ng/kg	1.59	1.07	1.32	1.11	1.62	0.972	1.85	1.1	1.11	1.38	0.983	1.53	2.13	0.869	1.53
Asbestos																
Asbestos	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs																
Aroclor (unspecified)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1262 (PCB-1262)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1268 (PCB-1268)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (7)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0.5)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Total Petroleum Hydrocarbons	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C12-C28)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C25-C36) ORO	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C28-C35)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
General Chemistry																
Cyanide (total)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flash point (closed cup)	Deg C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent solids	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reactive cyanide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total solids	%	79.9	77.8	81.2	75.3	84.1	81.8	87.6	85.8	82.1	83	80.3	81.8	83.2	83	81.6

Notes:
ng/kg - nanograms per kilogram
ug/kg - microgram per kilogram
pg/kg - picogram per kilogram
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
Dup - indicates the result from a duplicate sample
-- Data not available

Table 2-1

First Phase Pre-Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits	Northern Impoundment - Waste Pits
Sample Location:		SJSB035	SJSB036	SJSB036	SJSB036	SJSB036	SJSB036	SJSB037	SJSB037	SJSB037	SJSB037	SJSB037	SJSB038	SJSB038	SJSB038	SJSB038
Sample Identification:		SL0536	SL0559	SL0560	SL0556	SL0557	SL0558	SL0552	SL0549	SL0550	SL0551	SL0553	SL0590	SL0591	SL0592	SL0593
Sample Date:		11/11/2018	11/16/2018	11/16/2018	11/16/2018	11/16/2018	11/16/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/16/2018	12/9/2018	12/9/2018	12/9/2018	12/9/2018
Sample Type:																
Sample Depth:		(16-18) ft bgs	(3.5-4.5) ft bgs	(6-8) ft bgs	(10-11) ft bgs	(11-12) ft bgs	(12-13) ft bgs	(6.3-8) ft bgs	(10-11) ft bgs	(11-12) ft bgs	(12-13) ft bgs	(4-5.8) ft bgs	(8-9) ft bgs	(9-10) ft bgs	(10-11) ft bgs	(11-12) ft bgs
Integral Sample ID:		SJSB035-C9	SJSB036-C2	SJSB036-C3	SJSB036-C11	SJSB036-C12	SJSB036-C13	SJSB037-C2	SJSB037-C11	SJSB037-C12	SJSB037-C13	SJSB037-C3	SJSB038-C6	SJSB038-C7	SJSB038-C8	SJSB038-C9
Dioxins/Furans																
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ng/kg	1.06 U	369	18.4	38.6	0.403 J	2.9 J	1.6 J	14.8	0.841 J	0.769 J	384	1720	2.56 U	2.13 U	1.63 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ng/kg	127	5460	357	106 Dup 433	21.1 Dup 86.3	46.2 Dup 221	800	545	163	153	5550	1730	675	793	987
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.165 U	654	9.65	22.2 Dup 68.8	0.35 U Dup 0.551 U	4.51 Dup 1.1 J	0.31 U	22.6	0.53 J	0.445 UJ	741	3430	5.46	3.3 J	0.33 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	5.25	188	8.23	11.1 Dup 2.78 J	0.6 J Dup 2.2 J	5.54 Dup 1.43 J	10.7	15.2	5.21	6.19	182	97.8	19.4	20.8	25.7
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ng/kg	0.0912 U	240	3.05 U	8.56 Dup 33.1	0.14 J Dup 0.244 U	1.45 U Dup 0.389 J	2.8 U	9.89	3.26 U	3.01 U	265	972	1.63 U	0.97 J	0.133 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.0663 U	2540	29.7	160 Dup 57.2	0.543 J Dup 2.16 J	3.56 Dup 17.3	2.8 U	72.5	0.33 J	0.77 U	2580	10500	15.5	7.77	0.23 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	2.96 U	1.97 J	0.135 U	0.0911 U Dup 2.97 U	0.104 U Dup 0.0689 U	0.0435 U Dup 0.19 J	0.155 U	0.4 J	3.26 U	3.01 U	2.12 U	2.6 U	0.44 J	0.49 J	0.408 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	2.96 U	596	7.44	14.1 Dup 28.1	0.141 U Dup 0.428 U	0.801 J Dup 3.97 U	2.8 U	16.5	0.0895 U	0.3 J	628	2590	4.04	2.37 J	0.124 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.255 U	12.1	0.4 J	0.174 J Dup 0.494 U	0.0765 U Dup 0.0997 U	0.288 U Dup 0.0911 U	0.202 U	0.612 U	0.3 J	3.01 U	11.2	9.86 U	0.692 U	0.71 J	0.668 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ng/kg	0.07 J	195	2.62 J	4.05 Dup 3.93	0.123 U Dup 0.0568 U	0.307 U Dup 1.18 J	2.8 U	4.45 U	3.26 U	3.01 U	184	611	1.18 U	0.82 J	0.123 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	0.33 U	3.91 J	0.442 U	0.197 U Dup 0.47 J	0.0709 U Dup 0.141 U	0.4 J Dup 0.137 U	0.393 U	0.71 J	0.274 U	0.259 U	4.82	5.44	1.09 J	1.04 J	1.32 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	2.96 U	1510	14.2	25.8 Dup 8.58	1.22 J Dup 0.212 U	1.62 J Dup 10.5	0.088 U	24.3	3.26 U	0.444 U	1430	2660	11.5	6.03	0.23 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	2.96 U	129	1.6 J	2.57 J Dup 0.876 J	0.11 U Dup 0.27 J	0.221 J Dup 1.28 J	0.115 U	3.02	3.26 U	3.01 U	118	284	2.68 J	1.36 U	0.54 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ng/kg	2.96 U	112	1.19 U	1.92 J Dup 2.38 J	0.139 U Dup 0.176 J	0.134 U Dup 0.683 U	2.8 U	2.86 J	3.26 U	0.0877 U	120	631	0.92 J	0.538 U	0.0816 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ng/kg	2.96 U	1240	12.5	22.8 Dup 6.91	0.37 U Dup 0.79 J	9.83 Dup 1.65 J	2.8 U	21	0.174 U	0.314 U	1130	2120	12.2	6.5	0.14 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ng/kg	0.24 J	62400	591	1240 Dup 217	33.2 Dup 5.51	358 Dup 51.7	1.35	2330	3.83	20.9	45500	136000	1210	313	4.88
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	0.592 U	43400	207	88 Dup 376	14.8 Dup 2.43	146 Dup 20.9	0.559 U	365	1.93	9.1	35000	80600	234	116	2.87
Octachlorodibenzofuran (OCDF) 13C12	ng/kg	1.06 U	369	18.4	14 Dup 38.6	0.4 J Dup 0.523 U	2.9 J Dup 0.881 U	1.6 J	14.8	0.84 J	0.76 J	384	1720	2.56 U	2.13 U	1.63 U
Total dioxin/furan	pg/g	133	119000	1260	2230 Dup 765	30.5 Dup 141	779 Dup 130	814	3440	176	190	93800	244000	2190	1270	1020
Total dioxin/furan (ND*0.5)	pg/g	134	119000	1260	2230 Dup 765	31.5 Dup 142	782 Dup 130	815	3450	177	192	93800	244000	2200	1270	1020
Total dioxin/furan (ND*1)	pg/g	135	119000	1260	2230 Dup 765	32.5 Dup 143	785 Dup 131	816	3450	177	193	93800	244000	2200	1280	1030
Total heptachlorodibenzofuran (HpCDF)	ng/kg	0.17 J	1180	13.6	118 Dup 36.6	2.77 U Dup 0.14 J	6.31 Dup 1.98 J	0.17 J	40	0.96 J	0.41 J	1250	5270	5.52	5.52	0.55 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	ng/kg	20.6	467	27.6	9.41 Dup 36.2	10.3 Dup 2.86 J	4.76 Dup 14.1	32.6	47.4	17.3	17.6	438	227	60.5	73.4	88.9
Total hexachlorodibenzofuran (HxCDF)	ng/kg	0.23 J	3740	42.3	194 Dup 83.1	2.16 J Dup 0.838 J	4.53 Dup 18.5	2.8 U	99.2	0.52 J	0.47 J	3780	11600	22.2	11.1	0.23 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	ng/kg	5.25	55.4	4.77	5.18 Dup 1.5 J	4.15 Dup 0.879 J	5.93 Dup 1.11 J	3.29	9.69	3.12 J	1.71 J	79.5	56.6	19	25.2	33.6
Total pentachlorodibenzofuran (PeCDF)	ng/kg	2.96 U	4080	40	23.6 Dup 72.7	0.37 J Dup 2.52 J	4.03 Dup 25.3	2.8 U	65.5	3.26 U	3.01 U	3760	7320	34.4	16.2	0.23 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	ng/kg	1.19 J	142	1.91 J	3.06 Dup 1.03 J	0.71 J Dup 0.0937 U	0.221 J Dup 1.28 J	0.17 J	3.02	0.12 J	3.01 U	131	323	4.27	1.32 J	4.88
Total TEQ 1998 (Avian) (ND*0.5)	ng/kg	0.676	108000	818	1650 Dup 334	8.28 Dup 49.5	75.1 Dup 518	1.84	2730	5.99	30.4	82300	221000	1460	438	8.7
Total TEQ 1998 (Fish) (ND*0.5)	ng/kg	0.426	47700	249	461 Dup 124	2.96 Dup 17.5	173 Dup 25.1	0.559	506	2.33	10.4	38400	90400	306	137	3.98
Total TEQ Dioxin 1998 (Bird) (ND=0)	ng/kg	0.265	108000	818	334 Dup 1650	8.02 Dup 49.4	518 Dup 75.1	1.44	2730	5.82	30.1	82300	221000	1460	437	8.6
Total TEQ Dioxin 1998 (Bird) (ND=1)	ng/kg	1.09	108000	818	334 Dup 1650	49.5 Dup 8.55	519 Dup 75.2	2.24	2730	6.17	30.7	82300	221000	1460	439	8.8
Total TEQ Dioxin 1998 (Fish) (ND=0)	ng/kg	0.0369	47700	249	124 Dup 461	2.78 Dup 17.4	25.1 Dup 173	0.156	506	2.19	10.2	38400	90400	306	137	3.83
Total TEQ Dioxin 1998 (Fish) (ND=1)	ng/kg	0.815	47700	249	462 Dup 124	17.5 Dup 3.15	25.1 Dup 173	0.96	506	2.48	10.7	38400	90400	306	138	4.14
Total TEQ Dioxin Texas TEF (ND=0)	ng/kg	0.031	50700	278	133 Dup 522	3.05 Dup 18.9	27.5 Dup 190	0.135	621	2.38	11.2	40600	97000	365	152	3.79
Total TEQ Dioxin Texas TEF (ND=0.5)	ng/kg	0.409	50700	278	522 Dup 133	3.2 Dup 19	27.6 Dup 190	0.503	621	2.48	11.4	40600	97000	365	153	3.9
Total TEQ Dioxin Texas TEF (ND=1)	ng/kg	0.788	50700	278	522 Dup 133	19 Dup 3.34	190 Dup 27.6	0.871	621	2.58	11.6	40600	97000	365	153	4
Total tetrachlorodibenzofuran (TCDF)	ng/kg	0.24 J	80400	837	1570 Dup 404	58.2 Dup 9.42	638 Dup 96.7	1.88	1460	3.83	34.5	75800	159000	1220	566	3.3
Total tetrachlorodibenzo-p-dioxin (TCDD)	ng/kg	1.05	22900	230	99.4 Dup 416	2.43 Dup 18.1	23.5 Dup 164	0.559 U	401	3.1	9.1	21900	38000	257	127	4.19
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	ng/kg	0.122	50500	276	519 Dup 133	3.07 Dup 18.9	188 Dup 27.3	0.482	618	2.48	11.3	40400	96700	364	151	4.62
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	ng/kg	0.516	50500	276	519 Dup 133	3.2 Dup 19	27.3 Dup 189	0.873	618	2.59	11.5	40400	96700	364	152	4.71
Total WHO Dioxin TEQ(Human/Mammal)(ND=1)	ng/kg	0.911	50500	276	519 Dup 133	3.34 Dup 19	189 Dup 27.4	1.26	618	2.71	11.7	40400	96700	365	153	4.8
Asbestos																
Asbestos	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs																
Aroclor (unspecified)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1016 (PCB-1016)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1262 (PCB-1262)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor-1268 (PCB-1268)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (7)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs (ND*0.5)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Total Petroleum Hydrocarbons	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C12-C28)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C25-C36) ORO	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C28-C35)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
General Chemistry																
Cyanide (total)	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flash point (closed cup)	Deg C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent solids	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Reactive cyanide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total solids	%	79.5	58.8	80.5	79.2 Dup 79.3	83 Dup 82.5	80.4 Dup 78.9	83.7	79.2	74.6	75.8	54	47.3 Dup 47.3	71.1 Dup 71.1	63.3 Dup 63.3	70.3 Dup 70.3

Notes:
ng/kg - nanograms per kilogram
ug/kg - microgram per kilogram
pg/kg - picogram per kilogram
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
Dup - indicates the result from a duplicate sample
-- Data not available

Table 2-2

First Phase Pre-Design Investigation Waste Characterization Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Parameters	Area: / Sample Location: / Sample Identification: / Sample Date:			Northern Impoundment - East SJSB038 SL0594 12/18/2018	Northern Impoundment - West SJSB037 SL0547 11/15/18	Northern Impoundment - West SJSB036 SL0554 11/16/18
	Units	TCLP Regulatory Levels[1]	Method Detection Limits[2]	-	-	-
TCLP-Volatile Organic Compounds (VOCs)						
1,1-Dichloroethene	mg/L	0.7	0.00008	0.20 U	0.032 U	0.032 U
1,2-Dichloroethane	mg/L	0.5	0.00008	0.20 U	0.032 U	0.032 U
1,4-Dichlorobenzene	mg/L	7.5	0.00032	0.20 U	0.048 U	0.048 U
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	200.0	0.0019	8.0 U	0.76 U	0.76 U
Benzene	mg/L	0.5	0.000062	0.20 U	0.025 U	0.025 U
Carbon tetrachloride	mg/L	0.5	0.000096	0.20 U	0.039 U	0.039 U
Chlorobenzene	mg/L	100.0	0.00011	0.20 U	0.044 U	0.044 U
Chloroform (Trichloromethane)	mg/L	6.0	0.000072	0.20 U	0.029 U	0.029 U
Tetrachloroethene	mg/L	0.7	0.000099	0.20 U	0.040 U	0.040 U
Trichloroethene	mg/L	0.5	0.0001	0.20 U	0.040 U	0.040 U
Vinyl chloride	mg/L	0.2	0.000075	0.080 U	0.030 U	0.030 U
TCLP-Semi-Volatile Organic Compounds (SVOCs)						
2,4,5-Trichlorophenol	mg/L	400.0	0.000018	0.10 U	0.013 U	0.013 U
2,4,6-Trichlorophenol	mg/L	2.0	0.000014	0.10 U	0.011 U	0.0099 U
2,4-Dinitrotoluene	mg/L	0.13	0.00027	0.10 U	0.020 U	0.019 U
2-Methylphenol	mg/L	200.0	0.00033	0.10 U	0.013 U	0.013 U
4-Methylphenol	mg/L	200.0	0.00048	0.10 U	0.0070 U	0.0067 U
Hexachlorobenzene	mg/L	0.13	0.00063	0.10 U	0.014 U	0.014 U
Hexachlorobutadiene	mg/L	0.5	0.00029	0.10 U	0.0095 U	0.0091 U
Hexachloroethane	mg/L	3.0	0.00029	0.10 U	0.0071 U	0.0068 U
Nitrobenzene	mg/L	2.0	0.00057	0.10 U	0.012 U	0.012 U
Pentachlorophenol	mg/L	100.0	0.0024	0.25 U	0.016 U	0.016 U
Pyridine	mg/L	5.0	0.0075	0.50 U	0.38 U	0.36 U
TCLP-Pesticides						
Chlordane	mg/L	0.03	0.0001	0.0010 U	0.0010 U	0.0010 U
Endrin	mg/L	0.02	0.00000069	0.00010 U	0.00010 U	0.00010 U
gamma-BHC (lindane)	mg/L	0.3	0.00000036	0.00010 U	0.00010 U	0.00010 U
Heptachlor	mg/L	0.008	0.00000068	0.00010 U	0.00010 U	0.00010 U
Heptachlor epoxide	mg/L	0.04	0.00000084	0.00010 U	0.00010 U	0.00010 U
Methoxychlor	mg/L	10.0	0.0000001	0.00010 U	0.00010 U	0.00010 U
Toxaphene	mg/L	0.5	0.0002	0.0020 U	0.0020 U	0.0020 U
TCLP-Metals						
Arsenic	mg/L	5.0	0.005	0.020 U	0.021 J	0.020 U
Barium	mg/L	100.0	0.0006	0.9 J	1.6	1.4
Cadmium	mg/L	1.0	0.0005	0.050 U	0.002 J	0.001 J
Chromium	mg/L	5.0	0.0009	0.050 U	0.010 U	0.010 U
Lead	mg/L	5.0	0.005	0.050 U	0.015 U	0.015 U
Mercury	mg/L	0.2	0.00002	0.0010 U	0.0001 U	0.0001 U
Selenium	mg/L	1.0	0.009	0.10 U	0.02 U	0.02 J
Silver	mg/L	5.0	0.002	0.050 U	0.004 U	0.004 U
TCLP-Herbicides						
2,4,5-TP (Silvex)	mg/L	1.0	0.000036	0.020 U	0.030 U	0.029 U
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	10.0	0.000045	0.100 U	0.150 U	0.150 U
General Chemistry						
Flash point (closed cup)	°C	> 60	NA	> 110	> 110	> 110
Percent solids	%	NA	NA	45.9 J	67.1 J	70.0 J
pH, lab	s.u.	>2 or <12	NA	7.84	8.09 J	8.54 J
Reactive cyanide	mg/kg	NA	17.4	17 U	100 U	100 U
Reactive sulfide	mg/kg	NA	0.2	70 U	48 U	46 U
Sulfur	mg/kg	NA	0.46	---	---	---
Total Petroleum Hydrocarbons (TPH)						
Gasoline Range Organics (GRO)	mg/kg	>1500[3]	0.62	---	---	---
Diesel Range Organics (DRO)	mg/kg	>1500[3]	0.79	---	---	---
Residual Range Organics (RRO)	mg/kg	>1500[3]	2.9	---	---	---
Polychlorinated Biphenyls (PCBs)						
Aroclor 1016	mg/kg	NA	2.1	---	---	---
Aroclor 1221	mg/kg	NA	2.1	---	---	---
Aroclor 1232	mg/kg	NA	2.1	---	---	---
Aroclor 1242	mg/kg	NA	2.1	---	---	---
Aroclor 1248	mg/kg	NA	2.1	---	---	---
Aroclor 1254	mg/kg	NA	2.1	---	---	---
Aroclor 1260	mg/kg	NA	2.1	---	---	---
Aroclor 1262	mg/kg	NA	2.1	---	---	---
Aroclor 1268	mg/kg	NA	2.1	---	---	---

Notes:

TCLP - Toxicity Characteristic Leaching Procedure
mg/L - milligrams per Liter
ug/L - microgram per Liter
mg/kg - milligram per kilogram
Deg C - Degrees in Celsius
TCLP - Toxicity Characteristic Leaching Procedure
NA - Not Applicable
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
--- - Not analyzed

[1] - TCLP Regulatory Levels from the *Guidelines for the Classification and Coding of Industrial and Hazardous Wastes*, November 2014, and Table 1 - Maximum Concentrations.

[2] - Method Detection Limits were taken from *Table 9 Analyte, Method Reporting Limits, and Method Detection Limits for Waste Characterization Samples* from the First Phase Pre-Design Investigation Report.

[3] - TPH Regulatory Standard is a Total value, not a TCLP.

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB045 11187072-090719-SS-SJSB045-S- (8-10) 9/7/2019 (8-10) ft bgs	SJSB045 11187072-090719-SS-SJSB045-S- (10-12) 9/7/2019 (10-12) ft bgs	SJSB045 11187072-090719-SS-SJSB045-S- (12-14) 9/7/2019 (12-14) ft bgs	SJSB045 11187072-090719-SS-SJSB045-S- (14-16) 9/7/2019 (14-16) ft bgs	SJSB045 11187072-090719-SS-SJSB045-S- (16-18) 9/7/2019 (16-18) ft bgs	SJSB045 11187072-091119-SS-SJSB045-S (0-2) 9/11/2019 (0-2) ft bgs	SJSB045 11187072-091119-SS-DUP-2 9/11/2019 (2-4) ft bgs Duplicate
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.6 J	0.28 U	0.30 U	1.4 J	0.93 J	1.8 J	0.87 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	350	240	950	1900	350 J	410	230
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.57 J	0.37 U	0.38 U	0.44 U	0.37 U	0.26 U	0.23 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11	6.9	33	70	11	10	6.1 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.2 J	0.52 J	0.81 J	0.95 J	0.67 J	1.3 U	0.93 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.37 J	0.19 U	0.22 U	0.25 J	0.27 J	0.53 J	0.38 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.53 J	0.25 U	0.43 U	0.76 U	0.31 U	0.26 U	0.22 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.32 J	0.20 U	0.23 U	0.22 U	0.20 U	0.27 J	0.26 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.57 J	0.24 U	0.44 U	0.80 U	0.31 U	0.27 U	0.22 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	2.3 U	1.6 U	1.7 U	1.8 U	1.7 U	1.9 U	1.9 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.80 J	0.67 J	1.3 J	3.2 J	0.77 J	0.62 J	0.21 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.36 U	0.29 U	0.37 U	0.39 U	0.44 J	0.85 U	0.54 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.49 U	0.36 U	0.61 U	0.51 U	0.46 U	0.37 U	0.36 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.26 J	0.15 U	0.18 U	0.17 U	0.15 U	0.17 U	0.15 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.39 U	0.33 U	0.39 U	0.42 U	0.36 U	0.34 U	0.27 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	7.1	0.32 J	1.0 J	0.97 J	13 J	31	16
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.6	0.21 U	0.27 U	0.25 U	2.9	6.4	3.1
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.8 J	0.52 J	0.81 J	0.95 J	0.67 J	1.3 J	0.93 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	36 J	29 J	110 J	250 J	41 J	44 J	22 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	4.4 J	3.0 J	2.1 J	3.6 J	3.0 J	3.4 J	3.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.8 J	7.0 J	20 J	47 J	8.2 J	9.8 J	4.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.42 U	0.34 U	0.45 U	0.46 U	0.44 J	0.85 J	0.54 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.64 J	0.55 J	1.9 J	7.9 J	0.66 J	0.37 U	0.36 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	9.0 J	0.32 J	1.6 J	1.9 J	16 J	47 J	25 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.1 J	0.21 U	1.4 J	4.2 J	3.5 J	6.8 J	3.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.83	0.245	0.853	1.72	4.54	9.87	4.89
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.25	0.717	1.52	2.36	4.96	10.3	5.26

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB045 11187072-091119-SS-SJSB045-S (2-4) 9/11/2019 (2-4) ft bgs	SJSB045 11187072-091119-SS-SJSB045-S (4-6) 9/11/2019 (4-6) ft bgs	SJSB045 11187072-091119-SS-DUP-3 9/11/2019 (6-8) ft bgs Duplicate	SJSB045 11187072-091119-SS-SJSB045-S (6-8) 9/11/2019 (6-8) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (0-2) 11/9/2019 (0-2) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (2-4) 11/9/2019 (2-4) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (4-6) 11/9/2019 (4-6) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.29 U	0.89 J	0.38 U	0.28 U	9.7 J	7.4 J	11 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	120	170	350	740	360	250	1000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.25 U	0.26 U	0.27 U	0.19 U	7.6	5.6	9.8
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3.3 J	5.3 J	11	23	13	10	34
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.79 U	1.1 U	0.99 U	0.95 U	3.3 J	2.0 J	3.3 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.27 J	0.21 U	0.20 U	0.37 J	27	17	27
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.22 U	0.25 U	0.24 U	0.47 J	0.26 J	0.15 J	0.62 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.18 U	0.34 J	0.21 U	0.16 U	6.8	3.8 J	7.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.23 U	0.26 U	0.25 U	0.49 J	0.38 J	0.31 J	0.84 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 U	2.2 U	1.9 U	1.9 U	0.64 J	0.37 J	0.52 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.21 U	0.24 U	0.70 J	1.0 J	0.62 J	0.44 J	1.9 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.29 U	0.28 U	0.32 U	0.21 U	17	10	17
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.31 U	0.44 U	0.36 U	0.32 U	2.0 J	1.2 J	2.5 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.14 U	0.17 U	0.16 U	0.12 U	0.75 J	0.46 J	0.94 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.31 U	0.31 U	0.34 U	0.22 U	13	9.2	13
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	8.9	18	12 J	2.8 J	760	530	740
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.1	3.2	3.0	0.88 J	200	130	200
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.79 J	1.1 J	0.99 J	0.95 J	14 J	9.9 J	16 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	12 J	18 J	35 J	63 J	40 J	30 J	97 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	3.3 J	2.5 J	2.9 J	42 J	26 J	42 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	4.0 J	6.9 J	11 J	9.1 J	6.8 J	20 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.31 U	0.31 U	0.34 U	0.27 U	52 J	34 J	53 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.31 U	0.44 U	0.36 U	0.32 U	3.7 J	1.5 J	3.2 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	12 J	33 J	18 J	4.0 J	1600 J	1100 J	1500 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.1 J	3.2 J	3.5 J	1.5 J	220 J	150 J	220 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3.09	5.14	4.49	1.85	286	190	286
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.42	5.58	4.88	2.16	286	190	286

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (6-8) 11/9/2019 (6-8) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (8-10) 11/9/2019 (8-10) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (10-12) 11/9/2019 (10-12) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (12-14) 11/9/2019 (12-14) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (14-16) 11/9/2019 (14-16) ft bgs	SJSB045-C1 11187072-11719-KW-SJSB045-C1-S (16-18) 11/9/2019 (16-18) ft bgs
Dioxins/Furans							
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.4 U	2.4 U	1.6 U	0.20 U	0.83 U	0.25 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1200	590	1600	2400	2900	3400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.6 J	1.6 J	1.5 J	0.072 U	0.46 U	0.087 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	40	21	64	100	110	130
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.50 J	0.56 J	0.32 U	0.033 U	0.24 U	0.040 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.1 J	5.4 J	3.6 J	0.059 U	1.6 J	0.17 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.46 J	0.31 J	0.67 J	1.4 J	1.1 J	1.3 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.94 J	1.3 J	0.89 J	0.056 U	0.45 J	0.091 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.80 J	0.38 J	1.6 J	3.0 J	2.2 J	3.3 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.096 U	0.15 J	0.16 U	0.077 U	0.14 U	0.096 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	1.0 J	2.9 J	5.1 J	5.2 J	6.5 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.4 J	4.1 J	2.3 J	0.094 J	0.84 J	0.17 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.51 J	0.32 J	0.58 J	0.37 J	0.46 J	0.58 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.079 U	0.17 J	0.13 U	0.064 U	0.11 U	0.078 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.1 J	2.9 J	2.2 J	0.030 U	0.89 J	0.098 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	130	110	150	1.6	56	4.3
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	31	41	32	0.56 J	13	1.3 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	2.8 J	2.8 J	2.2 J	0.15 J	0.93 J	0.17 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	100 J	69 J	200 J	300 J	330 J	380 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	5.5 J	8.3 J	4.9 J	0.077 U	2.1 J	0.26 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	20 J	16 J	48 J	72 J	82 J	93 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	7.8 J	10 J	7.2 J	0.19 J	2.9 J	0.26 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.3 J	2.2 J	6.6 J	12 J	14 J	17 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	230 J	330 J	270 J	5.2 J	100 J	9.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	36 J	47 J	39 J	7.0 J	23 J	12 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	46.8	54.6	50.4	3.76	22.4	5.80
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	46.8	54.6	50.4	3.79	22.4	5.81

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB046 11187072-100719-SS-SJSB046 (0-2) 10/7/2019 (0-2) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (2-4) 10/7/2019 (2-4) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (4-6) 10/7/2019 (4-6) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (6-8) 10/7/2019 (6-8) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (8-10) 10/7/2019 (8-10) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (10-12) 10/7/2019 (10-12) ft bgs	SJSB046 11187072-100719-DUP-6 10/7/2019 (12-14) ft bgs Duplicate
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	9.7 J	98	470	780	410	6.4 J	290
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	400	3800	4900	2900	5100	800	3300
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	8.7	78	240	1800	180	3.5 J	130
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	22	130	190	190 J	210	29	120
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	2.4 J	23	85	660	61	1.7 J	38
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	31	210	820	5700	600	12	340
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.44 U	1.9 J	2.7 J	4.5 U	3.1 J	0.67 U	1.6 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	7.8	54	210	1400	150	3.1 J	87
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.80 J	3.7 J	7.2 J	13 J	7.4 J	0.79 J	4.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.53 J	3.5 J	14	76 J	11	0.44 J	5.8 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.76 J	4.8 J	7.1 J	7.5 J	7.1 J	1.8 J	4.0 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	28	160	590	2800	450	7.6	230
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.4 J	17	62	200 J	46	0.94 J	23
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.2 J	6.6 J	24	140 J	18	0.61 J	10
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	25	110	380	1500	290	4.4 J	140
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2600	8700	19000	30000	18000	310	8500
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	360	1700	6400	24000 J	4900	75	2400
Total heptachlorodibenzofuran (HpCDF)	pg/g	15 J	130 J	410 J	2800 J	310 J	6.5 J	210 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	63 J	380 J	520 J	470 J	590 J	110 J	330 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	48 J	320 J	1200 J	8300 J	920 J	19 J	520 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	13 J	68 J	92 J	90 J	100 J	30 J	56 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	88 J	450 J	1600 J	6800 J	1200 J	19 J	600 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.2 J	30 J	83 J	230 J	67 J	7.7 J	34 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	4100 J	14000 J	41000 J	140000 J	31000 J	490 J	15000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	420 J	1900 J	7000 J	27000 J	5300 J	84 J	2600 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	636	2660	8610	28500	6930	111	3370
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	636	2660	8610	28500	6930	111	3370

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB046 11187072-100719-SS-SJSB046 (12-14) 10/7/2019 (12-14) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (14-16) 10/7/2019 (14-16) ft bgs	SJSB046 11187072-100719-SS-SJSB046 (16-18) 10/7/2019 (16-18) ft bgs	SJSB046 11187072-111119-KW-SJSB046-S(18-20) 11/11/2019 (18-20) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(0-2) 12/9/2019 (0-2) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(2-4) 12/9/2019 (2-4) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(4-6) 12/9/2019 (4-6) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	320	270	230	1.9 J	30	45	65
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2000	1800	2500	1800	1000 J	1600 J	1900 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	110	59	98	0.44 U	26	54	55
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	74	63	95	76	38	49	69
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	35	18	31	0.17 U	8.1	16	17
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	360	170	310	0.35 U	100	200	180
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	0.99 U	1.3 J	1.3 U	0.66 U	0.97 J	1.2 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	91	41	77	0.34 U	25	48	45
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.9 J	2.2 J	3.2 J	2.2 J	1.2 J	1.7 J	2.4 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	6.1 J	2.6 J	5.0 J	0.39 J	1.7 J	2.9 J	3.0 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.8 J	2.4 J	3.5 J	4.0 J	1.2 J	1.9 J	2.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	260	110	220	0.59 U	85	170	150
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	22	11	22	0.44 J	7.4	18	14
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	12	4.9 J	9.1	0.24 U	3.2 J	5.7 J	5.4 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	150	70	140	0.28 J	61	130	110
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	7900	4500	8900	9.1	5100	8600	8400
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2500	1200	2400	2.6 U	1000	2400	1900
Total heptachlorodibenzofuran (HpCDF)	pg/g	180 J	97 J	160 J	0.44 J	44 J	84 J	96 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	200 J	180 J	260 J	220 J	130 J	150 J	200 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	540 J	250 J	460 J	0.39 J	150 J	280 J	270 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	40 J	37 J	48 J	54 J	21 J	29 J	38 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	660 J	300 J	580 J	0.88 J	240 J	480 J	420 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	30 J	17 J	31 J	11 J	12 J	24 J	23 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	14000 J	7300 J	15000 J	15 J	11000 J	25000 J	19000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2600 J	1200 J	2500 J	8.8 J	1100 J	2700 J	2200 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3420	1710	3400	3.39	1550	3350	2820
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3420	1710	3400	4.82	1550	3350	2820

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB046-C1 11187072-120919-BN-SJSB046-C1(6-8) 12/9/2019 (6-8) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(8-10) 12/9/2019 (8-10) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(10-12) 12/9/2019 (10-12) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(12-14) 12/9/2019 (12-14) ft bgs	SJSB046-C1 11187072-120919-BN-SJSB046-C1(14-16) 12/9/2019 (14-16) ft bgs	SJSB046-C1 11187072-120919-BN-DUP3 12/9/2019 (16-18) ft bgs Duplicate	SJSB046-C1 11187072-120919-BN-SJSB046-C1(16-18) 12/9/2019 (16-18) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	370	270	2.6 U	50	4.9 U	180	93
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2400 J	2100 J	1200 J	1800 J	1600 J	4100 J	1600 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	290	540	1.5 J	60	3.2 J	120	160
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130	120	41	72	68	150	67
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	120	180	0.56 J	24	1.4 J	38	45
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1400	2000	4.7 J	180	10	390	470
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.4 J	2.3 J	0.64 U	3.5 J	0.93 U	2.0 J	1.1 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	390	510	1.6 J	46	3.1 J	94	120
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	6.2 J	6.6 J	0.92 J	4.6 J	2.0 J	4.7 J	2.8 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	25	34	0.28 U	6.2 J	0.56 U	5.6 J	7.8
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.6 J	4.6 J	2.2 J	6.3 J	3.7 J	4.6 J	2.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1100	1400	3.7 J	140	9.5	280	340
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	70	89	0.48 J	13	1.3 J	25	39
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	46	56	0.24 J	7.4 J	0.59 J	11	13
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	590	710	2.3 J	93	7.3 J	180	240
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	21000	13000	160	5600	680	8400	12000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9100	13000	36	1600	130	3000	4300
Total heptachlorodibenzofuran (HpCDF)	pg/g	500 J	850 J	2.8 J	98 J	5.8 J	210 J	240 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	350 J	250 J	140 J	210 J	190 J	420 J	170 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2200 J	2900 J	7.2 J	270 J	17 J	570 J	680 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	77 J	56 J	37 J	60 J	49 J	71 J	34 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2700 J	3300 J	9.4 J	370 J	28 J	710 J	910 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	89 J	100 J	6.6 J	20 J	9.7 J	35 J	84 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	70000 J	74000 J	270 J	12000 J	1300 J	24000 J	35000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9900 J	15000 J	43 J	1800 J	150 J	3300 J	4800 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	11700	14900	55.0	2230	205	3980	5690
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	11700	14900	55.1	2230	205	3980	5690

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB047 11187072-100919-SS-SJSB047(8-10) 10/9/2019 (8-10) ft bgs	SJSB047 11187072-100919-SS-SJSB047(10-12) 10/9/2019 (10-12) ft bgs	SJSB047 11187072-100919-SS-SJSB047(12-14) 10/9/2019 (12-14) ft bgs	SJSB047 11187072-100919-SS-SJSB047(14-16) 10/9/2019 (14-16) ft bgs	SJSB047 11187072-100919-SS-SJSB047(16-18) 10/9/2019 (16-18) ft bgs	SJSB047 11187072-101019-SS-SJSB047(0-2) 10/10/2019 (0-2) ft bgs	SJSB047 11187072-101019-SS-SJSB047(2-4) 10/10/2019 (2-4) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.83 U	1.4 U	1.5 U	0.33 U	0.29 U	2.5 U	0.91 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1700	930	1000	1400	1100	500	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.29 U	0.22 U	0.65 J	0.27 U	0.29 U	0.57 J	0.17 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	49	34	48	65	46	22	43
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.052 U	0.22 J	0.33 U	0.29 U	0.34 U	0.13 J	0.16 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 J	0.084 U	0.24 U	0.21 U	0.25 U	0.11 J	0.098 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.62 U	0.60 U	0.75 U	0.70 U	0.82 U	0.38 J	0.47 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 J	0.083 U	0.26 U	0.22 U	0.27 U	0.064 U	0.11 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	0.81 J	1.3 J	1.5 J	1.2 J	0.65 J	0.95 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.19 J	0.21 J	0.23 J	0.11 U	0.27 J	0.13 J	0.24 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6 J	1.8 J	3.0 J	3.2 J	2.7 J	1.6 J	2.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.17 J	0.070 U	0.23 U	0.20 U	0.18 U	0.054 U	0.043 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.25 J	0.20 J	0.36 U	0.38 U	0.39 U	0.11 U	0.097 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.059 U	0.066 U	0.16 U	0.14 U	0.16 U	0.048 U	0.094 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.067 U	0.077 U	0.24 U	0.22 U	0.19 U	0.056 U	0.043 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.42 J	0.31 J	0.27 J	0.13 U	0.20 J	1.0 J	0.27 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.27 J	0.22 J	0.27 U	0.28 U	0.28 U	0.36 J	0.10 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.29 J	0.44 J	0.65 J	0.29 U	0.34 U	1.6 J	0.52 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	210 J	120 J	160 J	200 J	160 J	85 J	150 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.48 J	0.28 J	0.23 J	0.22 U	0.27 J	0.24 J	0.55 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	47 J	30 J	43 J	47 J	45 J	17 J	35 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.31 J	0.10 U	0.24 U	0.22 U	0.20 U	0.066 U	0.053 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.9 J	5.6 J	9.5 J	7.6 J	9.3 J	1.9 J	6.6 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.0 J	1.1 J	0.96 J	0.50 J	0.82 J	1.8 J	0.93 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.0 J	2.9 J	5.1 J	4.3 J	5.2 J	2.0 J	4.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.99	1.35	1.27	1.54	1.23	1.12	1.30
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.03	1.41	1.69	1.98	1.67	1.19	1.35

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB047 11187072-101019-SS-SJSB047(4-6) 10/10/2019 (4-6) ft bgs	SJSB047 11187072-101019-SS-SJSB047(6-8) 10/10/2019 (6-8) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(0-2) 10/17/2019 (0-2) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(2-4) 10/17/2019 (2-4) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(4-6) 10/17/2019 (4-6) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(6-8) 10/17/2019 (6-8) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(8-10) 10/17/2019 (8-10) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.48 U	27	390	410	5.5 J	1.8 U	45
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	830	2300	4300	2400	1300	1200	1200
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.14 J	3.5 J	190	150	3.6 J	0.83 J	25
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	27	79	190	110	50	53	44
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.15 J	0.33 J	63	52	1.2 J	0.27 J	7.3
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.085 J	0.067 U	690	530	11	1.8 J	75
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.50 J	0.86 J	3.4 J	2.1 J	0.79 U	0.71 U	0.62 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.075 J	0.16 J	180	140	3.1 J	0.57 J	19
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.60 J	1.6 J	7.6 J	5.4 J	1.2 J	1.4 J	1.2 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.18 J	0.15 J	11	8.8 J	0.26 J	0.18 J	1.2 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	3.6 J	7.3 J	5.4 J	2.7 J	3.1 J	1.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.14 J	0.064 U	510	400	8.2 J	1.8 J	51
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.18 J	0.30 J	58	49	1.3 J	0.26 U	6.3 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.063 J	0.055 U	20	16	0.43 J	0.095 U	2.2 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.047 U	0.066 U	330	260	5.5 J	1.1 J	34
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.7	0.17 J	14000 J	13000	380	82	2000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.35 J	0.23 J	5800	4800	95	19	540
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.43 J	12 J	330 J	260 J	6.0 J	1.3 J	40 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	110 J	250 J	550 J	330 J	180 J	170 J	140 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.40 J	1.3 J	1000 J	780 J	17 J	2.7 J	110 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	28 J	52 J	95 J	70 J	43 J	48 J	28 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.14 J	0.080 U	1300 J	1000 J	22 J	4.1 J	130 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.8 J	11 J	64 J	54 J	10 J	12 J	10 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	3.2 J	0.93 J	39000 J	30000 J	630 J	130 J	3900 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.1 J	5.0 J	6300 J	5300 J	110 J	26 J	590 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.53	2.71	7470	6310	139	29.2	769
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.53	2.73	7470	6310	139	29.4	769

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(10-12) 10/17/2019 (10-12) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(12-14) 10/17/2019 (12-14) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(14-16) 10/17/2019 (14-16) ft bgs	SJSB047-C1 11187072-101719-SS-SJSB047-C1-(16-18) 10/17/2019 (16-18) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (0-2) 9/8/2019 (0-2) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (2-4) 9/8/2019 (2-4) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (4-6) 9/8/2019 (4-6) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	31	17	9.0 J	1.1 U	1.4 J	1.5 J	0.35 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1300	1100	930	1400	400	280	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	19	25	9.4	0.27 J	0.45 U	0.94 J	0.41 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	43	40	34	60	9.5	8.0	42
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	6.1 J	7.6	3.1 J	0.093 U	1.1 J	0.73 J	0.71 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	61	76	29	0.49 J	0.37 J	0.53 J	0.23 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.59 U	0.68 U	0.52 U	1.0 U	0.31 U	0.27 U	0.61 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	16	20	7.6	0.15 U	0.34 J	0.16 U	0.24 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.2 J	1.0 J	0.74 J	1.3 J	0.32 U	0.29 U	1.3 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.95 J	1.2 J	0.53 J	0.10 U	1.9 U	1.4 U	1.4 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	1.6 J	1.5 J	4.1 J	1.0 J	0.91 J	2.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	43	50	19	0.46 J	0.39 U	0.30 U	0.41 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.5 J	7.3	2.7 J	0.47 J	0.57 U	0.46 U	0.47 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.0 J	2.3 J	0.97 J	0.10 U	0.17 U	0.13 U	0.18 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	30	37	13	0.29 J	0.43 U	0.34 U	0.43 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1700	1900	950	16	1.7	1.8	0.26 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	490	600	220	3.5	0.64 J	0.24 U	0.26 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	32 J	39 J	15 J	0.27 J	1.1 J	2.2 J	0.71 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	140 J	120 J	100 J	220 J	33 J	27 J	120 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	91 J	110 J	42 J	0.49 J	4.2 J	3.5 J	2.0 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	31 J	25 J	22 J	55 J	6.9 J	6.2 J	21 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	120 J	140 J	51 J	0.95 J	0.51 U	0.34 U	0.43 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	10 J	11 J	6.5 J	13 J	0.57 U	0.46 U	2.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	3500 J	4300 J	1500 J	23 J	2.7 J	2.6 J	0.84 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	530 J	650 J	240 J	10 J	0.64 J	0.31 J	2.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	685	821	327	7.28	1.21	0.505	1.18
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	685	821	327	7.35	1.70	1.02	1.72

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB048 11187072-090819-SS-SJSB048-S- (6-8) 9/8/2019 (6-8) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (8-10) 9/8/2019 (8-10) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (10-12) 9/8/2019 (10-12) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (12-14) 9/8/2019 (12-14) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (14-16) 9/8/2019 (14-16) ft bgs	SJSB048 11187072-090819-SS-SJSB048-S- (16-18) 9/8/2019 (106-18) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (0-2) 11/7/2019 (0-2) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.3 J	1.2 J	0.34 U	1.2 J	0.31 U	1.3 J	7.9 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1800	1700	1200	1300	920	1900	780
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.75 J	0.45 U	0.41 U	0.40 U	0.62 J	0.38 U	16
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	74	66	44	45	36	69	35
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.51 U	0.79 J	0.69 J	0.41 U	0.45 U	0.55 J	5.4 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	0.22 U	0.22 U	0.17 U	0.21 U	0.25 U	53
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.77 J	0.86 J	0.60 J	0.63 J	0.56 J	0.83 J	0.40 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.22 U	0.24 U	0.24 U	0.18 U	0.23 U	0.27 U	13
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.7 J	1.7 J	1.2 J	1.0 J	0.93 J	1.6 J	1.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 U	2.0 U	1.3 U	0.90 U	1.3 U	1.4 U	1.1 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.4 J	3.5 J	2.4 J	2.1 J	2.2 J	3.6 J	1.9 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.38 U	0.43 U	0.36 U	0.35 U	0.38 U	0.38 U	35
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.55 U	0.63 U	0.49 U	0.48 U	0.58 U	0.58 U	5.4 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.18 U	0.18 U	0.19 U	0.14 U	0.18 U	0.20 U	1.8 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.42 U	0.46 U	0.39 U	0.36 U	0.41 U	0.42 U	30
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.17 U	0.42 J	0.16 U	0.59 J	0.65 J	0.62 J	1400
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.25 U	0.34 U	0.26 U	0.38 J	0.26 U	0.32 U	460
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.75 J	0.79 J	0.69 J	0.41 U	0.62 J	0.55 J	26 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	210 J	280 J	160 J	150 J	130 J	250 J	89 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.0 J	2.5 J	2.2 J	0.90 J	1.8 J	1.4 J	80 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	40 J	60 J	35 J	30 J	32 J	53 J	20 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.50 U	0.47 U	0.39 U	0.36 U	0.41 U	0.45 U	110 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.3 J	9.1 J	5.1 J	5.9 J	6.8 J	8.2 J	5.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.52 J	1.1 J	0.66 J	1.4 J	1.7 J	1.6 J	3300 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.8 J	2.6 J	3.9 J	3.7 J	4.7 J	5.8 J	510 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.87	1.83	1.23	1.65	1.08	1.93	623
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.46	2.52	1.77	2.03	1.66	2.56	623

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (2-4) 11/7/2019 (2-4) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (4-6) 11/7/2019 (4-6) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (6-8) 11/7/2019 (6-8) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (8-10) 11/7/2019 (8-10) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (10-12) 11/7/2019 (10-12) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (12-14) 11/7/2019 (12-14) ft bgs
Dioxins/Furans							
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.1 U	9.2 J	0.37 U	3.4 U	0.24 U	1.5 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	490	380	1300	150	2000	2200
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2.0 J	20	0.33 U	7.2	0.25 U	3.1 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	19	16	48	6.4	91	98
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.70 J	7.8	0.22 U	2.6 J	0.031 U	1.3 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.7 J	55	0.63 J	25	0.41 J	11
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.23 J	0.28 J	0.51 J	0.13 J	0.86 J	1.1 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 J	13	0.15 J	6.1	0.18 J	2.6 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.54 J	0.38 J	0.93 J	0.22 J	2.2 J	2.5 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 J	1.0 J	0.069 U	0.44 J	0.073 U	0.25 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	0.96 J	2.8 J	0.36 J	4.9 J	5.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3.5 J	33	0.26 J	16	0.31 J	6.8 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.59 J	5.3 J	0.24 J	2.8 J	0.33 J	1.4 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 J	1.6 J	0.058 U	0.86 J	0.062 U	0.35 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3.1 J	28	0.24 J	15	0.26 J	6.4 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	42	1400	5.5	820	6.6	390
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	48	430	2.7	230	2.9	100
Total heptachlorodibenzofuran (HpCDF)	pg/g	3.2 J	32 J	0.55 J	12 J	0.34 J	5.1 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	53 J	42 J	150 J	20 J	290 J	300 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	8.4 J	81 J	0.78 J	37 J	0.60 J	16 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	13 J	11 J	39 J	5.7 J	66 J	78 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	11 J	93 J	0.50 J	49 J	0.67 J	23 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.3 J	7.9 J	6.5 J	3.0 J	10 J	13 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	340 J	3000 J	21 J	1700 J	22 J	790 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	54 J	480 J	7.0 J	260 J	9.6 J	120 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	55.1	592	4.94	323	6.34	147
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	55.1	592	4.95	323	6.35	147

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (14-16) 11/7/2019 (14-16) ft bgs	SJSB048-C1 11187072-11719-KW-SJSB048-C1-S (16-18) 11/7/2019 (16-18) ft bgs	SJSB048-C1 1187072-120519-SS-SJSB048-C1(18-20) 12/5/2019 (18-20) ft bgs	SJSB048-C1 1187072-120519-SS-DUP-1 12/5/2019 (20-22) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (0-2) 9/11/2019 (0-2) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (2-4) 9/11/2019 (2-4) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (4-6) 9/11/2019 (4-6) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.5 U	2.3 U	2.5 U	1.9 U	490	240	82
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2600	710	1200 J	62	5200	3200	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	3.2 J	5.3 J	0.63 J	0.13 U	830	190	94
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	87	30	47	2.3 J	260	120	60
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.1 J	1.9 J	0.20 U	0.17 U	260	56	30
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	9.7	18	0.92 J	0.19 J	2400	550	240
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.86 J	0.30 J	0.86 J	0.32 J	3.2 J	1.7 J	0.94 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.4 J	4.3 J	0.44 J	0.14 J	680	150	65
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.9 J	0.67 J	1.3 J	0.27 J	14	4.6 J	1.7 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.30 J	0.39 J	0.55 J	0.28 J	43	10 U	5.6 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.9 J	1.3 J	4.0 J	0.42 J	7.7 J	4.3 J	2.5 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.6 J	11	0.20 U	0.11 U	1600	430	150
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.5 J	2.0 J	0.60 J	0.17 U	150	46	12 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.38 J	0.49 J	0.23 J	0.11 J	76	16	6.1 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.0 J	9.9	0.47 J	0.11 U	1100	330	100
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	400	510	25 J	1.9	27000 J	14000 J	5700 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	96	160	6.9	0.56 J	20000 J	5000 J	1700 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	5.1 J	8.6 J	0.63 J	0.17 U	1400 J	300 J	140 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	240 J	77 J	170 J	6.6 J	620 J	320 J	180 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	15 J	26 J	2.1 J	0.73 J	3600 J	820 J	350 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	54 J	19 J	47 J	2.9 J	110 J	61 J	33 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	22 J	36 J	0.47 J	0.12 U	4400 J	1200 J	380 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.9 J	3.0 J	7.9 J	0.17 U	160 J	61 J	14 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	750 J	1100 J	44 J	2.1 J	100000 J	35000 J	11000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	110 J	170 J	11 J	1.1 J	21000 J	5500 J	1800 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	143	219	11.8	0.965	23600	6640	2350
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	143	219	11.8	1.07	23600	6640	2350

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB049 11187072-091119-SS-SJSB049-S (6-8) 9/11/2019 (6-8) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (8-10) 9/11/2019 (8-10) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (10-12) 9/11/2019 (10-12) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (12-14) 9/11/2019 (12-14) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (14-16) 9/11/2019 (14-16) ft bgs	SJSB049 11187072-091119-SS-SJSB049-S (16-18) 9/11/2019 (16-18) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(0-2) 9/16/2019 (0-2) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	5.1 J	9.7 J	3.2 J	4.5 J	1.8 J	0.47 U	7.2 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1700	1600	1700	2600	2000	2000	2600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	3.0 J	6.6 J	2.2 J	2.8 J	0.49 U	0.37 U	1.1 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	64	59	75	99	75	77	91
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	2.9 U	3.6 U	2.5 U	3.0 U	1.5 U	1.6 U	0.42 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	8.1	18	6.5 J	8.4	1.7 J	0.24 U	0.27 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.57 J	0.62 J	1.0 J	1.0 J	1.4 J	0.83 J	1.1 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.4 J	4.6 J	2.1 J	2.6 J	0.67 J	0.25 U	0.27 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.4 J	2.0 J	2.3 J	2.2 J	1.5 J	2.5 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	3.6 U	3.1 U	2.4 U	3.5 U	2.8 U	3.2 U	0.70 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.8 J	2.6 J	4.1 J	5.5 J	6.3 J	5.0 J	4.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.4 J	14	5.8 J	7.4 J	1.9 J	0.39 U	0.38 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.1 J	1.6 J	1.1 J	0.89 J	0.52 U	0.60 U	0.47 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.22 U	0.63 J	0.19 U	0.48 J	0.18 U	0.20 U	0.21 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	4.2 J	9.4	4.1 J	4.5 J	1.1 J	0.41 U	0.42 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	320	720 J	330	340	77	11 J	11
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	73	170	74	77	17	2.1 J	3.4
Total heptachlorodibenzofuran (HpCDF)	pg/g	5.9 J	12 J	4.7 J	7.0 J	1.5 J	1.6 J	1.1 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	190 J	190 J	220 J	290 J	260 J	240 J	220 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	18 J	31 J	13 J	18 J	6.5 J	4.7 J	0.70 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	39 J	42 J	58 J	68 J	67 J	62 J	44 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	17 J	37 J	16 J	19 J	2.9 J	0.41 U	0.42 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.3 J	7.9 J	15 J	10 J	5.5 J	9.6 J	6.1 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	520 J	1200 J	530 J	530 J	110 J	17 J	13 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	80 J	190 J	84 J	88 J	22 J	7.5 J	6.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	110	251	112	117	27.7	5.30	7.03
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	110	251	112	117	28.1	5.87	7.41

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB050 11187072-091619-SS-DUP-5 9/16/2019 (2-4) ft bgs Duplicate	SJSB050 11187072-091619-SS-SJSB050-(2-4) 9/16/2019 (2-4) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(4-6) 9/16/2019 (4-6) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(6-8) 9/16/2019 (6-8) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(8-10) 9/16/2019 (8-10) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(10-12) 9/16/2019 (10-12) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(12-14) 9/16/2019 (12-14) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.8 J	1.7 J	0.46 U	0.39 U	1.0 J	0.45 U	0.34 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1400	2300	850	1300	2500	2000	1400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.27 U	0.34 U	0.27 U	0.23 U	0.22 U	0.24 U	0.19 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	50	62	31	38	110	85	50
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.32 U	0.38 U	0.32 U	0.26 U	0.24 U	0.28 U	0.20 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	0.20 U	0.17 U	0.16 U	0.18 U	0.15 U	0.13 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.76 J	1.2 J	0.51 J	0.42 J	1.1 J	1.0 J	0.44 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	0.21 U	0.18 U	0.17 U	0.18 U	0.16 U	0.14 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.3 J	0.62 J	0.78 J	2.4 J	2.1 J	0.97 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.53 U	0.30 U	0.23 U	0.23 U	0.35 U	0.32 U	0.27 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	3.1 J	1.9 J	2.0 J	5.6 J	4.7 J	2.4 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.30 U	0.54 J	0.23 U	0.23 U	0.24 U	0.22 U	0.20 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.48 U	0.52 U	0.48 U	0.41 U	0.45 U	0.47 U	0.36 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 U	0.16 U	0.14 U	0.12 U	0.14 U	0.12 U	0.10 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.31 U	0.36 U	0.25 U	0.25 U	0.26 U	0.25 U	0.22 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3.9	0.97 J	0.20 U	0.14 U	0.19 U	0.21 U	0.15 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.0 J	0.71 J	0.27 U	0.21 U	0.30 J	0.31 U	0.25 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.32 U	0.38 U	0.32 U	0.26 U	0.24 U	0.28 U	0.20 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	160 J	120 J	150 J	280 J	230 J	140 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.53 J	0.30 J	0.23 J	0.23 J	0.35 J	0.32 J	0.27 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	24 J	30 J	34 J	36 J	78 J	66 J	33 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.36 U	1.5 J	0.28 U	0.25 U	0.26 U	0.26 U	0.22 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.2 J	5.4 J	7.3 J	6.2 J	17 J	13 J	5.6 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	5.9 J	2.8 J	0.20 U	0.14 U	0.47 J	1.4 J	0.37 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.0 J	4.1 J	3.2 J	1.6 J	8.4 J	8.1 J	2.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.79	2.69	0.868	1.09	3.06	2.23	1.55
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.13	3.05	1.33	1.48	3.38	2.71	1.81

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB050 11187072-091619-SS-SJSB050-(14-16) 9/16/2019 (14-16) ft bgs	SJSB050 11187072-091619-SS-SJSB050-(16-18) 9/16/2019 (16-18) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(0-2) 10/10/2019 (0-2) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(2-4) 10/10/2019 (2-4) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(4-6) 10/10/2019 (4-6) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(6-8) 10/10/2019 (6-8) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(8-10) 10/10/2019 (8-10) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.41 U	0.31 U	0.18 U	0.83 U	0.26 U	1.4 U	0.52 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1200	40	450	750	1500	2300	130
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.23 U	0.16 U	0.17 U	0.20 U	0.24 U	0.22 U	0.15 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	45	0.94 J	16	33	58	97	6.0 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.26 U	0.20 U	0.20 U	0.23 U	0.25 U	0.26 U	0.18 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.21 U	0.13 U	0.14 U	0.18 U	0.17 U	0.19 U	0.14 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.61 J	0.15 U	0.33 U	0.44 U	0.62 U	1.0 U	0.15 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.21 U	0.13 U	0.15 U	0.20 U	0.18 U	0.22 U	0.15 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	0.16 U	0.39 J	0.77 J	1.2 J	2.0 J	0.16 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.36 U	0.26 U	0.11 J	0.25 J	0.094 U	0.27 J	0.076 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.9 J	0.14 U	0.79 J	1.5 J	2.6 J	4.5 J	0.34 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.27 U	0.22 U	0.16 U	0.16 U	0.17 U	0.17 U	0.22 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.48 U	0.29 U	0.27 U	0.29 U	0.33 U	0.36 U	0.21 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 U	0.098 U	0.092 U	0.12 U	0.11 U	0.13 U	0.090 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.29 U	0.23 U	0.17 U	0.17 U	0.18 U	0.18 U	0.14 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.19 U	0.13 U	3.5	0.86 J	0.44 J	0.31 J	3.0
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.27 U	0.17 U	1.3 J	0.85 J	0.51 J	0.44 J	0.70 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.26 U	0.20 U	0.20 U	0.23 U	0.25 U	0.26 U	0.18 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130 J	3.8 J	51 J	110 J	180 J	320 J	15 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.36 J	0.26 J	0.11 U	0.25 J	0.18 U	0.27 J	0.15 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	38 J	0.78 J	9.2 J	20 J	40 J	72 J	2.2 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.29 U	0.23 U	0.17 U	0.19 U	0.18 U	0.18 U	0.22 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.5 J	0.29 U	0.49 J	1.5 J	6.6 J	12 J	0.21 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.80 J	0.13 U	4.6 J	1.7 J	0.88 J	0.89 J	4.4 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.1 J	0.17 U	2.1 J	3.1 J	4.1 J	7.5 J	0.91 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.29	0.0214	2.07	1.74	1.96	2.81	1.14
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.77	0.351	2.27	1.97	2.22	3.10	1.31

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB050-C1 11187072-100919-SS-SJSB050C1(10-12) 10/10/2019 (10-12) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(12-14) 10/10/2019 (12-14) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(14-16) 10/10/2019 (14-16) ft bgs	SJSB050-C1 11187072-100919-SS-SJSB050C1(16-18) 10/10/2019 (16-18) ft bgs	SJSB050-C1 11187072-101019-SS-DUP-7 10/10/2019 (16-18) ft bgs Duplicate	SJSB051 11187072-091019-SS-SJSB051-S (0-2) 9/10/2019 (0-2) ft bgs	SJSB051 11187072-091019-SS-SJSB051-S (2-4) 9/10/2019 (2-4) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.24 U	0.32 U	1.1 U	0.24 U	0.19 U	2.5 J	4.0 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	340	2000	1800	960 J	250 J	2300	5500
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.19 U	0.24 U	0.21 U	0.19 U	0.13 U	0.28 U	0.53 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	14	100	96	41 J	8.7 J	60	130
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.21 U	0.27 U	0.24 U	0.21 U	0.16 U	0.35 U	0.67 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 U	0.21 U	0.19 U	0.16 U	0.13 U	0.19 U	0.33 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.38 U	0.97 U	0.88 U	0.51 U	0.17 U	0.62 J	1.3 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.17 U	0.23 U	0.21 U	0.18 U	0.14 U	0.19 U	0.32 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.35 J	2.6 J	2.7 J	0.92 J	0.17 U	1.4 J	3.1 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.085 U	0.33 J	0.24 J	0.088 U	0.11 J	1.5 U	2.3 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.71 J	5.7 J	5.4 J	2.0 J	0.39 J	3.2 J	6.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.15 U	0.18 U	0.19 U	0.18 U	0.11 U	0.29 U	0.58 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.24 U	0.41 U	0.38 U	0.30 U	0.23 U	0.45 U	0.94 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 U	0.15 U	0.13 U	0.11 U	0.087 U	0.15 U	0.25 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.17 U	0.20 U	0.21 U	0.18 U	0.12 U	0.33 U	0.67 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2.4	0.15 U	0.12 U	0.14 U	0.097 U	1.4 J	0.30 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.76 J	0.59 J	0.24 J	0.19 U	0.17 U	0.67 J	0.43 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.21 U	0.27 U	0.24 U	0.21 U	0.16 U	0.35 U	0.67 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	40 J	260 J	240 J	110 J	25 J	160 J	330 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.17 U	0.33 J	0.24 J	0.18 U	0.11 U	1.9 J	2.6 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.1 J	67 J	59 J	22 J	5.2 J	31 J	53 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.17 U	0.20 U	0.21 U	0.18 U	0.15 U	0.33 U	0.67 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.57 J	9.7 J	8.8 J	2.2 J	0.46 J	2.4 J	1.8 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2.7 J	0.70 J	0.99 J	0.14 U	0.097 U	2.6 J	1.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.2 J	6.4 J	5.3 J	1.2 J	0.18 J	2.4 J	3.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.35	3.05	2.57	0.99	0.212	2.62	4.00
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.54	3.38	2.88	1.33	0.473	3.02	4.98

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB051 11187072-091019-SS-SJSB051-S (4-6) 9/10/2019 (4-6) ft bgs	SJSB051 11187072-091019-SS-SJSB051-S (6-8) 9/10/2019 (6-8) ft bgs	SJSB051 11187072-091019-SS-SJSB051-S (8-10) 9/10/2019 (8-10) ft bgs	SJSB051 11187072-091019-SS-SJSB051-S (10-12) 9/10/2019 (10-12) ft bgs	SJSB051 11187072-091019-SS-SJSB051-S (12-14) 9/10/2019 (12-14) ft bgs	SJSB051 11187072-091019-SS-SJSB051-S (14-16) 9/10/2019 (14-16) ft bgs	SJSB051 11187072-091019-SS-DUP-1 9/10/2019 (16-18) ft bgs Duplicate
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.38 U	1.2 J	2.6 J	0.58 J	0.85 J	0.74 J	0.61 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1600	2200	1400	1400	2600	1500	850
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.40 U	0.34 J	0.50 J	0.14 J	0.25 J	0.22 J	0.15 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	62	81	49	51	70	66	40
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.48 U	0.76 J	0.76 J	0.71 J	0.75 J	0.74 J	0.56 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.23 U	0.24 J	0.17 J	0.15 J	0.27 J	0.18 J	0.19 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.73 J	1.2 J	0.95 J	0.79 J	1.1 J	0.90 J	0.74 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.22 U	0.17 J	0.15 J	0.12 J	0.17 J	0.14 J	0.032 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.5 J	1.2 J	1.0 J	1.5 J	1.3 J	1.1 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 U	1.6 U	1.5 U	1.4 U	1.5 U	1.5 U	1.3 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.6 J	4.4 J	2.9 J	2.7 J	3.1 J	3.6 J	3.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.32 U	0.29 J	0.28 J	0.22 J	0.28 J	0.17 J	0.19 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.60 U	0.080 U	0.28 J	0.060 U	0.37 J	0.33 J	0.24 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.17 U	0.024 U	0.021 U	0.019 U	0.026 U	0.019 U	0.027 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.34 U	0.13 J	0.18 J	0.13 J	0.15 J	0.083 J	0.058 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.21 U	0.13 J	2.2	0.11 J	0.56 J	0.11 J	0.096 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.34 J	0.23 J	0.93 J	0.14 J	0.25 J	0.17 J	0.17 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.48 U	1.5 J	1.9 J	1.1 J	1.3 J	1.3 J	0.98 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	220 J	290 J	150 J	180 J	210 J	220 J	140 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.5 J	2.9 J	3.1 J	2.5 J	2.9 J	2.7 J	2.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	49 J	76 J	44 J	51 J	42 J	65 J	41 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.34 U	0.92 J	1.3 J	0.86 J	1.1 J	0.69 J	0.82 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.9 J	13 J	9.2 J	7.6 J	8.0 J	12 J	6.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.21 U	0.92 J	3.9 J	0.49 J	3.0 J	1.0 J	1.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.2 J	8.2 J	5.8 J	4.1 J	6.0 J	5.5 J	3.9 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.00	2.52	2.95	1.61	2.83	2.27	1.62
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.48	2.64	3.03	1.71	2.91	2.35	1.70

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB051 11187072-091019-SS-SJSB051-S (16-18) 9/10/2019 (16-18) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (0-2) 9/12/2019 (0-2) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (2-4) 9/12/2019 (2-4) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (4-6) 9/12/2019 (4-6) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (6-8) 9/12/2019 (6-8) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (8-10) 9/12/2019 (8-10) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (10-12) 9/12/2019 (10-12) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.75 J	1.3 J	0.33 U	0.30 U	0.58 U	0.46 U	1.6 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1500	440	280	610	1200	640	1700
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.19 J	0.29 U	0.25 U	0.26 U	0.38 U	0.33 U	0.25 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	67	31	13	23	48	29	74
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.67 J	2.0 U	1.6 U	1.5 U	1.6 U	1.7 U	2.1 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 J	0.44 J	0.26 J	0.16 U	0.20 U	0.23 U	0.22 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	0.70 J	0.25 U	0.25 U	0.67 J	0.62 J	0.97 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 J	0.33 J	0.38 J	0.17 U	0.22 U	0.23 U	0.38 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	0.90 J	0.26 U	0.46 J	1.1 J	0.66 J	1.6 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.4 U	2.6 U	2.7 U	2.1 U	3.4 U	3.0 U	3.2 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.5 J	1.5 J	0.72 J	1.0 J	2.7 J	1.8 J	3.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.25 J	0.57 J	0.76 J	0.23 U	0.36 U	0.28 U	0.28 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.33 J	0.36 U	0.38 U	0.33 U	0.47 U	0.48 U	0.37 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.023 U	0.13 U	0.16 U	0.13 U	0.16 U	0.19 U	0.14 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.045 U	0.25 U	0.29 U	0.25 U	0.38 U	0.31 U	0.32 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.11 J	2.8	3.8	3.2	0.43 J	1.8	0.46 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.19 J	0.58 J	0.78 J	0.76 J	0.30 U	0.56 J	0.40 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.3 J	2.0 J	1.6 J	1.5 J	1.6 J	1.7 J	2.1 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	240 J	58 J	38 J	79 J	170 J	100 J	210 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.1 J	4.4 J	4.5 J	2.9 J	4.7 J	4.2 J	5.1 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	66 J	11 J	7.6 J	17 J	41 J	30 J	48 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.68 J	0.57 J	0.76 J	0.25 U	0.38 U	0.31 U	0.32 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.7 J	0.39 J	0.38 U	0.95 J	4.6 J	4.7 J	8.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.70 J	3.8 J	4.3 J	4.6 J	0.43 J	2.6 J	1.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.2 J	0.80 J	0.78 J	1.3 J	1.9 J	2.3 J	5.2 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.40	1.71	1.53	1.64	1.33	1.53	2.38
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.48	2.07	1.94	1.99	1.99	2.01	2.80

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

ED_014247_00001351-00149

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB052 11187072-091219-SS-SJSB052-S (12-14) 9/12/2019 (12-14) ft bgs	SJSB052 11187072-091219-SS-SJSB052-S (14-16) 9/12/2019 (14-16) ft bgs	SJSB052 11187072-091219-SS-DUP-4 9/12/2019 (16-18) ft bgs Duplicate	SJSB052 11187072-091219-SS-SJSB052-S (16-18) 9/12/2019 (16-18) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (0-2) 10/8/2019 (0-2) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (2-4) 10/8/2019 (2-4) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (4-6) 10/8/2019 (4-6) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.30 U	0.32 U	0.34 U	0.38 U	1.4 J	0.31 J	0.53 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1500	140	1400	1000	1300	460	100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.25 U	0.27 U	0.32 U	0.31 U	0.47 J	0.12 J	0.12 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	53	4.4 J	55	46	39	33	3.0 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.7 U	2.5 U	2.0 U	2.5 U	0.26 J	0.075 J	0.027 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	0.21 U	0.21 U	0.25 U	0.75 J	0.066 J	0.10 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.61 J	0.25 U	0.90 J	0.59 J	0.86 U	0.51 U	0.22 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.19 U	0.44 J	0.23 U	0.26 U	0.28 J	0.040 J	0.038 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	0.26 U	2.2 J	1.1 J	1.1 J	0.98 J	0.13 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	3.0 U	3.8 U	3.0 U	4.1 U	0.30 J	0.15 J	0.088 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.1 J	0.24 U	3.1 J	3.0 J	2.3 J	2.0 J	0.18 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.24 U	0.67 U	0.54 U	1.1 U	0.75 J	0.15 J	0.041 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.36 U	0.29 U	5.2 J	0.39 U	0.44 J	0.21 J	0.071 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 U	0.17 U	0.18 U	0.20 U	0.13 J	0.044 J	0.030 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.26 U	0.31 U	0.31 U	0.33 U	0.47 J	0.043 U	0.042 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.44 J	0.15 U	1.0 J	49 J	23	0.41 J	0.85 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.33 J	0.19 U	3.0	5.5	5.0	0.11 J	0.24 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.7 J	2.5 J	2.0 J	2.5 J	0.96 J	0.25 J	0.16 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	170 J	14 J	170 J	140 J	120 J	68 J	8.4 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	4.7 J	6.3 J	5.7 J	6.1 J	1.5 J	0.30 J	0.19 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	38 J	2.8 J	52 J	37 J	21 J	15 J	1.7 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.27 U	0.67 J	7.7 J	1.9 J	2.8 J	0.33 J	0.061 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.0 J	0.29 U	19 J	5.9 J	10 J	2.8 J	0.29 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.93 J	0.15 U	1.9 J	88 J	47 J	1.8 J	1.7 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.3 J	0.19 U	8.0 J	8.5 J	13 J	1.8 J	0.57 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.84	0.130	9.89	11.6	9.18	1.16	0.436
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.24	0.694	10.1	12.1	9.22	1.20	0.493

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (6-8) 10/8/2019 (6-8) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (8-10) 10/8/2019 (8-10) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (10-12) 10/8/2019 (10-12) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (12-14) 10/8/2019 (12-14) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (14-16) 10/8/2019 (14-16) ft bgs	SJSB052-C1 11187072-100819-SS-SJSB052-C1 (16-18) 10/8/2019 (16-18) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (0-2) 10/13/2019 (0-2) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.25 J	0.37 U	0.17 U	0.69 U	0.26 U	0.24 U	10 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	790	1400	740 J	1100	900	1300	720
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.13 J	0.13 U	0.079 U	0.25 U	0.13 U	0.13 U	2.1 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	31	60	31	43	39	56	36
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.072 J	0.12 J	0.037 U	0.055 U	0.076 J	0.087 J	0.32 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.035 U	0.12 J	0.059 U	0.057 U	0.088 J	0.048 U	0.27 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.50 U	0.73 U	0.67 U	0.72 U	0.83 U	0.78 U	0.57 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.093 J	0.13 J	0.060 U	0.099 J	0.092 J	0.087 J	0.32 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.83 J	1.5 J	0.91 J	1.1 J	1.1 J	1.5 J	1.1 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.17 J	0.26 U	0.13 U	0.21 U	0.17 U	0.18 U	0.17 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.0 J	3.8 J	2.1 J	3.0 J	3.2 J	4.0 J	2.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.11 J	0.077 U	0.055 U	0.060 U	0.058 U	0.051 U	0.16 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.20 J	0.33 J	0.24 J	0.31 J	0.42 J	0.33 J	0.34 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.028 U	0.049 U	0.047 U	0.078 J	0.083 J	0.065 J	0.18 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.041 U	0.081 U	0.059 U	0.064 U	0.059 U	0.052 U	0.18 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.74 J	0.28 J	0.11 J	0.056 U	0.22 J	0.044 U	0.33 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.30 J	0.32 J	0.25 J	0.15 J	0.17 J	0.17 J	0.53 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.20 J	0.25 J	0.079 J	0.25 J	0.21 J	0.22 J	5.8 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	100 J	180 J	120 J	150 J	140 J	180 J	120 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.26 J	0.51 J	0.13 J	0.39 J	0.43 J	0.33 J	0.55 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	26 J	40 J	29 J	44 J	43 J	49 J	26 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.11 J	0.094 U	0.073 U	0.071 U	0.067 U	0.059 U	0.18 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.2 J	7.0 J	5.0 J	10 J	9.0 J	11 J	3.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2.1 J	1.4 J	1.3 J	0.85 J	1.1 J	1.5 J	0.76 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.9 J	4.4 J	3.6 J	5.4 J	3.9 J	6.6 J	2.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.44	2.25	1.33	1.65	1.73	2.02	1.54
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.47	2.32	1.39	1.71	1.79	2.08	1.79

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB053 11187072-101319-SS-SJSB053 (2-4) 10/13/2019 (2-4) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (4-6) 10/13/2019 (4-6) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (6-8) 10/13/2019 (6-8) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (8-10) 10/13/2019 (8-10) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (10-12) 10/13/2019 (10-12) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (12-14) 10/13/2019 (12-14) ft bgs	SJSB053 11187072-101319-SS-SJSB053 (14-15) 10/13/2019 (14-15) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.57 U	1.1 U	2.0 U	2.8 U	0.50 U	0.29 U	120
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	570	640	800	810	1300	21 U	2100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.050 U	0.15 J	0.43 J	0.69 J	0.11 J	0.14 J	17
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	22	22	32	34	53	0.97 J	110 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.053 U	0.050 U	0.073 U	0.067 U	0.060 U	0.048 U	1.4 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.096 U	0.095 U	0.096 U	0.12 U	0.086 U	0.10 U	0.28 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.42 J	0.42 J	0.62 J	0.42 J	0.51 J	0.25 J	0.75 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.097 U	0.093 U	0.095 U	0.12 U	0.087 U	0.099 U	0.44 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.52 J	0.54 J	0.79 J	0.80 J	1.1 J	0.12 J	2.3 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 J	0.067 U	0.094 J	0.089 U	0.16 J	0.077 U	0.14 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.3 J	2.1 J	2.3 J	3.3 J	0.18 J	5.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.063 U	0.087 U	0.099 U	0.093 U	0.088 U	0.066 U	0.062 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 U	0.17 U	0.19 U	0.14 U	0.25 J	0.12 U	0.21 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.075 U	0.074 U	0.072 U	0.099 U	0.071 U	0.081 U	0.19 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.065 U	0.088 U	0.099 U	0.096 U	0.087 U	0.068 U	0.063 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.22 J	1.3 J	0.98 J	0.23 J	0.14 U	0.13 U	0.057 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.18 J	0.55 J	0.29 J	0.21 J	0.15 U	0.11 U	0.24 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.053 U	0.33 J	1.0 J	1.7 J	0.11 J	0.14 J	58 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	81 J	79 J	110 J	130 J	180 J	3.2 J	250 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.10 J	0.095 U	0.094 J	0.12 U	0.16 J	0.10 U	6.3 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	20 J	18 J	28 J	31 J	38 J	1.2 J	41 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.086 U	0.11 U	0.13 U	0.14 U	0.097 U	0.092 U	0.19 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.8 J	3.2 J	4.0 J	4.7 J	5.7 J	0.12 U	8.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.55 J	1.7 J	1.7 J	0.64 J	0.55 J	0.13 U	0.18 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.3 J	1.7 J	2.6 J	2.9 J	2.6 J	0.11 U	2.9 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.827	1.32	1.31	1.17	1.68	0.0660	3.32
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.917	1.44	1.44	1.28	1.79	0.220	3.33

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB053 11187072-111019-KW-SJSB053-S(14-16) 11/10/2019 (14-16) ft bgs	SJSB053 11187072-111019-KW-SJSB053-S(16-18) 11/10/2019 (16-18) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (0-2) 11/9/2019 (0-2) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (2-4) 11/9/2019 (2-4) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (4-6) 11/9/2019 (4-6) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (6-8) 11/9/2019 (6-8) ft bgs
Dioxins/Furans							
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.5 U	0.59 U	1.8 U	3.4 U	3.3 U	9.3 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	92	130	150	600	940	1000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.25 U	0.14 U	0.19 U	0.40 U	0.47 U	0.71 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2.8 J	4.0 J	7.1	24	38	42
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.12 U	0.073 U	0.12 U	0.21 U	0.25 U	0.35 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.068 U	0.059 U	0.066 U	0.074 U	0.15 U	0.14 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.31 U	0.27 U	0.31 U	0.41 U	0.57 U	0.60 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.067 U	0.058 U	0.063 U	0.070 U	0.15 U	0.14 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.25 J	0.19 J	0.22 J	0.65 J	0.80 J	1.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 U	0.12 U	0.14 U	0.054 U	0.20 U	0.27 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.33 U	0.41 U	0.35 U	1.5 J	1.9 J	2.4 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.13 U	0.14 U	0.047 U	0.16 U	0.17 U	0.14 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 J	0.16 J	0.13 J	0.099 U	0.23 J	0.14 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 U	0.069 J	0.048 U	0.052 U	0.11 U	0.074 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.058 U	0.050 U	0.047 U	0.050 U	0.061 U	0.084 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.068 J	0.057 J	1.1 J	0.14 J	0.15 J	0.094 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.062 U	0.046 U	0.37 J	0.11 J	0.092 J	0.15 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.37 J	0.21 J	0.39 J	0.77 J	0.72 J	1.5 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	10 J	17 J	26 J	86 J	130 J	160 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.13 J	0.19 J	0.14 J	0.074 U	0.20 J	0.63 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.5 J	6.6 J	5.8 J	21 J	29 J	39 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.13 J	0.14 J	0.048 U	0.16 J	0.17 J	0.31 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.67 J	2.0 J	0.84 J	4.8 J	5.4 J	6.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.068 J	0.12 J	1.8 J	0.34 J	0.44 J	0.27 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.1 J	2.6 J	0.83 J	2.9 J	2.9 J	3.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.247	0.271	0.748	0.759	1.27	1.28
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.339	0.350	0.806	0.855	1.34	1.40

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (8-10) 11/9/2019 (8-10) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (10-12) 11/9/2019 (10-12) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (12-14) 11/9/2019 (12-14) ft bgs	SJSB053-C1 11187072-110919-KW-SJSB053-C1-S (14-16) 11/9/2019 (14-16) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (0-2) 10/13/2019 (0-2) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (2-4) 10/13/2019 (2-4) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (4-6) 10/13/2019 (4-6) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.82 U	0.80 U	0.82 U	1.1 U	130 J	29 U	0.36 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	510	1300	410	1300	690	310	1400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.13 U	0.13 U	0.12 U	0.23 U	370	66 J	0.23 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	18	50	15	57	49 J	15 J	53
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.033 U	0.087 U	0.028 U	0.053 U	150 J	29 J	0.092 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.056 U	0.062 U	0.067 J	0.091 U	1300	180	0.59 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.35 U	0.76 U	0.35 U	0.80 U	1.5 U	0.51 UJ	0.57 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.055 U	0.060 U	0.050 U	0.090 U	340	47 J	0.17 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.35 J	1.0 J	0.35 J	1.6 J	4.6 J	1.5 J	1.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.22 U	0.14 U	0.24 U	20 J	2.5 J	0.081 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.91 J	2.6 J	0.87 J	4.5 J	1.5 U	0.48 U	3.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.15 U	0.14 U	0.042 U	0.20 U	850	88	0.28 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.097 U	0.25 J	0.14 J	0.31 J	140 J	13 J	0.35 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.068 J	0.048 J	0.056 J	0.062 U	42 J	5.1 J	0.064 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.047 U	0.047 U	0.078 J	0.056 U	730	78	0.24 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.92 J	0.10 J	1.6	0.18 J	50000 J	2900	13
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.29 J	0.18 J	0.39 J	0.22 J	11000	1200	3.2
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.13 J	0.29 J	0.12 J	0.23 J	620 J	110 J	0.38 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	61 J	170 J	53 J	190 J	110 J	50 J	180 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.19 J	0.27 J	0.26 J	0.24 J	1900 J	260 J	0.76 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	14 J	39 J	12 J	49 J	26 J	15 J	49 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.15 J	0.14 J	0.078 J	0.20 J	2600 J	280 J	0.52 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.2 J	6.8 J	2.4 J	10 J	140 J	15 J	9.8 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.6 J	0.25 J	2.2 J	0.92 J	89000 J	8800 J	24 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.7 J	3.4 J	1.6 J	6.7 J	12000 J	1300 J	10 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.848	1.69	1.12	2.12	16600	1550	6.42
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.936	1.76	1.15	2.20	16600	1550	6.43

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB054 11187072-101319-SS-SJSB054 (6-8) 10/13/2019 (6-8) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (8-10) 10/13/2019 (8-10) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (10-12) 10/13/2019 (10-12) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (12-14) 10/13/2019 (12-14) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (14-16) 10/13/2019 (14-16) ft bgs	SJSB054 11187072-101319-SS-SJSB054 (16-18) 10/13/2019 (16-18) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (0-2) 9/10/2019 (0-2) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.24 U	0.28 U	0.19 U	4.2 U	0.63 U	0.25 U	0.61 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1900	1700	1300	550	310	2000	410 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.19 U	0.52 U	0.15 U	8.0	0.98 J	0.18 U	0.25 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	70	67	61	25	12	82	20
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.052 U	0.15 U	0.061 U	3.0 J	0.52 J	0.097 U	0.70 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.38 J	1.0 J	0.27 J	29	3.0 J	0.34 J	0.23 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.93 J	0.56 J	0.68 J	0.44 J	0.15 J	0.90 J	0.85 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.068 U	0.29 J	0.058 U	7.5	0.80 J	0.21 J	0.15 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	1.5 J	1.3 J	0.69 J	0.21 J	1.7 J	0.037 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.14 J	0.086 U	0.074 U	0.56 J	0.099 U	0.087 U	1.5 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.5 J	4.0 J	3.3 J	1.3 J	0.12 U	5.8 J	1.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.24 J	1.0 J	0.18 J	19	1.8 J	0.12 J	0.63 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.27 J	0.47 J	0.38 J	3.4 J	0.30 J	0.43 J	0.30 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.071 U	0.066 U	0.059 U	1.0 J	0.079 U	0.070 U	0.020 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.087 U	0.78 J	0.072 U	17	1.6 J	0.20 J	0.051 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	9.4	39	9.2	850	82	11	1.1 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.8 J	11	2.4	270	23	2.6	0.22 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.33 J	0.84 J	0.15 J	13 J	1.7 J	0.28 J	1.2 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	230 J	200 J	210 J	81 J	43 J	250 J	63 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.52 J	1.3 J	0.27 J	43 J	4.3 J	0.55 J	2.9 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	55 J	43 J	53 J	21 J	11 J	68 J	20 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.24 J	2.6 J	0.18 J	58 J	5.1 J	0.32 J	3.4 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.1 J	7.3 J	8.2 J	6.3 J	2.0 J	13 J	7.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	21 J	79 J	18 J	2000 J	160 J	19 J	7.0 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	10 J	16 J	8.2 J	300 J	27 J	9.6 J	8.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	5.92	17.5	5.26	369	32.7	6.51	1.27
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	5.94	17.6	5.28	369	32.7	6.52	1.36

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB055 11187072-091019-SS-SJSB055-S (2-4) 9/10/2019 (2-4) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (4-6) 9/10/2019 (4-6) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (6-8) 9/10/2019 (6-8) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (8-10) 9/10/2019 (8-10) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (10-12) 9/10/2019 (10-12) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (12-14) 9/10/2019 (12-14) ft bgs	SJSB055 11187072-091019-SS-SJSB055-S (14-16) 9/10/2019 (14-16) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.72 J	0.57 J	0.79 J	1.4 J	1.5 J	0.72 J	1.6 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	280	240	720	260	110	300	630
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.26 J	0.19 J	0.29 J	0.28 J	0.32 J	0.21 J	0.41 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	24	11	27	9.0	4.3 J	16	29
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.69 J	0.79 J	0.83 J	0.69 J	0.88 J	0.61 J	1.2 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 J	0.16 J	0.17 J	0.29 J	0.28 J	0.17 J	0.25 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.51 J	0.31 J	0.62 J	0.37 J	0.41 J	0.46 J	0.84 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 J	0.022 U	0.14 J	0.15 J	0.25 J	0.15 J	0.20 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.63 J	0.35 J	0.64 J	0.32 J	0.33 J	0.41 J	0.63 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.2 U	1.4 U	1.8 U	1.4 U	1.4 U	1.1 U	2.0 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.2 J	0.74 J	1.7 J	0.57 J	0.45 J	1.3 J	2.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.22 J	0.24 J	0.27 J	0.43 J	0.30 J	0.25 J	0.29 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.21 J	0.12 J	0.17 J	0.12 J	0.17 J	0.16 J	0.26 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 J	0.019 U	0.019 U	0.020 U	0.016 U	0.015 U	0.021 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.089 J	0.091 J	0.14 J	0.21 J	0.17 J	0.11 J	0.15 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.38 J	0.19 J	0.13 J	5.1	0.69 J	0.79 J	0.15 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.12 J	0.22 J	0.13 J	1.4	0.26 J	0.25 J	0.075 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.2 J	1.2 J	1.6 J	1.4 J	1.6 J	1.0 J	2.0 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	58 J	44 J	110 J	30 J	13 J	70 J	130 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	2.4 J	3.3 J	2.7 J	2.9 J	2.0 J	3.9 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	13 J	11 J	29 J	8.3 J	3.5 J	22 J	36 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.66 J	0.85 J	1.1 J	1.5 J	0.88 J	0.75 J	1.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.9 J	1.2 J	5.1 J	1.6 J	0.76 J	4.3 J	6.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.0 J	0.69 J	0.83 J	9.2 J	1.3 J	1.8 J	0.56 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.5 J	2.0 J	4.0 J	2.8 J	0.86 J	3.1 J	3.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.01	0.741	1.19	2.45	0.819	1.04	1.32
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.07	0.814	1.28	2.53	0.890	1.09	1.42

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB055 11187072-091019-SS-SJSB055-S (16-18) 9/10/2019 (16-18) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (0-2) 10/14/2019 (0-2) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (2-4) 10/14/2019 (2-4) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (4-6) 10/14/2019 (4-6) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (6-8) 10/14/2019 (6-8) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (8-10) 10/14/2019 (8-10) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (10-12) 10/14/2019 (10-12) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.60 J	2.7 J	1.3 J	0.14 U	0.35 J	0.43 J	0.50 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	400	860	600	430	250	670	500
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.16 J	1.2 J	0.61 U	0.12 U	0.12 U	0.12 U	0.068 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	19	34	24	19	12	31	23
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.58 J	0.48 J	0.33 J	0.071 J	0.094 J	0.044 U	0.083 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 J	1.9 J	1.6 J	0.11 U	0.075 U	0.088 U	0.078 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.49 J	0.77 U	0.49 U	0.33 U	0.35 U	0.54 U	0.44 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 J	0.58 J	0.58 J	0.10 U	0.070 U	0.083 U	0.073 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.47 J	0.88 J	0.65 J	0.48 J	0.31 J	0.59 J	0.41 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.4 U	0.24 J	0.17 J	0.067 U	0.092 J	0.15 J	0.12 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.9 J	2.3 J	1.7 J	1.5 J	1.3 J	2.7 J	1.9 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.19 J	1.4 J	1.3 J	0.062 U	0.052 U	0.078 U	0.052 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.17 J	0.61 J	0.43 J	0.15 U	0.13 U	0.15 U	0.21 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.018 U	0.25 J	0.098 J	0.072 U	0.045 U	0.058 U	0.048 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.085 J	1.3 J	1.2 J	0.064 U	0.055 U	0.084 U	0.053 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.12 J	110	93	2.1	0.39 J	0.26 J	0.62 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.025 U	21	20	0.49 J	0.19 J	0.12 U	0.22 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.97 J	2.5 J	1.3 J	0.20 J	0.21 J	0.12 J	0.15 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	89 J	140 J	100 J	84 J	55 J	150 J	110 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.5 J	3.3 J	2.7 J	0.11 U	0.092 J	0.15 J	0.12 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	29 J	29 J	24 J	21 J	18 J	35 J	29 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.81 J	3.3 J	3.9 J	0.064 U	0.055 U	0.084 U	0.061 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.4 J	4.7 J	4.0 J	3.9 J	3.6 J	6.4 J	5.8 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.55 J	190 J	160 J	3.7 J	0.71 J	0.81 J	1.1 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.7 J	26 J	23 J	2.4 J	2.2 J	3.0 J	3.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.841	34.3	31.0	1.22	0.595	0.881	1.12
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.920	34.3	31.1	1.34	0.697	1.07	1.16

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB055 11187072-101419-SS-SJSB055 C1 (12-14) 10/14/2019 (12-14) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (14-16) 10/14/2019 (14-16) ft bgs	SJSB055 11187072-101419-SS-SJSB055 C1 (16-18) 10/14/2019 (16-18) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (0-2) 11/11/2019 (0-2) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (2-4) 11/11/2019 (2-4) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (4-6) 11/11/2019 (4-6) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (6-8) 11/11/2019 (6-8) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.092 U	0.49 J	0.42 J	2.5 J	0.83 J	0.19 U	0.19 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	210	500	51	480	340	220	390
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.031 U	0.058 U	0.18 U	0.47 J	0.14 U	0.13 U	0.13 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11	24	2.7 J	24	14	10	17
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.036 U	0.056 J	0.073 J	0.16 U	0.14 U	0.14 U	0.14 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.066 U	0.092 U	0.35 J	0.17 U	0.15 U	0.12 U	0.14 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.37 U	0.54 U	0.25 U	0.62 J	0.36 J	0.33 J	0.37 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.060 U	0.086 U	0.11 J	0.20 U	0.17 U	0.14 U	0.16 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.36 J	0.56 J	0.14 J	0.87 J	0.45 J	0.39 J	0.32 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.074 J	0.18 J	0.078 J	0.35 J	0.14 J	0.14 J	0.081 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.67 J	2.4 J	0.26 J	1.9 J	1.1 J	0.92 J	1.4 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.050 U	0.075 U	0.28 J	0.19 U	0.14 U	0.14 U	0.13 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.12 U	0.17 U	0.11 U	0.56 J	0.26 U	0.27 J	0.23 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.040 U	0.057 U	0.037 U	0.13 U	0.11 U	0.087 U	0.11 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.052 U	0.079 U	0.26 J	0.21 U	0.15 U	0.15 U	0.14 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.52 J	0.55 J	15	4.7	2.2	0.46 J	0.32 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.24 J	0.22 J	3.7	1.5	0.81 J	0.20 U	0.18 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.036 U	0.11 J	0.33 J	0.47 J	0.14 U	0.14 U	0.14 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	52 J	140 J	10 J	96 J	65 J	45 J	72 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.074 J	0.18 J	0.58 J	0.35 J	0.14 J	0.14 J	0.16 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	19 J	41 J	2.7 J	27 J	16 J	13 J	20 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.085 U	0.079 U	0.75 J	0.21 U	0.15 U	0.15 U	0.16 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.9 J	8.6 J	0.28 J	4.9 J	1.6 J	3.1 J	2.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.90 J	1.2 J	28 J	6.8 J	2.7 J	0.46 J	0.32 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.9 J	5.9 J	4.4 J	3.8 J	2.1 J	0.49 J	0.18 U
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.575	0.980	5.42	3.29	1.48	0.660	0.528
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.671	1.12	5.49	3.35	1.65	0.803	0.782

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB056 11187072-111119-SS-SJSB056 (8-10) 11/11/2019 (8-10) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (10-12) 11/11/2019 (10-12) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (12-14) 11/11/2019 (12-14) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (14-16) 11/11/2019 (14-16) ft bgs	SJSB056 11187072-111119-SS-SJSB056 (16-18) 11/11/2019 (16-18) ft bgs	SJSB056-C1 11187072-120319-SS-SJSB056-C1(0-2) 12/3/2019 (0-0) ft bgs	SJSB056-C1 11187072-120319-SS-SJSB056-C1(2-4) 12/3/2019 (2-4) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.0 J	0.35 J	4.0 J	1.5 J	1.1 J	7.1 U	11 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	81	17	350	190	59	140 U	150 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.15 U	0.13 U	0.53 J	0.14 U	0.55 J	0.17 U	0.98 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2.9 J	0.89 J	14	8.2	3.0 J	2.5 U	4.8 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.15 U	0.14 U	0.54 J	0.13 U	0.14 U	0.11 U	0.31 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.36 J	0.12 U	0.31 J	0.13 U	0.31 J	0.10 U	0.12 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.16 U	0.30 J	0.48 J	0.32 J	0.43 J	0.25 U	0.27 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 U	0.14 U	0.17 U	0.15 U	0.16 U	0.11 U	0.13 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.17 U	0.14 U	0.25 U	0.26 J	0.28 J	0.14 J	0.15 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.075 U	0.12 J	0.24 J	0.074 U	0.078 U	0.15 U	0.14 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.16 U	0.13 U	1.2 J	0.71 J	0.45 J	0.22 J	0.33 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.15 U	0.10 U	0.14 U	0.34 J	0.14 U	0.094 U	0.11 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.20 U	0.20 U	0.27 U	0.17 U	0.25 U	0.16 U	0.15 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 U	0.093 U	0.29 J	0.093 U	0.10 U	0.086 U	0.11 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.16 U	0.12 U	0.16 U	0.19 J	0.16 U	0.094 U	0.11 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	10	1.5	5.2	11	0.16 U	1.1 J	1.6
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.5 J	0.57 J	1.7	2.9	0.16 U	0.48 J	0.72 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.15 U	0.14 U	1.1 J	0.14 U	0.55 J	0.45 J	2.6 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11 J	2.7 J	64 J	33 J	8.8 J	10 J	13 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.36 J	0.12 J	0.84 J	0.15 U	0.31 J	0.15 J	0.14 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.9 J	0.30 J	15 J	9.4 J	1.9 J	2.3 J	2.4 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.16 U	0.15 U	0.18 U	0.53 J	0.24 U	0.094 U	0.11 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.20 U	0.20 U	2.1 J	1.2 J	0.25 U	0.16 U	0.15 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	16 J	2.1 J	9.1 J	18 J	0.16 U	1.6 J	2.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.5 J	0.57 J	2.4 J	2.9 J	0.19 J	0.48 J	0.72 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3.59	0.776	2.73	4.34	0.201	0.626	0.980
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.76	0.928	2.91	4.44	0.457	0.792	1.14

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB056-C1 11187072-120319-SS-SJSB056-C1(4-6) 12/3/2019 (4-6) ft bgs	SJSB056-C1 11187072-120319-SS-SJSB056-C1(6-8) 12/3/2019 (6-8) ft bgs	SJSB056-C1 11187072-120319-SS-SJSB056-C1(8-10) 12/3/2019 (8-10) ft bgs	SJSB056-C1 11187072-120319-SS-SJSB056-C1(10-12) 12/3/2019 (10-12) ft bgs	SJSB056-C1 11187072-120319-SS-SJSB056-C1(12-14) 12/3/2019 (12-14) ft bgs	SJSB056-C1 11187072-120319-SS-DUP-1 12/3/2019 (14-16) ft bgs Duplicate	SJSB056-C1 11187072-120319-SS-SJSB056-C1(14-16) 12/3/2019 (14-16) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4.8 U	35	2.4 U	3.3 U	2.5 U	4.3 U	2.6 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	120 U	260	88 U	160 U	320	370	270
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.19 U	1.9 J	0.33 U	0.94 U	0.31 U	0.55 U	0.62 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3.3 U	14	2.7 U	6.8	15	17	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.087 U	0.20 J	0.16 J	0.90 J	0.13 J	0.064 U	0.10 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.094 U	0.11 U	0.53 J	0.064 U	0.075 U	0.34 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.079 U	0.23 U	0.25 U	0.83 J	0.40 U	0.44 U	0.26 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.14 U	0.11 U	0.11 U	0.60 J	0.068 U	0.078 U	0.13 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.082 U	0.30 J	0.18 J	0.79 J	0.46 J	0.46 J	0.26 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.090 U	0.13 U	0.081 U	0.81 U	0.16 U	0.13 U	0.16 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.26 J	0.40 J	0.36 J	1.1 J	1.3 J	1.3 J	0.98 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.094 U	0.17 U	0.13 U	0.36 U	0.067 U	0.067 U	0.054 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	0.18 U	0.12 U	0.39 J	0.12 U	0.12 U	0.097 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 U	0.081 U	0.088 U	0.61 J	0.050 U	0.063 U	0.070 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.091 U	0.080 U	0.081 U	0.35 J	0.070 U	0.067 U	0.055 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.45 U	0.86 J	2.9	0.20 U	0.14 U	0.050 U	0.086 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.099 U	0.11 U	0.92 J	0.23 J	0.11 U	0.10 U	0.15 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.47 J	11 J	0.77 J	2.0 J	0.73 J	1.2 J	0.93 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11 J	29 J	8.9 J	24 J	62 J	69 J	45 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.14 U	0.13 J	0.11 U	2.6 J	0.16 J	0.13 J	0.63 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	5.1 J	2.7 J	8.0 J	19 J	20 J	14 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.094 U	0.17 J	0.13 J	0.72 J	0.087 U	0.067 U	0.063 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	0.29 J	0.29 J	1.3 J	3.2 J	3.4 J	2.2 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.63 J	1.4 J	4.0 J	0.41 J	0.59 J	0.31 J	0.16 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.099 U	0.91 J	1.1 J	0.55 J	2.3 J	2.3 J	1.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.0260	0.406	1.27	1.25	0.423	0.457	0.503
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.260	0.597	1.40	1.33	0.596	0.624	0.593

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB056-C1 11187072-120319-SS-SJSB056-C1(16-18) 12/3/2019 (16-18) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (0-2) 11/5/2019 (0-2) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (2-4) 11/5/2019 (2-4) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (4-6) 11/5/2019 (4-6) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (6-8) 11/5/2019 (6-8) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (8-10) 11/5/2019 (8-10) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (10-12) 11/5/2019 (10-12) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.2 U	490 J	520 J	55	6.8 J	0.94 U	6.1 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	440	5200	2400	670	94	48	85
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.45 U	990	1300	110	13	0.36 U	2.0 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	18	310	190 J	43	4.7 J	4.0 J	6.1
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.058 U	300	410 J	34	4.0 J	0.27 U	1.9 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.090 U	3000	4400	350	39	0.71 J	0.75 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.41 U	3.6 U	5.6 U	0.64 U	0.25 U	0.35 U	1.2 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.097 U	740	1100	92	10	0.25 U	0.59 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.44 J	21 J	16 U	1.9 J	0.27 U	0.28 U	1.3 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.21 U	45 J	56 J	5.0 J	0.64 J	0.21 U	1.1 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.7 J	8.7 J	9.0 J	1.1 J	0.25 J	0.42 J	1.5 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.069 U	2000	2900	230	26	0.53 J	0.21 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.19 J	200 J	300 J	21	2.3 J	0.26 J	0.45 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.076 U	90 J	120 J	9.1	1.1 J	0.15 U	1.2 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.071 U	1300	1900	140	15	0.31 J	0.32 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.15 U	31000 J	51000 J	8200	890	18	2.9
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.18 J	20000	31000	2600	270	5.2	1.2
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.5 J	1600 J	2100 J	180 J	20 J	0.63 J	4.1 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	80 J	700 J	410 J	99 J	13 J	11 J	13 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.44 J	4400 J	6400 J	510 J	58 J	1.3 J	3.6 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	24 J	110 J	83 J	18 J	3.0 J	3.3 J	6.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.073 U	5200 J	7400 J	570 J	64 J	1.1 J	0.53 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.5 J	230 J	330 J	27 J	2.7 J	0.71 J	0.91 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.44 J	130000 J	210000 J	13000 J	1500 J	29 J	5.0 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.5 J	22000 J	34000 J	2800 J	290 J	5.8 J	1.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.896	24200	37600	3540	372	7.54	2.93
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.962	24200	37600	3540	372	7.60	2.93

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB057 11187072-110519-SS-SJSB057 (12-14) 11/5/2019 (12-14) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (14-16) 11/5/2019 (14-16) ft bgs	SJSB057 11187072-110519-SS-SJSB057 (16-18) 11/5/2019 (16-18) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (0-2) 10/14/2019 (0-2) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (2-4) 10/14/2019 (2-4) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (4-6) 10/14/2019 (4-6) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (6-8) 10/14/2019 (6-8) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	2.2 U	0.53 U	0.34 U	13	690	1100	8.4 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	99	85	69	520	6600	13000	400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.65 U	0.11 U	0.096 U	4.7 J	1900	2100	14
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	4.0 J	3.5 J	3.1 J	35	540	620	18
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.36 U	0.081 U	0.032 U	0.62 J	780	820	5.6 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.4 J	0.15 J	0.12 J	2.2 J	8200	7200	44
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.27 U	0.33 U	0.25 U	0.25 J	6.3 J	6.3 J	0.38 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.42 J	0.083 U	0.062 U	0.78 J	2000 J	1800 J	11
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.26 U	0.21 U	0.23 U	0.83 J	30 J	41 J	0.62 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.26 U	0.077 U	0.091 U	0.15 U	110 J	120 J	0.90 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.47 J	0.36 J	0.32 J	0.92 J	11 J	14 J	1.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.1 J	0.13 J	0.098 J	1.4 J	4200	3900	23
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.19 J	0.21 J	0.24 J	0.28 U	260	430	2.6 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.18 U	0.040 U	0.047 U	0.32 J	200 J	210 J	1.4 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.64 J	0.11 J	0.058 U	0.87 J	2200	2900	15
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	41	2.7	2.5	25	100000 J	150000 J	800
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	11	0.92 J	0.87 J	8.0	24000 J	31000 J	230
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.2 J	0.23 J	0.096 J	14 J	3200 J	3800 J	24 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	13 J	10 J	8.6 J	83 J	1100 J	1400 J	67 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.4 J	0.35 J	0.21 J	9.9 J	12000 J	11000 J	66 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.8 J	2.8 J	2.5 J	11 J	220 J	230 J	17 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.6 J	0.29 J	0.098 J	9.2 J	10000 J	11000 J	60 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.86 J	0.73 J	0.58 J	1.0 J	310 J	510 J	3.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	66 J	5.2 J	3.8 J	55 J	180000 J	270000 J	1400 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	13 J	1.4 J	1.2 J	9.4 J	27000 J	34000 J	250 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	15.8	1.55	1.46	11.9	36100	48400	324
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	15.9	1.59	1.50	12.0	36100	48400	324

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB058 11187072-101419-BN-SJSB058-S (8-10) 10/14/2019 (8-10) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (10-12) 10/14/2019 (10-12) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (12-14) 10/14/2019 (12-14) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (14-16) 10/14/2019 (14-16) ft bgs	SJSB058 11187072-101419-BN-SJSB058-S (16-18) 10/14/2019 (16-18) ft bgs	SJSB058 11187072-111219-SS-SJSB058 (18-20) 11/12/2019 (18-20) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (0-2) 11/12/2019 (0-2) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	25 J	6.4 J	270 J	3.0 U	20 U	0.37 U	710
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	670	360	3400	140	410	120	2000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	47	14	590	5.7 J	35	0.15 U	1900
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	28 J	20	160	8.0	22 J	5.6 J	190
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	17 J	5.3 J	200	2.1 J	15 J	0.16 U	610
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	150	50	1700	18	120	0.12 U	6700
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.18 U	0.55 J	0.82 U	0.13 J	0.40 J	0.16 U	4.7 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	37	13	440	4.9 J	31 J	0.14 U	1700
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.95 J	0.94 J	9.0 J	0.23 J	0.94 J	0.17 U	14
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	3.0 J	0.92 J	26 J	0.30 J	1.7 J	0.23 J	46 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.17 U	2.0 J	3.2 J	0.38 J	1.2 J	0.38 J	5.9 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	88	29	940	9.2	70	0.18 U	4200
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.7 J	3.0 J	96 J	0.66 J	6.2 J	0.35 U	390
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.3 J	1.6 J	51 J	0.61 J	3.3 J	0.10 U	170 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	59	19	630	6.7	42	0.18 U	2700
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1900	790	6400	310	1500	0.60 U	27000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	920	280	8700	99	600	0.20 U	39000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	81 J	24 J	990 J	9.9 J	61 J	0.16 U	2900 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	80 J	77 J	370 J	27 J	68 J	23 J	370 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	220 J	74 J	2500 J	28 J	180 J	0.23 J	9600 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	14 J	23 J	60 J	9.1 J	16 J	6.9 J	98 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	240 J	78 J	2600 J	26 J	180 J	0.18 U	11000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.7 J	5.4 J	96 J	1.8 J	6.2 J	0.35 U	410 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	5800 J	1600 J	62000 J	630 J	3800 J	0.96 J	300000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1000 J	310 J	9700 J	110 J	670 J	0.70 J	44000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1160	376	9890	136	788	0.153	43900
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1160	376	9890	136	788	0.524	43900

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB070 11187072-111219-SS-SJSB070 (2-4) 11/12/2019 (2-4) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (4-6) 11/12/2019 (4-6) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (6-8) 11/12/2019 (6-8) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (8-10) 11/12/2019 (8-10) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (10-12) 11/12/2019 (10-12) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (12-14) 11/12/2019 (12-14) ft bgs
Dioxins/Furans							
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1400	920	480	370	14	7.8 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	15000 J	11000 J	6000 J	4500	300	410 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2800	1900	980	790	29	16
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	960	630	330	260	15	19
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	860	550	290	240	9.6	5.2 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	9100	5800	3100	2200	97	51
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.8 J	6.1 J	3.2 J	2.0 J	0.38 U	0.47 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2300	1500	780	570	24	13
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	55	39	20	14	0.61 U	0.72 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	110 J	61 J	37 J	33	0.45 J	0.85 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	15	11 J	6.1	4.4 J	0.73 J	1.0 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6500	4300	2100	1400	65	36
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	550	410	200	130	6.0 J	3.6 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	250 J	170 J	78 J	57	2.8 J	1.6 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3800	2800	1500	920	40	23
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	35000 J	24000	12000	9700	2400	1600
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	62000 J	41000 J	22000 J	15000 J	730	430
Total heptachlorodibenzofuran (HpCDF)	pg/g	4900 J	3200 J	1700 J	1300 J	48 J	26 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2000 J	1300 J	710 J	560 J	44 J	63 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	13000 J	8600 J	4300 J	3200 J	140 J	75 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	320 J	220 J	110 J	75 J	8.8 J	14 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	17000 J	12000 J	5600 J	3800 J	170 J	94 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	640 J	410 J	230 J	150 J	6.4 J	5.1 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	350000 J	280000 J	130000 J	86000 J	5100 J	2600 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	70000 J	45000 J	25000 J	17000 J	800 J	470 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	68600	45600	24300	16700	1000	609
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	68600	45600	24300	16700	1000	609

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB070 11187072-111219-SS-SJSB070 (14-16) 11/12/2019 (14-16) ft bgs	SJSB070 11187072-111219-SS-SJSB070 (16-18) 11/12/2019 (16-18) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (0-2) 11/12/2019 (0-2) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (2-4) 11/12/2019 (2-4) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (4-6) 11/12/2019 (4-6) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (6-8) 11/12/2019 (6-8) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (8-10) 11/12/2019 (8-10) ft bgs
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.52 J	0.41 J	820 J	1200 J	1.2 J	1.1 J	0.39 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	110 J	310 J	8100 J	11000 J	110 J	38 J	46 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.35 U	0.22 U	1600	2500	0.97 U	0.70 U	0.20 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	5.0 J	13	460	650	3.5 J	1.7 J	1.7 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.094 J	0.054 U	460	770	0.37 J	0.15 J	0.089 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.81 J	0.52 J	4200	8300	2.7 J	0.73 J	0.089 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.30 U	0.37 U	5.3 U	6.6 J	0.24 U	0.24 U	0.20 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.065 U	0.090 U	1100	2100	1.0 J	0.19 U	0.085 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.19 U	0.39 U	32 J	36	0.20 U	0.12 U	0.13 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 J	0.19 J	56	100 J	0.10 U	0.13 U	0.16 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.41 J	1.0 J	10 J	13	0.23 J	0.20 J	0.23 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.64 U	0.65 U	3200	5000	1.8 J	0.38 U	0.24 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 J	0.11 U	320 J	380 J	0.24 J	0.13 U	0.098 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.047 U	0.072 U	120	200 J	0.11 U	0.14 U	0.063 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.38 J	0.29 J	2200	3000	1.1 J	0.090 U	0.058 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	17	11	20000	24000	67	7.9	3.3 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.7	3.0	31000 J	41000 J	19	2.4 U	1.4 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.54 J	0.22 J	2600 J	4200 J	1.8 J	0.85 J	0.29 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	22 J	61 J	1000 J	1400 J	12 J	5.3 J	6.6 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.93 J	0.70 J	6300 J	14000 J	3.7 J	0.73 J	0.16 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	6.4 J	16 J	140 J	220 J	2.3 J	2.4 J	4.4 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1.2 J	1.1 J	8500 J	13000 J	4.5 J	0.56 J	0.24 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.2 J	2.7 J	320 J	400 J	0.24 J	0.28 J	0.91 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	31 J	20 J	220000 J	260000 J	110 J	14 J	5.0 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.6 J	4.8 J	34000 J	46000 J	21 J	3.6 J	3.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	6.86	4.58	34700	45900	26.8	0.913	0.0710
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	6.90	4.69	34700	45900	26.8	2.24	1.03

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-3

Second Phase Pre-Design Investigation Analytical Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Sample Type:	Units	SJSB071 11187072-111219-SS-SJSB071 (10-12) 11/12/2019 (10-12) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (12-14) 11/12/2019 (12-14) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (14-16) 11/12/2019 (14-16) ft bgs	SJSB071 11187072-111219-SS-SJSB071 (16-18) 11/12/2019 (16-18) ft bgs
Dioxins/Furans					
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.11 UJ	0.24 J	1.7 J	1.8 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	98 J	130 J	59	63
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.23 U	0.11 U	1.9 J	1.7 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	5.7 J	5.9 J	3.0 J	2.6 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.053 U	0.038 U	0.52 J	0.47 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.30 J	0.071 U	4.6 J	4.6 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.30 U	0.32 U	0.14 U	0.14 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.095 U	0.067 U	1.3 J	1.3 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.29 U	0.24 U	0.14 U	0.15 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.23 J	0.089 J	0.27 J	0.43 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.38 J	0.48 J	0.13 U	0.14 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.30 U	0.23 U	3.3 J	2.4 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.12 U	0.094 U	0.35 U	0.31 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.079 U	0.051 U	0.21 J	0.12 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.15 J	0.063 U	2.0 J	1.6 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	6.1 U	1.1 U	110	110
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.7 U	0.43 U	32	33
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.23 J	0.11 J	3.0 J	2.8 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	17 J	21 J	8.5 J	7.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.53 J	0.089 J	6.8 J	6.3 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.2 J	7.0 J	1.6 J	1.4 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.45 J	0.23 J	8.5 J	6.4 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.6 J	1.3 J	0.35 U	0.31 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	10 J	1.8 J	190 J	180 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.7 J	1.2 J	34 J	35 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.222	0.155	44.4	45.3
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.48	0.523	44.6	45.4

Notes:
pg/g - picogram per gram
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB072 11215702-072021-SS-SJSB072(8-10) 07/20/2021 (8-10) ft bgs	SJSB072 11215702-072021-SS-SJSB072(10-12) 07/20/2021 (10-12) ft bgs	SJSB072 11215702-072021-SS-SJSB072(12-14) 07/20/2021 (12-14) ft bgs	SJSB072 11215702-072021-SS-SJSB072(14-16) 07/20/2021 (14-16) ft bgs	SJSB072 11215702-072021-SS-SJSB072(16-18) 07/20/2021 (16-18) ft bgs	SJSB072 11215702-072021-SS-SJSB072(18-20) 07/20/2021 (18-20) ft bgs	SJSB072 11215702-072021-SS-SJSB072(20-22) 07/20/2021 (20-22) ft bgs	SJSB072 11215702-072021-SS-SJSB072 (20-22)-R 07/20/2021 (20-22) ft bgs Lab Duplicate	SJSB072 11215702-072021-SS-SJSB072(22-24) 07/20/2021 (22-24) ft bgs	SJSB073 11215702-072021-SS-SJSB073(0-2) 07/20/2021 (0-2) ft bgs	SJSB073 11215702-072021-SS-SJSB073(2-4) 07/20/2021 (2-4) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.49 U	5.3 U	0.046 U	0.49 U	2.3 U	0.88 U	1.3 U	2.6 U	0.88 U	20	440
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	72	190	42	38	89	190	120	130	43	550	3500
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.32 J	10	0.050 U	0.11 U	1.7 J	0.35 U	2.7 J	4.1 J	0.032 U	6.4 J	1000
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2.6 J	8.2	1.8 J	1.9 J	4.1 J	8.4	7.7	5.5 J	1.8 U	33	260
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.14 J	3.4 J	0.056 U	0.13 U	0.85 J	0.033 U	0.92 U	1.3 U	0.037 U	1.5 U	330
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.96 J	33	0.083 J	0.16 J	5.0 J	0.024 U	8.3	12	0.072 J	16	3300
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.22 J	0.26 J	0.20 J	0.16 U	0.32 J	0.31 U	0.31 U	0.25 U	0.31 U	0.092 U	2.7 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.29 J	8.7	0.039 U	0.081 U	1.4 J	0.025 U	2.1 J	3.3 J	0.036 J	3.4 J	820
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.14 J	0.36 J	0.088 U	0.16 U	0.28 J	0.27 J	0.18 J	0.26 U	0.088 J	1.1 J	12
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.89 U	1.3 U	0.85 U	0.77 U	0.84 U	0.050 J	0.039 U	0.25 U	0.053 J	2.8 U	57
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.28 J	0.21 J	0.17 J	0.14 U	0.44 J	0.70 J	0.32 J	0.32 U	0.21 J	0.56 U	5.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.1 J	24	0.30 J	0.41 J	3.1 J	0.028 U	5.6 J	8.8	0.081 J	7.0	1900
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.13 J	1.9 J	0.061 U	0.12 U	0.075 U	0.057 U	0.44 J	0.70 J	0.050 U	0.068 U	190
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 J	0.98 J	0.030 U	0.063 U	0.20 J	0.019 U	0.26 U	0.45 J	0.11 U	0.44 J	83
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.50 J	14	0.073 J	0.10 U	1.5 J	0.028 U	3.1 J	4.7 J	0.035 U	0.98 J	1200
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	25	710	2.7	2.6	70	0.40 J	180	270	1.7	13	77000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.4	260	0.85 J	1.2	25	0.18 J	53	87	0.52 J	4.9	22000
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.57 J	17 J	0.056 U	0.13 U	3.1 J	0.091 J	4.5 J	7.0 J	0.037 U	19 J	1600 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11 J	28 J	8.0 J	6.5 J	15 J	38 J	21 J	18 J	7.3 J	88 J	550 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	51 J	0.94 J	0.94 J	8.2 J	0.050 J	12 J	18 J	0.19 J	29 J	4700 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6 J	3.9 J	5.3 J	2.2 J	5.6 J	13 J	5.7 J	5.7 J	3.1 J	8.7 J	68 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.3 J	60 J	0.38 J	0.41 J	7.0 J	0.031 U	14 J	22 J	0.081 J	13 J	4700 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.39 J	2.2 J	2.0 J	0.19 U	0.82 J	2.4 J	1.7 J	1.8 J	0.56 J	0.52 J	220 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	50 J	1400 J	5.4 J	4.9 J	140 J	0.66 J	320 J	510 J	2.4 J	30 J	120000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.4 J	280 J	4.1 J	1.2 J	28 J	1.8 J	59 J	96 J	0.96 J	4.9 J	24000 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	12 J	340 J	1.2 J	1.5 J	33 J	0.46 J	74 J	120 J	0.75 J	9.4 J	31000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	12 J	340 J	1.3 J	1.7 J	34 J	0.52 J	74 J	120 J	0.81 J	9.6 J	31000 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00167

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB073 11215702-072021-SS-SJSB073(4-6) 07/20/2021 (4-6) ft bgs	SJSB073 11215702-072021-SS-SJSB073(6-8) 07/20/2021 (6-8) ft bgs	SJSB073 11215702-072021-SS-SJSB073(8-10) 07/20/2021 (8-10) ft bgs	SJSB073 11215702-072021-SS-SJSB073(10-12) 07/20/2021 (10-12) ft bgs	SJSB073 11215702-072021-SS-SJSB073(12-14) 07/20/2021 (12-14) ft bgs	SJSB073 11215702-072021-SS-SJSB073(14-16) 07/20/2021 (14-16) ft bgs	SJSB073 11215702-072021-SS-SJSB073(16-18) 07/20/2021 (16-18) ft bgs	SJSB074 11215702-072221-SS-SJSB074(0-2) 07/22/2021 (0-2) ft bgs	SJSB074 11215702-072221-SS-SJSB074(2-4) 07/22/2021 (2-4) ft bgs	SJSB074 11215702-072221-DUP-5 07/22/2021 (2-4) ft bgs Field Duplicate	SJSB074 11215702-072221-SS-SJSB074(4-6) 07/22/2021 (4-6) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	350	780 J	1300 J	1.8 U	0.32 U	1.5 U	0.15 U	140	1600	950	600
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2400	10000	19000	160 U	200 U	390	220	2200	41000 J	21000 J	17000 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	770	1700	2800 J+	2.2 U	0.64 U	0.92 U	0.11 U	280	4200 J	1900	1200
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	170	590 J	950 J	9.4	19	24	11	110	4000 J	1800	1700
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	240	520 J	850 J	0.85 U	0.17 U	0.51 U	0.13 U	85	1100	610	420
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2400	5600	8400	6.0	0.82 J	1.8 J	0.97 J	910	9900 J	5900 J	5100 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.2 J	5.4 U	12 U	0.30 U	0.19 U	0.21 U	0.17 U	1.3 J	8.7 J	6.5 J	4.0 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	620	1500	2200	1.3 J	0.46 U	0.64 U	0.38 U	240	2700	1600	1400
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.2 J	41 J	52 J	0.30 U	0.23 U	0.24 U	0.20 U	3.6 J	80	45	32
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	42	100 U	140 U	3.0 U	2.3 U	2.5 U	2.3 U	13	130	86	110
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.2 J	17 U	10 U	0.28 U	1.3 U	1.9 U	0.17 U	2.7 J	25	16	8.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1400	4500	5000	4.5 U	1.9 U	2.7 U	1.6 U	680	5300 J	3900 J	3600 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	130	400 J	460 J	0.24 U	0.25 U	0.15 U	0.13 U	49	480	390	190
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	66	170 J	210 J	0.37 U	0.16 U	0.11 U	0.093 U	28	250	160	160
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	820	2700	2900	2.2 J	0.14 U	0.99 J	0.13 U	370	3300	2600	1500
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	91000	160000	200000	90	3.4	28	5.9	19000 J	180000 J	160000 J	63000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	16000	50000	60000	30	4.1	11	4.5	5600 J	49000 J	41000 J	22000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1200 J	2800 J	4600 J	3.0 J	1.1 J	2.4 J	0.13 U	440 J	6300 J	3200 J	2000 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	350 J	1300 J	2100 J	60 J	77 J	82 J	48 J	230 J	6600 J	3200 J	2700 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	3500 J	8500 J	12000 J	10 J	3.6 J	4.9 J	3.6 J	1300 J	15000 J	8800 J	7800 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	49 J	160 J	210 J	19 J	20 J	23 J	14 J	32 J	450 J	250 J	350 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	3300 J	11000 J	13000 J	7.9 J	1.9 J	3.7 J	1.6 J	1600 J	13000 J	10000 J	7600 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	150 J	400 J	460 J	0.45 U	0.25 U	0.15 U	0.13 U	52 J	600 J	480 J	240 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	78000 J	290000 J	350000 J	210 J	24 J	63 J	24 J	34000 J	210000 J	160000 J	110000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	17000 J	55000 J	66000 J	36 J	5.1 J	11 J	4.5 J	6100 J	54000 J	46000 J	24000 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	26000 J	68000 J	83000 J	41 J	4.7 J	15 J	5.4 J	7800 J	70000 J	59000 J	30000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	26000 J	68000 J	83000 J	41 J	5.2 J	15 J	5.6 J	7800 J	70000 J	59000 J	30000 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00168

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB074 11215702-072221-SS-SJSB074(6-8) 07/22/2021 (6-8) ft bgs	SJSB074 11215702-072221-SS-SJSB074(8-10) 07/22/2021 (8-10) ft bgs	SJSB074 11215702-072221-SS-SJSB074(10-12) 07/22/2021 (10-12) ft bgs	SJSB074 11215702-072221-SS-SJSB074(12-14) 07/22/2021 (12-14) ft bgs	SJSB074 11215702-072221-SS-SJSB074(14-16) 07/22/2021 (14-16) ft bgs	SJSB074 11215702-072221-SS-SJSB074(16-18) 07/22/2021 (16-18) ft bgs	SJSB075 11215702-072021-SS-SJSB075(4-6) 07/20/2021 (4-6) ft bgs	SJSB075 11215702-072021-SS-SJSB075(10-12) 07/20/2021 (10-12) ft bgs	SJSB075 11215702-072021-SS-SJSB075(12-14) 07/20/2021 (12-14) ft bgs	SJSB075 11215702-072021-SS-SJSB075(14-16) 07/20/2021 (14-16) ft bgs	SJSB075 11215702-072021-SS-SJSB075(16-18) 07/20/2021 (16-18) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	7.1 J	0.38 U	0.32 U	0.32 U	0.34 U	0.14 U	970 U	3.0 U	0.11 U	1.1 U	0.10 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1200	82	58	55	51	200	11000 U	130 U	52 U	240 U	190 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	4.3 J	0.22 U	0.16 U	0.13 U	0.42 U	0.14 U	2300	5.4 J	0.096 U	0.48 U	0.48 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	34	2.9 J	1.8 J	2.2 J	2.2 J	9.6	660	7.0 U	1.9 U	15 U	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.87 J	0.063 U	0.059 U	0.099 U	0.12 U	0.027 U	710	2.5 J	0.10 U	0.19 U	0.30 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	7.8	0.44 J	0.28 U	0.13 U	0.38 J	0.067 J	8400	25	0.33 J	0.41 J	0.90 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.55 U	0.20 U	0.19 U	0.11 U	0.25 U	0.26 U	6.3 U	0.30 U	0.25 U	0.28 U	0.37 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.3 J	0.12 U	0.13 U	0.054 U	0.20 U	0.019 U	2100	6.3	0.32 U	0.14 U	0.34 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.98 J	0.082 U	0.074 J	0.11 U	0.19 J	0.27 J	34 J	0.39 J	0.10 U	0.62 J	0.43 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.085 U	0.036 U	0.11 U	0.11 U	0.19 U	0.22 U	110 U	2.1 U	2.9 U	1.9 U	1.9 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.4 J	0.19 U	0.061 U	0.22 U	0.24 U	0.67 J	9.6 U	0.43 U	0.36 U	1.1 U	0.72 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5.6 J	0.33 J	0.17 J	0.033 U	0.30 J	0.18 J	5500	22	1.7 U	1.4 U	1.4 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.64 J	0.065 U	0.043 U	0.11 J	0.054 U	0.12 J	330 J	1.8 J	0.069 U	0.23 U	0.066 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.32 J	0.035 U	0.024 U	0.056 J	0.10 J	0.016 U	230 J	1.0 J	0.065 U	0.11 U	0.12 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3.6 J	0.20 J	0.12 J	0.032 U	0.16 J	0.056 J	2800	12	0.065 U	0.19 U	0.33 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	200	12	6.2	0.76 U	5.7	0.66 U	130000	690	1.3 U	5.9 U	13
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	63	3.7	2.3	0.26 U	1.8	0.38 J	40000	190	0.98 U	1.8 U	5.0
Total heptachlorodibenzofuran (HpCDF)	pg/g	7.3 J	0.35 J	0.16 J	0.34 J	0.74 J	0.096 J	3800 J	10 J	0.10 U	0.28 J	0.56 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	110 J	13 J	7.1 J	9.6 J	7.6 J	37 J	1500 J	18 J	11 J	43 J	36 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	14 J	0.56 J	0.47 J	0.35 J	0.88 J	0.28 J	12000 J	40 J	4.2 J	2.3 J	3.5 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	21 J	2.7 J	1.4 J	7.9 J	6.8 J	11 J	170 J	5.1 J	4.8 J	15 J	13 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	17 J	0.69 J	0.36 J	0.033 U	0.55 J	0.29 J	13000 J	55 J	2.2 J	1.4 J	2.6 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.1 J	0.17 J	0.18 J	2.9 J	1.8 J	2.4 J	350 J	1.8 J	0.71 J	3.1 J	2.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	370 J	22 J	10 J	1.1 J	7.7 J	1.3 J	230000 J	1300 J	5.0 J	10 J	29 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	69 J	4.0 J	2.7 J	7.9 J	4.6 J	2.0 J	44000 J	220 J	3.7 J	3.2 J	6.6 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	87 J	5.1 J	3.0 J	0.15 J	2.5 J	0.78 J	55000 J	270 J	0.033 J	0.10 J	6.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	87 J	5.1 J	3.1 J	0.37 J	2.6 J	0.84 J	55000 J	270 J	0.88 J	1.8 J	6.7 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00169

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB076 11215702-072221-SS-SJSB076(0-2) 07/22/2021 (0-2) ft bgs	SJSB076 11215702-072221-SS-SJSB076(2-4) 07/22/2021 (2-4) ft bgs	SJSB076 11215702-072221-SS-SJSB076(4-6) 07/22/2021 (4-6) ft bgs	SJSB076 11215702-072221-SS-SJSB076(6-8) 07/22/2021 (6-8) ft bgs	SJSB076 11215702-072221-SS-SJSB076(8-10) 07/22/2021 (8-10) ft bgs	SJSB076 11215702-072221-SS-SJSB076(10-12) 07/22/2021 (10-12) ft bgs	SJSB076 11215702-072221-SS-SJSB076 (10-12)-R 07/22/2021 (10-12) ft bgs Lab Duplicate	SJSB076 11215702-072221-SS-SJSB076(12-14) 07/22/2021 (12-14) ft bgs	SJSB076 11215702-072221-SS-SJSB076(14-16) 07/22/2021 (14-16) ft bgs	SJSB076 11215702-072221-SS-SJSB076(16-18) 07/22/2021 (16-18) ft bgs	SJSB077 11215702-072121-SS-SJSB077(6-8) 07/21/2021 (6-8) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	72	910	1400	3.6 J	0.35 J	2.7 J	1.7 U	0.58 J	0.81 J	0.24 U	1300
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1200	4500	16000 J	150	84	200	170	350	130	400	8900
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	150	2300	2900	6.6 J	0.43 J	5.2 J	3.1 J	1.0 J	0.70 J	0.21 U	2400
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	51 J	350	1200	6.4 J	3.4 J	8.9	8.7	19	10	18	550
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	46	780	1000	2.5 J	0.16 J	1.8 J	0.96 U	0.42 J	0.084 J	0.027 U	770
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	500	8400 J	11000 J	24	1.1 J	19	11	3.0 J	1.1 J	0.39 J	7100
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.96 J	3.6 J	7.0 J	0.051 U	0.28 J	0.071 U	0.24 U	0.61 J	0.31 J	0.45 U	7.4 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	130	2300	3000	6.8	0.30 J	4.4 J	3.0 J	0.87 J	0.31 J	0.13 J	1800
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	18	35	0.054 U	0.19 J	0.082 U	0.24 U	0.85 J	0.34 J	0.53 J	41 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	8.1	140	210	0.14 U	0.13 J	0.35 J	0.26 U	0.046 U	0.065 J	0.23 U	120
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.0 J	9.1 J	13	0.24 J	0.28 J	0.29 J	0.35 U	1.5 J	0.56 J	1.4 J	18 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	310	6000 J	6400 J	17	0.96 J	14	13	2.1 J	0.72 J	0.41 J	4600
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	20	270	420	1.5 J	0.19 J	0.98 J	0.61 J	0.21 U	0.15 J	0.22 J	400
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	16	260	360	0.15 U	0.073 U	0.59 J	0.51 J	0.044 U	0.029 U	0.019 U	220
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	160	2600	3200	9.7	0.54 J	7.5	6.4	0.95 J	0.31 J	0.16 J	2800
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	7600 J	110000 J	150000 J	540	28	360	260	43	9.8	6.5	170000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2100 J	36000 J	45000 J	150	7.9	110	82	15	3.5	2.2	44000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	230 J	3600 J	4600 J	11 J	0.72 J	8.5 J	5.1 J	1.7 J	0.90 J	0.32 J	3900 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	690 J	2200 J	19 J	12 J	24 J	22 J	69 J	26 J	77 J	1100 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	740 J	13000 J	16000 J	31 J	1.5 J	27 J	17 J	3.8 J	1.7 J	0.76 J	10000 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	22 J	110 J	260 J	3.6 J	3.9 J	3.4 J	3.7 J	17 J	7.5 J	21 J	190 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	720 J	13000 J	16000 J	38 J	2.1 J	32 J	33 J	4.0 J	1.5 J	0.81 J	11000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	22 J	300 J	420 J	1.5 J	0.40 J	0.98 J	0.87 J	0.68 J	0.66 J	4.2 J	400 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	13000 J	160000 J	230000 J	930 J	51 J	640 J	490 J	78 J	19 J	11 J	240000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2300 J	40000 J	50000 J	160 J	8.8 J	120 J	92 J	17 J	4.5 J	5.7 J	48000 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3000 J	49000 J	63000 J	210 J	11 J	150 J	110 J	21 J	5.2 J	3.7 J	63000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3000 J	49000 J	63000 J	210 J	11 J	150 J	110 J	21 J	5.2 J	3.7 J	63000 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00170

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB077 11215702-072121-DUP-3 07/21/2021 (6-8) ft bgs Field Duplicate	SJSB077 11215702-072121-SS-SJSB077(8-10) 07/21/2021 (8-10) ft bgs	SJSB077 11215702-072121-SS-SJSB077(10-12) 07/21/2021 (10-12) ft bgs	SJSB077 11215702-072121-SS-SJSB077 (10-12)-R 07/21/2021 (10-12) ft bgs Lab Duplicate	SJSB077 11215702-072121-SS-SJSB077(12-14) 07/21/2021 (12-14) ft bgs	SJSB077 11215702-072121-SS-SJSB077 (12-14)-R 07/21/2021 (12-14) ft bgs Lab Duplicate	SJSB077 11215702-072121-SS-SJSB077(14-16) 07/21/2021 (14-16) ft bgs	SJSB077 11215702-072121-SS-SJSB077 (14-16)-R 07/21/2021 (14-16) ft bgs Lab Duplicate	SJSB077 11215702-072121-SS-SJSB077(16-18) 07/21/2021 (16-18) ft bgs	SJSB078 11215702-072121-SS-SJSB078(0-2) 07/21/2021 (0-2) ft bgs	SJSB078 11215702-072121-SS-SJSB078(2-4) 07/21/2021 (2-4) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1400	1700	1.4 J	2.0 U	0.95 J	0.87 U	8.3 J	5.4 J	0.83 J	560 J	1100 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	9700	10000	100	150	73	120	480	480	89	5600	15000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2500	3900	2.1 J	3.4 J	0.84 J	1.0 U	14	11	0.32 J	1300	2300
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	610	720	4.4 J	8.7	2.7 J	5.7 J	21	27	3.9 J	440 J	1100
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	760	1000	0.67 J	1.3 U	0.33 J	0.41 U	4.5 J	3.6 J	0.18 J	480 J	730 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	8700	9800	6.9	14	2.2 J	3.5 J	41	36	0.033 U	4700	7100
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.6 J	5.2 J	0.32 J	0.31 U	0.17 U	0.26 U	0.24 U	0.41 U	0.077 U	38 J	5.8 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2300	2500	1.8 J	3.3 J	0.74 J	0.98 J	11	8.1	0.032 U	1200	1800
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	48 J	37 J	0.13 U	0.20 U	0.18 U	0.15 U	0.27 U	0.48 J	0.088 U	4.5 U	6.4 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	140	160	0.075 U	0.31 U	0.050 U	0.14 U	0.25 U	0.57 J	0.031 U	22 U	37 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	13 J	12 J	0.11 U	0.27 U	0.16 U	0.21 U	0.24 U	0.39 U	0.076 U	4.0 U	5.7 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5400	5900	5.1 J	9.5	1.6 J	2.1 J	27	22	0.038 U	3100	3300
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	460	530	0.091 U	0.98 J	0.077 U	0.23 J	2.4 J	1.9 J	0.069 U	170 J	260 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	280	280	0.077 U	0.42 J	0.050 U	0.18 U	1.4 J	1.0 J	0.031 U	170 J	170 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3200	3500	2.5 J	6.4	1.1 J	1.2 J	16	15	0.040 U	1700	1800
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	140000 J	200000 J	100	340	48	51	730 J	690 J	1.0 U	80000	190000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	44000 J	54000 J	38	110	18	17	260	250	0.058 U	24000	26000
Total heptachlorodibenzofuran (HpCDF)	pg/g	4000 J	5900 J	3.3 J	6.1 J	1.2 J	1.8 J	23 J	18 J	0.65 J	2100 J	3700 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1300 J	1500 J	17 J	23 J	9.9 J	19 J	74 J	66 J	16 J	820 J	2300 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	13000 J	14000 J	8.7 J	21 J	3.0 J	5.6 J	58 J	51 J	0.033 U	6500 J	9500 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	200 J	190 J	8.4 J	9.6 J	3.3 J	5.9 J	23 J	14 J	5.2 J	93 J	150 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	13000 J	14000 J	7.6 J	25 J	2.7 J	5.0 J	62 J	56 J	0.072 U	7600 J	7800 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	460 J	530 J	0.14 U	3.9 J	0.077 U	1.5 J	6.0 J	4.2 J	0.34 U	170 J	260 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	250000 J	300000 J	200 J	640 J	100 J	96 J	1400 J	1300 J	1.0 J	160000 J	160000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	48000 J	59000 J	43 J	130 J	20 J	22 J	290 J	270 J	0.74 U	27000 J	28000 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	61000 J	77000 J	50 J	150 J	24 J	23 J	350 J	330 J	0.071 J	33000 J	47000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	61000 J	77000 J	50 J	150 J	24 J	23 J	350 J	330 J	0.21 J	33000 J	47000 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00171

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB078 11215702-072121-SS-SJSB078(4-6) 07/21/2021 (4-6) ft bgs	SJSB078 11215702-072121-SS-SJSB078(6-8) 07/21/2021 (6-8) ft bgs	SJSB078 11215702-072121-SS-SJSB078 (6-8)-R 07/21/2021 (6-8) ft bgs Lab Duplicate	SJSB078 11215702-072121-SS-SJSB078(8-10) 07/21/2021 (8-10) ft bgs	SJSB078 11215702-072121-SS-SJSB078 (8-10)-R 07/21/2021 (8-10) ft bgs Lab Duplicate	SJSB078 11215702-072121-SS-SJSB078(10-12) 07/21/2021 (10-12) ft bgs	SJSB078 11215702-072121-SS-SJSB078 (10-12)-R 07/21/2021 (10-12) ft bgs Lab Duplicate	SJSB078 11215702-072121-SS-SJSB078(12-14) 07/21/2021 (12-14) ft bgs	SJSB078 11215702-072121-SS-SJSB078(14-16) 07/21/2021 (14-16) ft bgs	SJSB078 11215702-072121-DUP-2 07/21/2021 (14-16) ft bgs Field Duplicate	SJSB078 11215702-072121-SS-SJSB078(16-18) 07/21/2021 (16-18) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1200	0.74 J	2.1 U	1.7 J	1.5 U	3.1 J	1.5 U	0.073 U	0.069 U	0.33 U	4.4 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	12000	91 J	200 J	92	130	320	280	89	100	130	240
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2300	0.33 J	3.3 J	1.6 J	2.2 U	2.5 J	2.0 U	0.69 J	0.21 J	0.19 U	4.5 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	710	3.1 J	6.4 J	4.4 J	8.0	9.1	9.4	2.7 J	4.9 J	6.3	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	730	0.050 U	0.85 U	0.64 J	0.65 U	0.94 J	0.73 U	0.21 J	0.047 U	0.18 U	1.1 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	8200	1.6 J	8.8	5.1 J	6.2	9.9	7.6	1.7 J	0.58 J	0.89 J	13
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	6.2 J	0.093 U	0.35 U	0.056 U	0.22 U	0.17 U	0.28 U	0.090 U	0.081 U	0.28 U	0.10 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2100	0.50 J	2.7 J	1.5 J	1.8 J	2.3 J	2.3 J	0.52 J	0.030 U	0.12 U	3.4 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	45 J	0.11 U	0.29 U	0.065 U	0.26 U	0.20 U	0.29 U	0.11 U	0.088 U	0.29 U	0.11 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	160	0.033 U	0.27 U	0.063 U	0.13 U	0.092 U	0.19 U	0.033 U	0.029 U	0.11 U	0.38 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	14 J	0.093 U	0.45 U	0.056 U	0.26 U	0.17 U	0.37 U	0.090 U	0.078 U	0.26 U	0.098 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5300	1.8 J	8.0	4.4 J	5.6 J	7.1	7.4	1.3 J	0.48 J	0.17 U	8.1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	440	0.071 U	0.97 J	0.51 J	0.56 J	0.076 U	0.62 J	0.068 U	0.089 U	0.41 UJ	1.1 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	270	0.029 U	0.42 J	0.061 U	0.21 J	0.082 U	0.28 J	0.031 U	0.028 U	0.11 U	0.32 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3300	1.0 J	4.8 J	2.6 J	3.4 J	3.7 J	3.8 J	0.071 U	0.032 U	0.17 U	4.8 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	250000	66 J	290 J	150	250	200	250	32	15	22	230
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	58000	25 J	110 J	47	74	68	83	12	5.6	9.6	92
Total heptachlorodibenzofuran (HpCDF)	pg/g	4000 J	0.64 J	5.7 J	2.8 J	3.8 J	4.5 J	3.8 J	1.1 J	0.21 J	0.19 U	7.7 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1600 J	13 J	25 J	13 J	22 J	34 J	32 J	15 J	19 J	27 J	31 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	12000 J	2.1 J	14 J	6.6 J	9.3 J	13 J	11 J	2.2 J	0.58 J	0.89 J	20 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	220 J	3.0 J	6.4 J	3.5 J	4.8 J	5.8 J	6.8 J	2.0 J	8.8 J	11 J	7.3 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	13000 J	4.4 J	20 J	9.3 J	14 J	15 J	17 J	1.3 J	0.48 J	0.29 U	20 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	440 J	0.51 U	2.1 J	0.51 J	1.5 J	0.58 U	1.8 J	0.34 U	2.3 J	0.60 U	2.1 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	320000 J	130 J	570 J	300 J	500 J	380 J	490 J	64 J	26 J	38 J	460 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	63000 J	25 J	120 J	47 J	81 J	68 J	92 J	12 J	8.0 J	9.6 J	100 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	86000 J	32 J	140 J	64 J	100 J	91 J	110 J	16 J	7.3 J	12 J	120 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	86000 J	32 J	140 J	64 J	100 J	91 J	110 J	16 J	7.3 J	12 J	120 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00172

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB078 11215702-072121-SS-SJSB078 (16-18)-R 07/21/2021 (16-18) ft bgs Lab Duplicate	SJSB078 11215702-072121-SS-SJSB078(18-20) 07/21/2021 (18-20) ft bgs	SJSB078 11215702-072121-SS-SJSB078(20-22) 07/21/2021 (20-22) ft bgs	SJSB078 11215702-072121-SS-SJSB078 (20-22)-R 07/21/2021 (20-22) ft bgs Lab Duplicate	SJSB078 11215702-072121-SS-SJSB078(22-24) 07/21/2021 (22-24) ft bgs	SJSB079 11215702-072521-SS-SJSB079(0-2) 07/25/2021 (0-2) ft bgs	SJSB079 11215702-072521-SS-SJSB079(2-4) 07/25/2021 (2-4) ft bgs	SJSB079 11215702-072521-SS-SJSB079(4-6) 07/25/2021 (4-6) ft bgs	SJSB079 11215702-072521-SS-SJSB079(6-8) 07/25/2021 (6-8) ft bgs	SJSB079 11215702-072521-SS-SJSB079(8-10) 07/25/2021 (8-10) ft bgs	SJSB079 11215702-072521-DUP-7 07/25/2021 (8-10) ft bgs Field Duplicate
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.7 U	0.88 U	4.5 J	4.1 J	0.88 U	620	1500	950	1200	1200	1700
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	240	130	240	230	63	5100	12000	5600	6500	9000	11000
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	4.1 J	0.35 U	7.3	6.4	0.35 U	1200	2800	1900	2000	2100	2800
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	8.8	6.3	12	10	2.6 U	410	880	340	470	570	850
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.2 U	0.034 U	2.3 J	2.2 U	0.036 U	420	1000	620	650	640	1300
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	10	0.22 J	22	23	0.070 J	4800	10000	6500	6500	7000	20000
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.25 U	0.31 U	0.31 U	0.32 U	0.045 U	2.0 U	6.4 J	2.2 U	7.0 J	4.9 J	3.8 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.2 J	0.028 U	5.6 J	5.3 J	0.030 U	1200	2500	1700	1700	1900	4400
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.30 U	0.25 J	0.37 J	0.34 J	0.049 U	13 J	27 J	15 J	31 J	32 J	39 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	0.043 J	0.46 J	0.47 J	0.057 J	84 J	130	87 J	100	97 J	300
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.39 U	0.51 J	0.41 J	0.39 U	0.27 J	7.9 J	15 J	2.1 U	9.0 J	9.9 J	12 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	9.1	0.19 J	16	13	0.034 U	3600	5200	4100	4200	4500 J	26000 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.89 J	0.10 J	1.6 J	1.3 J	0.050 U	210	340	200	330	290	320 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.42 J	0.11 U	0.73 J	0.68 J	0.024 U	170	260	210	190	230 J	780 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5.1 J	0.096 J	9.5	8.4	0.033 U	2000	2600	1800	2400	2400 J	11000 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	280	5.0	570 J	450	0.57 J	77000 J	120000 J	70000 J	130000 J	120000 J	120000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	110	1.8	190	150	0.25 J	23000 J	37000 J	19000 J	35000 J	31000 J	31000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	7.9 J	0.14 J	13 J	11 J	0.10 J	1900 J	4500 J	3000 J	3300 J	3400 J	5300 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	28 J	25 J	32 J	32 J	12 J	750 J	1600 J	720 J	1000 J	1200 J	1800 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	16 J	0.28 J	33 J	33 J	0.13 J	7100 J	15000 J	9400 J	9700 J	10000 J	30000 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.2 J	8.8 J	7.4 J	8.1 J	5.0 J	80 J	160 J	80 J	140 J	140 J	170 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	23 J	0.37 J	41 J	34 J	0.034 U	8900 J	12000 J	9200 J	10000 J	11000 J	60000 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.3 J	1.6 J	3.3 J	2.8 J	1.2 J	210 J	340 J	200 J	330 J	290 J	320 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	580 J	8.2 J	1100 J	840 J	0.92 J	130000 J	220000 J	140000 J	240000 J	210000 J	240000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	120 J	2.9 J	210 J	170 J	1.4 J	25000 J	41000 J	21000 J	38000 J	33000 J	34000 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	140 J	2.6 J	260 J	200 J	0.37 J	32000 J	52000 J	28000 J	50000 J	45000 J	50000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	140 J	2.7 J	260 J	200 J	0.42 J	32000 J	52000 J	28000 J	50000 J	45000 J	50000 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00173

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB079 11215702-072521-SS-SJSB079(10-12) 07/25/2021 (10-12) ft bgs	SJSB079 11215702-072521-SS-SJSB079(12-14) 07/25/2021 (12-14) ft bgs	SJSB079 11215702-072521-SS-SJSB079(14-16) 07/25/2021 (14-16) ft bgs	SJSB079 11215702-072521-SS-SJSB079(16-18) 07/25/2021 (16-18) ft bgs	SJSB080 11215702-072221-SS-SJSB080(0-2) 07/22/2021 (0-2) ft bgs	SJSB080 11215702-072221-SS-SJSB080(2-4) 07/22/2021 (2-4) ft bgs	SJSB080 11215702-072221-SS-SJSB080(4-6) 07/22/2021 (4-6) ft bgs	SJSB080 11215702-072221-SS-SJSB080(6-8) 07/22/2021 (6-8) ft bgs	SJSB080 11215702-072221-SS-SJSB080(8-10) 07/22/2021 (8-10) ft bgs	SJSB080 11215702-072221-SS-SJSB080(10-12) 07/22/2021 (10-12) ft bgs	SJSB080 11215702-072221-SS-SJSB080(12-14) 07/22/2021 (12-14) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4.5 J	0.10 U	0.88 J	0.15 U	370	370	220	68	25	0.37 U	0.32 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	100	100	460	240	7000 J	3900	3100	1500	750	57	58
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	6.9	0.24 J	0.68 J	0.068 U	990	710	660	150	57	0.58 U	0.16 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	5.2 J	4.1 J	21	14	530	280	210	120	57	1.9 J	2.9 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	2.3 J	0.11 J	0.35 J	0.060 U	300	210	170	50	16	0.13 U	0.061 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	23	1.4 J	2.0 J	0.049 U	3100	2100	1700	610	160	1.5 J	0.23 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.070 U	0.11 U	0.19 U	0.18 U	3.0 J	2.0 J	1.3 J	0.79 J	0.49 U	0.20 U	0.17 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.8	0.36 J	0.65 J	0.045 U	840	590	460	150	44	0.42 J	0.092 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.075 U	0.12 U	0.23 U	0.21 U	14	8.0 J	5.7 J	3.3 J	1.4 J	0.070 U	0.073 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.61 U	0.038 U	0.11 U	0.042 U	45	32	21	10	2.4 J	0.11 U	0.028 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.067 U	0.11 U	1.4 J	0.18 U	6.3 J	4.3 J	3.3 J	0.24 U	0.81 J	0.062 U	0.22 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	14	1.8 J	1.7 J	0.16 U	1900	1300	810	360	110	0.98 J	0.13 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.4 J	0.11 U	0.16 U	0.37 U	140	94	58	23	9.0	0.055 U	0.055 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.58 J	0.042 U	0.10 U	0.044 U	92	66	38	19	4.7 J	0.038 U	0.027 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	8.1	0.70 J	1.1 J	0.16 U	1000	690	420	180	59	0.46 J	0.042 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	380	6.4	30	1.1 J	47000 J	28000 J	19000 J	7500 J	3300 J	26	2.7
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	140	1.9	12	0.14 U	17000 J	11000 J	6900 J	2300 J	1100 J	9.0	1.1 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	12 J	0.35 J	1.0 J	0.27 U	1500 J	1100 J	930 J	240 J	90 J	0.89 J	0.16 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	13 J	19 J	80 J	54 J	1000 J	540 J	420 J	230 J	140 J	8.9 J	11 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	35 J	1.7 J	2.6 J	0.19 U	4600 J	3200 J	2500 J	900 J	240 J	2.2 J	0.32 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.6 J	12 J	27 J	15 J	99 J	58 J	44 J	25 J	19 J	6.0 J	5.8 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	33 J	3.8 J	2.8 J	0.56 U	4500 J	3000 J	1900 J	830 J	260 J	2.2 J	0.13 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.8 J	0.11 U	3.5 U	2.4 U	170 J	110 J	67 J	27 J	12 J	1.6 J	1.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	730 J	9.7 J	53 J	1.1 J	71000 J	51000 J	33000 J	13000 J	6200 J	48 J	4.5 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	150 J	4.5 J	12 J	1.0 U	19000 J	12000 J	7600 J	2500 J	1300 J	14 J	2.2 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	190 J	3.1 J	16 J	0.32 J	23000 J	14000 J	9200 J	3200 J	1500 J	12 J	1.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	190 J	3.1 J	16 J	0.64 J	23000 J	14000 J	9200 J	3200 J	1500 J	12 J	1.5 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00174

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB080 11215702-072221-SS-SJSB080(14-16) 07/22/2021 (14-16) ft bgs	SJSB080 11215702-072221-SS-SJSB080(16-18) 07/22/2021 (16-18) ft bgs	SJSB080 11215702-072221-DUP-4 07/22/2021 (16-18) ft bgs Field Duplicate	SJSB081 11215702-080521-BN-SJSB081(0-2) 08/05/2021 (0-2) ft bgs	SJSB081 11215702-080521-BN-SJSB081(2-4) 08/05/2021 (2-4) ft bgs	SJSB081 11215702-080521-BN-SJSB081(4-6) 08/05/2021 (4-6) ft bgs	SJSB081 11215702-080521-BN-SJSB081(6-8) 08/05/2021 (6-8) ft bgs	SJSB081 11215702-080521-BN-DUP-13 08/05/2021 (6-8) ft bgs Field Duplicate	SJSB081 11215702-080521-BN-SJSB081(8-10) 08/05/2021 (8-10) ft bgs	SJSB081 11215702-080521-BN-SJSB081 (8-10)-R 08/05/2021 (8-10) ft bgs Lab Duplicate	SJSB081 11215702-080521-BN-SJSB081(10-12) 08/05/2021 (10-12) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.32 U	0.89 U	0.32 U	110 J	730 J+	460	0.85 U	0.72 U	510	320	3.4 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	120	72	72	2700	2500	2600	340	320	2400	2300	240
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.13 U	0.55 U	0.18 U	66 J	1600	830	0.35 J	0.30 U	1000 J	560 J	7.4
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	6.4	3.5 J	3.5 J	110	230	180	15	14	130	110	12
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.055 U	0.22 J	0.051 U	19 J	530 J+	310	0.10 U	0.063 U	400 J	230 J	2.8 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.096 U	1.3 J	0.35 J	220	4700	3100 J	0.60 J	0.29 J	3500 J	1900 J	41 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.12 U	0.28 U	0.22 U	0.99 U	4.9 J	1.8 U	0.38 J	0.33 U	1.2 U	3.9 U	0.27 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.035 U	0.42 J	0.10 U	67 J	1500	850	0.20 J	0.086 J	920 J	400 J	10
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.12 U	0.18 J	0.077 U	1.1 U	14 J	13 J	0.46 J	0.41 U	1.3 U	5.6 J	0.54 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 U	0.31 U	0.023 U	1.4 U	84 J	42	0.16 J	0.11 U	56 J	27 J	0.87 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.46 J	0.27 U	0.27 U	0.97 U	7.1 J	9.3 J	0.86 J	0.80 U	4.5 J	4.8 U	1.1 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.038 U	1.1 J	0.27 J	180	4200	2200	0.52 J	0.27 J	2300 J	800 J	38 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.073 U	0.20 J	0.055 U	14 J	290	260	0.12 U	0.085 U	110	54 J	1.5 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.028 U	0.059 J	0.022 U	8.1 J	180 J	94	0.089 J	0.040 U	96 J	45 J	1.2 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.038 U	0.66 J	0.10 J	110	2200	1400	0.28 J	0.056 U	1000 J	450 J	14
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.1 U	27 J	6.3 J	5600	93000 J	92000 J	8.0	3.2	45000 J	23000 J	530 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.34 U	9.1 J	2.1 J	1700	36000 J	37000 J	3.8	1.4	13000 J	7700 J	210
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.095 J	1.0 J	0.29 J	110 J	2500 J	1300 J	0.35 J	0.73 J	1700 J	930 J	12 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	24 J	12 J	13 J	360 J	470 J	380 J	52 J	58 J	310 J	290 J	48 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.17 J	2.3 J	0.45 J	350 J	7400 J	4700 J	1.1 J	0.45 J	5200 J	2600 J	61 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.7 J	3.6 J	4.5 J	59 J	99 J	79 J	14 J	16 J	57 J	63 J	16 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.038 U	2.4 J	0.49 J	430 J	10000 J	5700 J	0.88 J	0.33 J	5100 J	2000 J	72 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.1 J	0.81 J	0.93 J	14 J	290 J	260 J	0.68 J	2.7 J	110 J	64 J	1.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1.9 J	50 J	11 J	12000 J	170000 J	150000 J	13 J	5.4 J	70000 J	39000 J	1100 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.6 J	10 J	2.6 J	1900 J	40000 J	41000 J	3.8 J	3.5 J	14000 J	8400 J	230 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.15 J	13 J	2.9 J	2300 J	47000 J	47000 J	5.2 J	2.0 J	19000 J	11000 J	280 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.44 J	13 J	3.0 J	2300 J	47000 J	47000 J	5.3 J	2.1 J	19000 J	11000 J	280 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00175

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB081	SJSB081	SJSB081	SJSB081	SJSB082	SJSB082	SJSB082	SJSB082	SJSB082	SJSB082	SJSB082	SJSB082
Sample Identification:		11215702-080521-BN-SJSB081 (10-12)-R	11215702-080521-BN-SJSB081(12-14)	11215702-080521-BN-SJSB081(14-16)	11215702-080521-BN-SJSB081(16-18)	11215702-080921-BN-SJSB082(0-2)	11215702-080921-BN-SJSB082(2-4)	11215702-080921-BN-SJSB082(4-6)	11215702-080921-BN-SJSB082(6-8)	11215702-080921-DUP-16	11215702-080921-BN-SJSB082(8-10)	11215702-080921-BN-SJSB082 (8-10)-R
Sample Date:	Units	08/05/2021	08/05/2021	08/05/2021	08/05/2021	08/09/2021	08/09/2021	08/09/2021	08/09/2021	08/09/2021	08/09/2021	08/09/2021
Sample Depth:		(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(8-10) ft bgs
Parameters		Lab Duplicate								Field Duplicate		Lab Duplicate
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	2.3 U	0.45 U	0.52 U	0.45 U	220 J	8.3 J	17	0.30 U	0.29 U	3.8 J	2.2 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	160	620	690	210	3100	230	350	300	210	940	630
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	4.4 J	0.20 U	0.30 U	0.18 U	300	19	43	0.33 U	0.28 U	2.8 J	0.93 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	8.2	31	35	11	160	7.0	15	16	8.6	30	25
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.9 U	0.062 U	0.068 U	0.071 U	84 J	7.9	16	0.15 U	0.15 U	0.86 U	0.36 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	18 J	0.25 J	0.16 J	0.12 J	960	69 J	170	0.70 J	0.58 J	8.5	2.9 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.35 U	0.64 U	0.61 U	0.29 U	3.0 U	0.33 U	0.44 U	0.40 U	0.33 U	0.48 U	0.50 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.2 J	0.17 J	0.10 J	0.052 U	260	17	43	0.24 J	0.20 J	2.3 J	0.67 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.36 J	0.82 J	0.71 J	0.26 U	7.1 J	0.40 J	0.74 J	0.43 J	0.27 J	0.76 J	0.64 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.41 U	0.20 U	0.18 U	0.11 U	15 J	1.4 J	3.0 J	0.15 U	0.083 U	0.25 U	0.14 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.76 U	2.7 J	3.1 J	1.1 J	5.0 U	0.50 U	0.60 U	0.87 J	0.50 U	1.7 J	1.5 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	12 J	0.22 J	0.068 U	0.17 J	1100	47	130	0.53 J	0.39 J	6.9	2.1 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.0 J	0.31 J	0.15 U	0.096 U	93 J	3.1 J	9.3	0.22 J	0.15 J	0.95 J	0.37 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.57 J	0.052 U	0.040 U	0.036 U	34 J	2.0 J	4.8 J	0.096 J	0.077 J	0.31 J	0.10 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.0	0.068 U	0.069 U	0.052 U	1200	22	71	0.31 J	0.24 J	4.6 J	1.5 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	410	4.3	0.85 J	0.87 J	44000 J	1300 J	3900 J	14	9.7	320 J	110 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	150	1.1 J	0.47 J	0.39 J	10000	520 J	1500 J	5.5	3.9	84 J	29 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	7.5 J	0.20 J	0.30 J	0.14 J	450 J	31 J	70 J	0.54 J	0.49 J	4.7 J	1.8 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	32 J	140 J	150 J	56 J	390 J	35 J	51 J	49 J	33 J	100 J	80 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	26 J	0.61 J	0.44 J	0.20 J	1500 J	100 J	250 J	1.2 J	0.94 J	13 J	4.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	12 J	40 J	48 J	20 J	70 J	14 J	16 J	12 J	8.9 J	23 J	20 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	29 J	0.22 J	0.069 U	0.17 J	3500 J	110 J	320 J	1.2 J	0.63 J	19 J	5.7 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.3 J	6.4 J	8.7 J	3.7 J	110 J	6.0 J	14 J	2.0 J	1.5 J	5.4 J	3.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	740 J	4.6 J	1.8 J	1.6 J	90000 J	2600 J	8200 J	26 J	18 J	610 J	210 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	170 J	7.1 J	8.2 J	3.1 J	11000 J	570 J	1700 J	7.3 J	5.6 J	94 J	34 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	200 J	2.7 J	1.5 J	0.78 J	15000 J	670 J	2000 J	7.7 J	5.4 J	120 J	42 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	200 J	2.8 J	1.7 J	0.87 J	15000 J	670 J	2000 J	7.7 J	5.4 J	120 J	42 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00176

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB082	SJSB082	SJSB082	SJSB082	SJSB083	SJSB083	SJSB083	SJSB083	SJSB083	SJSB083-Waste	SJSB083
Sample Identification:		11215702-080921-BN-SJSB082(10-12)	11215702-080921-BN-SJSB082(12-14)	11215702-080921-BN-SJSB082(14-16)	11215702-080921-BN-SJSB082(16-18)	11215702-072221-BN-SJSB083(0-2)	11215702-072221-BN-SJSB083(2-4)	11215702-072221-BN-SJSB083(4-6)	11215702-072221-BN-SJSB083(6-8)	11215702-072221-BN-SJSB083(8-10)	11215702-072221-BN-SJSB083(8-10)-WC	11215702-072221-BN-SJSB083(10-12)
Sample Date:	Units	08/09/2021	08/09/2021	08/09/2021	08/09/2021	07/22/2021	07/22/2021	07/22/2021	07/22/2021	07/22/2021	07/22/21	07/22/2021
Sample Depth:		(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Parameters												
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.26 U	0.55 U	0.32 U	0.28 J	510	35	3.3 J	0.078 U	530	370	6.5 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	980	600	1000	190	2400	1700	1700	1000	3800	4100	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.22 U	0.43 U	0.28 U	0.27 J	750	69	0.44 J	0.23 J	450	140	12
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	36	23	42	6.8	160	71	77	51	160	180	62
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.033 U	0.058 U	0.15 U	0.16 J	250	23	0.051 U	0.059 U	160	46	5.2 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.30 J	0.24 U	0.29 U	0.40 J	2800	280	1.0 J	0.64 J	1700	500	44
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.53 U	0.49 U	0.69 U	0.29 J	3.2 J	0.31 U	0.93 J	0.78 J	0.70 U	2.1 J	0.89 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 J	0.047 U	0.12 J	0.13 J	760	75	0.36 J	0.041 U	410	140	12
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.74 J	0.57 J	0.87 J	0.20 J	11 J	0.39 U	1.9 J	1.4 J	8.0 J	7.2 J	1.1 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.086 U	0.092 U	0.12 U	0.073 J	49 J	5.0 J	0.024 U	0.038 U	28 J	9.8 J	0.29 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.0 J	1.7 J	2.2 J	0.67 J	5.5 J	3.2 J	4.3 J	3.2 J	5.7 J	8.8 J	3.2 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.23 J	0.051 U	0.20 J	0.12 J	2100	200	0.62 J	0.74 J	980	330	16
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.25 J	0.21 J	0.30 J	0.054 U	210	12	0.15 U	0.15 U	91	31	1.2 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.033 J	0.032 U	0.061 J	0.018 U	87 J	9.0	0.024 U	0.042 U	44	16	0.30 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.15 J	0.053 U	0.16 J	0.034 U	1300	98	0.34 J	0.079 U	560	190	8.1
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	6.0	0.50 U	5.4	1.5	220000	4400	16	29	38000	11000	430
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.2	0.26 U	1.7 J	0.50 J	23000	1700	5.9	9.7	11000	3100	140
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.18 J	0.43 J	0.50 J	0.49 J	1200 J	110 J	0.44 J	0.23 J	740 J	240 J	20 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130 J	91 J	180 J	31 J	380 J	190 J	220 J	120 J	460 J	490 J	180 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.55 J	0.33 J	0.65 J	0.60 J	4200 J	420 J	1.4 J	0.64 J	2400 J	740 J	59 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	28 J	24 J	50 J	12 J	72 J	28 J	67 J	37 J	71 J	92 J	42 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.55 J	0.054 U	0.51 J	0.12 J	5200 J	460 J	0.96 J	0.74 J	2400 J	770 J	34 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.4 J	4.2 J	8.7 J	2.7 J	210 J	14 J	11 J	6.5 J	91 J	37 J	7.6 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	12 J	0.87 J	10 J	2.7 J	160000 J	8200 J	29 J	57 J	67000 J	21000 J	820 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.1 J	2.8 J	7.4 J	2.5 J	25000 J	1800 J	7.8 J	9.7 J	12000 J	3400 J	160 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	4.1 J	0.85 J	3.6 J	0.96 J	46000 J	2200 J	9.8 J	14 J	15000 J	4400 J	200 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	4.1 J	1.1 J	3.7 J	0.99 J	46000 J	2200 J	9.8 J	14 J	15000 J	4400 J	200 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00177

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB083-Waste 11215702-072221-BN-SJSB083(10-12)-WC 07/22/21 (10-12) ft bgs	SJSB083 11215702-072221-BN-SJSB083(12-14) 07/22/2021 (12-14) ft bgs	SJSB083 11215702-072221-BN-SJSB083(14-16) 07/22/2021 (14-16) ft bgs	SJSB083 11215702-072221-BN-SJSB083(16-18) 07/22/2021 (16-18) ft bgs	SJSB083 11215702-072221-BN-SJSB083(18-20) 07/22/2021 (18-20) ft bgs	SJSB084 11215702-072021-BN-SJSB084(0-2) 07/20/2021 (0-2) ft bgs	SJSB084 11215702-072021-BN-SJSB084(2-4) 07/20/2021 (2-4) ft bgs	SJSB084 11215702-072021-BN-SJSB084(4-6) 07/20/2021 (4-6) ft bgs	SJSB084 11215702-072021-BN-SJSB084(6-8) 07/20/2021 (6-8) ft bgs	SJSB084 11215702-072021-BN-SJSB084(8-10) 07/20/2021 (8-10) ft bgs	SJSB084 11215702-072021-BN-SJSB084(10-12) 07/20/2021 (10-12) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.14 U	2.3 J	0.080 U	7.3 J	0.34 U	570	100	6.7 U	1.0 U	6.9 U	1.4 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1100	1300	980	360	19 J	7000	2500	2300	1600	1900	1400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.6 J	1.6 J	0.40 J	0.30 J	0.29 U	320	65	1.2 J	0.45 J	0.27 J	0.23 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	39	51	40	19	1.1 U	270	77	84	63	71	52
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.68 J	0.32 J	0.049 U	0.036 U	0.11 U	110	19	0.46 J	0.076 U	0.080 U	0.062 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.5 J	3.1 J	0.88 J	0.029 U	0.75 J	1100	200	2.8 J	1.4 J	0.25 J	0.24 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.26 U	0.54 J	0.42 J	0.35 J	0.073 U	4.3 J	1.2 J	0.85 J	0.92 J	0.78 J	0.88 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.3 J	0.76 J	0.27 J	0.029 U	0.23 U	300	52	0.85 J	0.57 J	0.15 J	0.055 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.30 U	1.1 J	0.93 J	0.099 U	0.12 U	11	2.4 J	2.0 J	1.6 J	1.7 J	1.1 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.29 J	0.053 U	0.034 U	0.028 U	0.16 U	20	4.6 U	1.2 U	1.1 U	1.0 U	1.1 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.2 J	2.7 J	2.4 J	1.3 J	0.13 U	8.6 J	2.9 J	4.2 J	3.1 J	3.6 J	2.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3.4 J	1.9 J	0.53 J	0.039 U	0.49 J	860	220	2.4 J	1.6 J	0.63 J	0.64 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.58 J	0.14 U	0.16 U	0.11 U	0.14 U	82	21	0.52 J	0.14 U	0.34 J	0.40 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.079 U	0.053 U	0.034 U	0.028 U	0.082 U	35 J	6.7 J	0.092 J	0.098 J	0.049 U	0.042 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.0 J	0.97 J	0.37 J	0.043 U	0.38 J	530	200	1.6 J	0.89 J	0.21 J	0.21 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	95	50	16	1.2 J	12	18000	8100	120	52	8.4	18
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	34	17	6.0	0.11 U	3.3	9600	2300	29	15	2.8	4.0
Total heptachlorodibenzofuran (HpCDF)	pg/g	2.3 J	2.3 J	0.40 J	0.82 J	0.51 J	530 J	110 J	2.5 J	0.67 J	1.0 J	0.44 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	170 J	130 J	54 J	3.3 J	770 J	270 J	240 J	200 J	210 J	190 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	7.1 J	3.8 J	1.1 J	0.029 U	1.4 J	1600 J	300 J	5.8 J	3.4 J	1.4 J	1.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	30 J	39 J	38 J	12 J	1.5 J	130 J	48 J	63 J	47 J	53 J	50 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	6.6 J	2.9 J	0.90 J	0.043 U	1.4 J	2200 J	630 J	6.2 J	3.1 J	1.1 J	1.1 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.0 J	6.2 J	7.6 J	1.6 J	0.56 J	100 J	29 J	11 J	8.4 J	11 J	8.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	180 J	99 J	31 J	1.3 J	24 J	62000 J	22000 J	230 J	100 J	17 J	33 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	38 J	17 J	8.5 J	0.32 U	3.8 J	11000 J	2600 J	38 J	22 J	9.0 J	10 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	47 J	24 J	8.9 J	0.59 J	4.7 J	12000 J	3200 J	45 J	22 J	6.0 J	7.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	47 J	24 J	9.0 J	0.72 J	4.8 J	12000 J	3200 J	45 J	23 J	6.1 J	7.8 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00178

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB084 11215702-072021-BN-SJSB084(12-14) 07/20/2021 (12-14) ft bgs	SJSB084 11215702-072021-BN-SJSB084(14-16) 07/20/2021 (14-16) ft bgs	SJSB084 11215702-072021-BN-SJSB084(16-18) 07/20/2021 (16-18) ft bgs	SJSB085 11215702-072321-BN-SJSB085(0-2) 07/23/2021 (0-2) ft bgs	SJSB085 11215702-072321-BN-SJSB085(2-4) 07/23/2021 (2-4) ft bgs	SJSB085 11215702-072321-BN-SJSB085(4-6) 07/23/2021 (4-6) ft bgs	SJSB085 11215702-072321-BN-SJSB085(6-8) 07/23/2021 (6-8) ft bgs	SJSB085 11215702-072321-BN-SJSB085 (6-8)-R 07/23/2021 (6-8) ft bgs Lab Duplicate	SJSB085 11215702-072321-BN-SJSB085(8-10) 07/23/2021 (8-10) ft bgs	SJSB085 11215702-072321-BN-SJSB085(10-12) 07/23/2021 (10-12) ft bgs	SJSB085 11215702-072321-BN-SJSB085(12-14) 07/23/2021 (12-14) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.84 U	1.7 U	2.8 U	770	13 J	0.88 U	2.5 J	0.31 U	1.1 U	0.66 U	0.64 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1700	1300	1800	5300	1600	1000	2500 J	810 J	750	2100	1700
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.11 U	0.24 J	0.72 J	1200	16	0.64 U	1.3 J	0.49 U	1.0 J	0.24 U	0.20 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	62	56	72	300	59	34	72 J	30 J	24	82	73
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.12 U	0.087 U	0.10 U	380	5.4 J	0.20 U	0.40 U	0.065 U	0.26 U	0.048 U	0.10 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.40 J	0.19 J	0.44 J	3600	54	2.0 J	3.5 J	0.37 U	2.5 J	0.28 J	0.37 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.98 J	1.0 J	0.66 J	4.5 J	0.82 U	0.44 U	0.68 U	0.47 U	0.42 U	1.1 U	0.87 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.21 J	0.12 J	0.25 J	960	14	0.59 J	1.0 J	0.14 U	0.77 J	0.11 U	0.12 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	1.2 J	1.4 J	16	1.7 J	0.68 J	1.5 J	0.80 J	0.53 J	1.7 J	1.9 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.4 U	1.2 U	1.2 U	49	1.1 J	0.12 U	0.044 U	0.10 U	0.12 U	0.20 U	0.12 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.5 J	3.4 J	3.9 J	9.4 J	2.8 J	1.5 J	3.1 J	1.4 U	0.98 J	3.8 J	3.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.73 J	0.55 J	0.62 J	2400	45	1.5 J	2.5 J	0.35 J	1.7 J	0.17 J	0.30 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.54 J	0.16 U	0.14 U	240	4.4 J	0.21 J	0.49 J	0.15 J	0.27 J	0.35 J	0.29 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.078 U	0.052 U	0.050 U	100	1.8 J	0.092 J	0.12 J	0.031 U	0.090 J	0.033 U	0.026 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.23 J	0.11 J	0.15 J	1600	26	0.97 J	1.6 J	0.24 J	0.95 J	0.083 J	0.14 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	8.1	4.7	3.9	98000 J	1700 J	65	97 J	17 J	55	3.4	12
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.8	1.5 J	1.4 J	31000 J	530	19	31 J	4.6 J	18	1.5 J	3.6
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.12 U	0.52 J	1.1 J	1900 J	27 J	1.0 J	2.2 J	0.16 J	1.5 J	0.24 J	0.27 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	220 J	200 J	230 J	710 J	150 J	110 J	200 J	83 J	79 J	240 J	200 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.0 J	1.7 J	1.9 J	5300 J	82 J	3.1 J	5.2 J	0.61 J	3.9 J	0.59 J	0.62 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	58 J	58 J	60 J	130 J	27 J	28 J	45 J	26 J	19 J	57 J	47 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1.2 J	0.79 J	1.1 J	6200 J	110 J	3.7 J	6.4 J	0.86 J	4.1 J	0.35 J	0.69 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	10 J	11 J	13 J	260 J	9.1 J	6.0 J	8.7 J	6.8 J	4.1 J	11 J	9.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	16 J	9.8 J	7.9 J	170000 J	2900 J	120 J	180 J	29 J	100 J	5.4 J	21 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	12 J	12 J	11 J	34000 J	580 J	24 J	38 J	8.9 J	23 J	7.0 J	9.8 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	6.0 J	3.6 J	3.8 J	42000 J	720 J	27 J	44 J	7.4 J	25 J	4.2 J	7.0 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	6.1 J	3.7 J	3.9 J	42000 J	720 J	27 J	44 J	7.4 J	25 J	4.3 J	7.0 J

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00179

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB085 11215702-072321-BN-SJSB085(14-16) 07/23/2021 (14-16) ft bgs	SJSB085 11215702-072321-BN-SJSB085(16-18) 07/23/2021 (16-18) ft bgs	SJSB086 11215702-080421-BN-SJSB086(0-2) 08/04/2021 (0-2) ft bgs	SJSB086 11215702-080421-BN-SJSB086(2-4) 08/04/2021 (2-4) ft bgs	SJSB086 11215702-080421-BN-SJSB086(4-6) 08/04/2021 (4-6) ft bgs	SJSB086 11215702-080421-BN-SJSB086(6-8) 08/04/2021 (6-8) ft bgs	SJSB086 11215702-080421-BN-DUP-12 08/04/2021 (6-8) ft bgs Field Duplicate	SJSB086 11215702-080421-BN-SJSB086(8-10) 08/04/2021 (8-10) ft bgs	SJSB086 11215702-080421-BN-SJSB086(10-12) 08/04/2021 (10-12) ft bgs	SJSB086 11215702-080421-BN-SJSB086(12-14) 08/04/2021 (12-14) ft bgs	SJSB086 11215702-080421-BN-SJSB086(14-16) 08/04/2021 (14-16) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.8 U	0.52 U	0.45 U	1.9 U	0.48 U	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1600	1300	580	1300	700	880	490	1700	1400	760	1800
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.85 U	0.28 U	0.31 U	1.0 U	0.18 U	0.18 U	0.27 U	0.18 U	0.25 U	0.27 U	0.18 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	66	51	25	69	38	30	17	70	66	35	72
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.20 U	0.071 U	0.075 U	0.43 J	0.058 U	0.069 U	0.053 U	0.063 U	0.062 U	0.057 U	0.045 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.86 J	0.67 J	0.32 J	0.52 J	0.054 J	0.040 U	0.18 J	0.049 U	0.065 U	0.43 J	0.23 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.73 U	0.82 U	0.60 U	0.61 U	0.55 U	0.45 U	0.37 U	0.92 U	1.0 U	0.42 U	0.99 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.26 U	0.27 J	0.17 J	0.38 J	0.084 J	0.040 U	0.084 J	0.080 J	0.067 U	0.21 J	0.11 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.6 J	1.2 J	0.94 J	1.4 J	0.97 J	0.67 J	0.48 U	1.8 J	1.8 J	0.78 J	1.7 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 U	0.13 U	0.20 U	0.25 U	0.13 U	0.13 U	0.12 U	0.13 U	0.16 U	0.11 U	0.13 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.6 J	2.8 J	1.9 J	2.9 J	2.0 J	1.3 J	0.89 J	3.9 J	4.2 J	1.7 J	3.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.70 J	0.58 J	0.47 J	0.51 J	0.042 U	0.069 J	0.36 J	0.052 U	0.070 U	0.30 J	0.14 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.37 J	0.39 J	0.27 J	0.27 J	0.19 J	0.17 J	0.14 J	0.14 U	0.32 J	0.21 J	0.32 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.10 J	0.048 U	0.089 U	0.10 U	0.069 U	0.069 U	0.069 U	0.035 U	0.076 U	0.045 U	0.031 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.33 J	0.31 J	0.21 J	0.18 J	0.042 U	0.051 U	0.11 J	0.050 U	0.072 U	0.18 J	0.053 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	21	16	11	0.89 J	0.35 U	0.40 U	1.0 J	0.30 U	0.23 U	6.5	1.7
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.3	5.2	2.7	0.24 J	0.13 J	0.21 J	0.29 J	0.24 J	0.25 J	1.4 J	0.54 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.1 J	0.28 J	0.31 J	2.0 J	0.17 J	0.14 J	0.27 J	0.15 J	0.25 J	0.27 J	0.11 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	190 J	170 J	64 J	140 J	83 J	89 J	61 J	230 J	210 J	83 J	200 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.4 J	1.1 J	0.78 J	1.5 J	0.32 J	0.19 J	0.45 J	0.26 J	0.23 J	0.72 J	0.48 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	46 J	43 J	17 J	24 J	17 J	18 J	14 J	54 J	58 J	17 J	48 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1.5 J	1.4 J	1.1 J	1.5 J	0.14 J	0.069 J	0.46 J	0.052 U	0.073 U	0.48 J	0.14 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.3 J	10 J	2.8 J	2.8 J	2.2 J	2.3 J	1.8 J	8.3 J	9.6 J	2.6 J	7.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	38 J	29 J	19 J	3.1 J	1.0 J	0.88 J	1.6 J	1.0 J	0.73 J	13 J	3.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	13 J	12 J	6.1 J	3.5 J	2.4 J	2.3 J	2.3 J	6.7 J	7.9 J	3.5 J	7.4 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	11 J	8.7 J	4.9 J	2.3 J	1.2 J	1.1 J	1.0 J	2.0 J	2.3 J	3.2 J	2.9 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	11 J	7.6 J	5.0 J	2.3 J	1.3 J	1.2 J	1.1 J	2.2 J	2.3 J	3.2 J	2.9 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00180

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB086 11215702-080421-BN-SJSB086(16-18) 08/04/2021 (16-18) ft bgs	SJSB087 11215702-081021-BN-SJSB087(0-2) 08/10/2021 (0-2) ft bgs	SJSB087 11215702-081021-BN-SJSB087(2-4) 08/10/2021 (2-4) ft bgs	SJSB087 11215702-081021-BN-SJSB087(4-6) 08/10/2021 (4-6) ft bgs	SJSB087 11215702-081021-BN-SJSB087(6-8) 08/10/2021 (6-8) ft bgs	SJSB087 11215702-081021-BN-DUP-17 08/10/2021 (6-8) ft bgs Field Duplicate	SJSB087 11215702-081021-BN-SJSB087(8-10) 08/10/2021 (8-10) ft bgs	SJSB087 11215702-081021-BN-SJSB087(10-12) 08/10/2021 (10-12) ft bgs	SJSB087 11215702-081021-BN-SJSB087(12-14) 08/10/2021 (12-14) ft bgs	SJSB087 11215702-081021-BN-SJSB087 (12-14)-R 08/10/2021 (12-14) ft bgs Lab Duplicate	SJSB087 11215702-081021-BN-SJSB087(14-16) 08/10/2021 (14-16) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.58 U	90	330	48	3.3 U	0.88 U	14	0.88 U	1.9 U	2.6 U	9.9 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1100	2000	4300	2600	830	520	990	1100	300	420	930
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 U	150	810	89	0.92 U	0.35 U	24	0.35 U	3.0 J	2.9 J	20 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	45	89	220	82	29	21	45	40	11	14	36
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.042 U	54	270 J+	30	0.30 U	0.036 U	8.2	0.061 U	0.98 U	0.94 U	9.2
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.064 J	1100	2800	370	0.98 J	0.17 J	66	0.30 J	9.5	8.4	74 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.83 U	1.2 U	2.3 U	1.0 U	0.49 U	0.42 U	0.83 U	0.60 U	0.31 U	0.28 U	0.59 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.034 U	260	710	95	0.33 J	0.068 J	17	0.11 J	2.8 J	2.8 J	18 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.97 J	3.0 J	11 J	2.3 J	0.76 J	0.56 J	1.2 J	1.1 J	0.29 J	0.39 J	0.95 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 U	19	46 J	6.2 J	0.081 J	0.065 J	1.1 J	0.16 J	0.20 J	0.20 U	1.3 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.4 J	2.9 J	6.5 J	3.2 J	1.5 J	1.4 J	2.3 J	2.8 J	0.57 J	0.70 U	2.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.065 J	1200	1800	250	0.58 J	0.13 J	40	0.18 J	7.4	6.7	42 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.23 J	23	130	11	0.086 U	0.13 J	3.1 J	0.15 U	0.64 J	0.64 J	3.1 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.025 U	37	71 J	12	0.046 U	0.024 U	1.8 J	0.045 U	0.39 U	0.39 J	1.9 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.045 U	440	930	100	0.35 J	0.030 U	20	0.084 U	4.3 J	3.8 J	21 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.17 U	12000 J	48000 J	4200 J	22 J	3.3 J	1200 J	5.0	280	270	1100 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.17 J	3100 J	19000 J	1800 J	6.8 J	1.3 J	430	1.7 J	80	75	440 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.28 J	250 J	1300 J	140 J	1.5 J	0.12 J	37 J	0.14 J	4.7 J	4.8 J	35 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	160 J	250 J	490 J	210 J	88 J	74 J	130 J	150 J	33 J	45 J	150 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.15 J	1600 J	4000 J	550 J	1.4 J	0.30 J	96 J	0.57 J	15 J	13 J	110 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	46 J	44 J	83 J	39 J	21 J	18 J	27 J	40 J	8.1 J	10 J	39 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.065 J	2600 J	4100 J	530 J	1.7 J	0.22 J	90 J	0.18 J	17 J	16 J	96 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.1 J	31 J	140 J	18 J	3.8 J	3.7 J	7.7 J	4.3 J	1.7 J	2.5 J	9.2 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.51 J	21000 J	91000 J	7900 J	35 J	6.5 J	2300 J	8.6 J	540 J	540 J	2100 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.9 J	3400 J	21000 J	1900 J	9.7 J	3.6 J	470 J	4.8 J	88 J	83 J	480 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.5 J	4600 J	25000 J	2300 J	10 J	2.4 J	570 J	3.4 J	110 J	110 J	570 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.6 J	4600 J	25000 J	2300 J	10 J	2.4 J	570 J	3.5 J	110 J	110 J	570 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00181

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB087	SJSB087	SJSB088	SJSB088	SJSB088	SJSB088	SJSB088	SJSB088	SJSB088	SJSB088	SJSB088
Sample Identification:		11215702-081021-BN-SJSB087 (14-16)-R	11215702-081021-BN-SJSB087(16-18)	11215702-080621-BN-SJSB088(0-2)	11215702-080621-BN-SJSB088(2-4)	11215702-080621-BN-SJSB088(4-6)	11215702-080621-BN-SJSB088(6-8)	11215702-080621-BN-SJSB088 (6-8)-R	11215702-080621-BN-DUP-14	11215702-080621-BN-SJSB088(8-10)	11215702-080621-BN-SJSB088(10-12)	11215702-080621-BN-SJSB088(12-14)
Sample Date:	Units	08/10/2021	08/10/2021	08/06/2021	08/06/2021	08/06/2021	08/06/2021	08/06/2021	08/06/2021	08/06/2021	08/06/2021	08/06/2021
Sample Depth:		(14-16) ft bgs	(16-18) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs
Parameters		Lab Duplicate						Lab Duplicate	Field Duplicate			
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	27	2.6 U	400	420	970	960	860	1200	1200	0.54 U	0.071 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1400	210	1600	1400 J-	3900	4600	5700	6000	6300	170	150
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	52 J	0.68 U	890	940	2100	2200	2000	2700	2400	0.33 J	0.051 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	52	10	120 J	120 J	300	340	370	420	420	9.5	7.0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	18	0.26 U	310	300 J+	820	700	760	970	770	0.060 U	0.062 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	180 J	0.50 J	2900	2900	7700	7300	9400	9800	7700	0.75 J	0.047 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.86 U	0.35 U	5.5 J	1.6 U	7.0 J	2.9 U	9.2 U	5.5 J	5.4 J	0.11 U	0.34 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	49 J	0.24 U	770	800	2100	1900	2100	2500	2000	0.18 J	0.048 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.6 J	0.38 U	12 J	8.7 J	20 J	30 J	25 J	28 J	29 J	0.12 U	0.28 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	3.2 J	0.17 U	38 J	32 J	110 J	98 J	140	150 J	91 J	0.022 U	0.10 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.4 J	0.90 J	2.0 U	1.4 U	8.2 J	2.6 U	15 U	12 U	12 J	0.10 U	0.57 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	120 J	0.31 U	2100	2300	4900	4500	5800	7000	5200	0.45 J	0.071 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.4 J	0.43 U	300	300 J+	330	320	380	290	300	0.13 U	0.093 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.6 J	0.17 U	81 J	95 J	210 J	210 J	220	290	200 J	0.023 U	0.034 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	54 J	0.32 U	1700	1800	2400	2300	2800	2900	2400	0.18 J	0.075 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2600 J	5.8	130000 J	170000 J	130000 J	120000 J	130000 J	110000 J	130000 J	10	0.79 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1200 J	1.8 J	25000 J	25000 J	35000 J	40000 J	55000 J	49000 J	36000 J	3.9	0.32 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	83 J	0.56 J	1400 J	1400 J	3400 J	3400 J	3300 J	4400 J	3700 J	0.49 J	0.062 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	190 J	44 J	250 J	250 J	640 J	700 J	750 J	910 J	850 J	35 J	33 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	260 J	0.50 J	4300 J	4300 J	11000 J	10000 J	13000 J	14000 J	11000 J	0.93 J	0.10 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	45 J	15 J	59 J	31 J	110 J	140 J	160 J	150 J	140 J	11 J	11 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	260 J	0.35 U	6000 J	6400 J	92000 J	11000 J	14000 J	15000 J	12000 J	0.78 J	0.075 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	13 J	2.1 J	300 J	300 J	330 J	320 J	430 J	320 J	300 J	0.13 U	2.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	5500 J	7.8 J	160000 J	200000 J	190000 J	180000 J	320000 J	200000 J	190000 J	17 J	1.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1300 J	3.1 J	28000 J	27000 J	39000 J	45000 J	62000 J	53000 J	39000 J	3.9 J	2.0 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1500 J	2.7 J	39000 J	43000 J	50000 J	54000 J	71000 J	63000 J	51000 J	5.2 J	0.58 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1500 J	3.0 J	39000 J	43000 J	50000 J	54000 J	71000 J	63000 J	51000 J	5.3 J	0.68 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00182

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB088 11215702-080621-BN-SJSB088(14-16) 08/06/2021 (14-16) ft bgs	SJSB088 11215702-080621-BN-SJSB088(16-18) 08/06/2021 (16-18) ft bgs	SJSB088 11215702-080621-BN-SJSB088 (16-18)-R 08/06/2021 (16-18) ft bgs Lab Duplicate	SJSB088 11215702-080621-BN-SJSB088(18-20) 08/06/2021 (18-20) ft bgs	SJSB088 11215702-080621-BN-SJSB088(20-22) 08/06/2021 (20-22) ft bgs	SJSB088 11215702-080621-BN-SJSB088(22-24) 08/06/2021 (22-24) ft bgs	SJSB089 11215702-080721-BN-SJSB089(0-2) 08/07/2021 (0-2) ft bgs	SJSB089 11215702-080721-BN-SJSB089(2-4) 08/07/2021 (2-4) ft bgs	SJSB089 11215702-080721-BN-SJSB089(4-6) 08/07/2021 (4-6) ft bgs	SJSB089 11215702-080721-BN-SJSB089(6-8) 08/07/2021 (6-8) ft bgs	SJSB089 11215702-080721-BN-DUP-19 08/07/2021 (6-8) ft bgs Field Duplicate
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.39 U	9.2 U	20	0.40 U	0.17 U	0.20 U	28	1.3 U	0.39 U	0.39 U	0.39 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	390	150 J	280 J	220	290	210	1900	480	910	1100	1600 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.13 U	17 J	57	0.26 U	0.26 U	0.21 U	41	2.1 J	0.35 U	0.16 U	0.14 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	20	8.4 J	16	11	16	11	55	17	41	48	72
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.061 U	6.6 J	23	0.14 U	0.077 U	0.0030 U	13	0.74 J	0.16 J	0.072 U	0.081 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.14 U	64 J	260 J	0.64 J	0.28 J	0.23 U	100	7.6	0.99 J	0.087 U	0.18 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.36 J	0.43 U	0.39 U	0.040 U	0.70 J	0.34 J	0.85 J	0.43 J	0.58 J	0.74 J	0.84 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 U	16 J	54	0.18 U	0.0075 U	0.21 U	27	2.0 J	0.28 J	0.11 J	0.11 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.44 J	0.44 U	0.79 J	0.38 J	0.66 J	0.035 U	1.5 J	0.52 J	0.85 J	1.4 J	1.8 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.094 U	1.5 U	3.2 J	0.14 U	0.14 U	0.0030 U	1.8 J	0.17 U	0.11 U	0.18 U	0.11 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.1 J	0.40 U	0.82 U	0.042 U	0.84 J	0.52 J	2.3 J	1.1 J	2.4 J	3.0 J	3.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.054 U	40 J	130 J	0.90 J	0.28 U	0.32 U	62	4.3 J	0.96 J	0.063 U	0.072 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.098 U	2.9 J	7.8	0.14 J	0.11 J	0.33 J	4.6 J	0.45 J	0.23 J	0.36 J	0.31 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.035 U	1.8 J	5.3 J	0.083 U	0.086 U	0.0025 U	3.0 J	0.22 U	0.064 U	0.037 U	0.042 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.056 U	19 J	75	0.66 J	0.22 U	0.25 U	32	2.0 J	0.64 J	0.065 U	0.075 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.2 J	930 J	3600 J	2.6	3.5	0.77 J	1600 J	110	37	1.0 J	2.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.51 J	410 J	1400 J	1.8	1.2 J	0.36 J	630 J	39	13	0.71 J	1.1 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.11 J	28 J	95 J	0.55 J	0.42 J	0.32 J	63 J	3.4 J	0.66 J	0.16 J	0.14 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	96 J	29 J	47 J	49 J	81 J	54 J	170 J	68 J	120 J	150 J	220 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.24 J	90 J	360 J	1.2 J	0.65 J	0.60 J	160 J	11 J	1.6 J	0.38 J	0.41 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	35 J	9.5 J	13 J	20 J	30 J	19 J	37 J	21 J	33 J	39 J	47 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.060 U	94 J	320 J	2.6 J	0.79 J	0.66 J	160 J	9.8 J	2.3 J	0.066 U	0.079 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.4 J	3.8 J	9.5 J	2.8 J	8.7 J	6.3 J	10 J	5.0 J	7.4 J	8.1 J	7.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2.1 J	2000 J	6700 J	13 J	7.9 J	1.4 J	3600 J	210 J	70 J	2.2 J	4.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.8 J	440 J	1600 J	3.1 J	4.4 J	5.2 J	690 J	45 J	18 J	5.0 J	5.4 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	1.2 J	520 J	1800 J	2.5 J	2.2 J	1.0 J	820 J	53 J	18 J	2.5 J	3.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.3 J	520 J	1800 J	2.5 J	2.2 J	1.1 J	820 J	53 J	18 J	2.5 J	3.5 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00183

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB089 11215702-080721-BN-DUP-19-R 08/07/2021 (6-8) ft bgs Lab Duplicate	SJSB089 11215702-080721-BN-SJSB089(8-10) 08/07/2021 (8-10) ft bgs	SJSB089 11215702-080721-BN-SJSB089 (8-10)-R 08/07/2021 (8-10) ft bgs Lab Duplicate	SJSB089 11215702-080721-BN-SJSB089(10-12) 08/07/2021 (10-12) ft bgs	SJSB089 11215702-080721-BN-SJSB089 (10-12)-R 08/07/2021 (10-12) ft bgs Lab Duplicate	SJSB089 11215702-080721-BN-SJSB089(12-14) 08/07/2021 (12-14) ft bgs	SJSB089 11215702-080721-BN-SJSB089(14-16) 08/07/2021 (14-16) ft bgs	SJSB089 11215702-080721-BN-SJSB089(16-18) 08/07/2021 (16-18) ft bgs	SJSB090 11215702-080221-BN-SJSB090(0-2) 08/02/2021 (0-2) ft bgs	SJSB090 11215702-080221-BN-SJSB090(2-4) 08/02/2021 (2-4) ft bgs	SJSB090 11215702-080221-BN-SJSB090(4-6) 08/02/2021 (4-6) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.38 U	0.92 U	0.92 U	1.2 U	0.45 U	0.067 U	0.11 U	0.39 U	820	170 J-	11 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	940 J	770	740	390 J	210 J	66	940	25	5100	1600	850
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.49 U	1.6 J	1.4 U	1.9 J	0.56 U	0.13 U	0.069 U	0.041 U	2000	390 J-	20
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	48	27	32	14	8.1	2.5 J	40	0.94 U	360	83	54
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.36 U	0.51 J	0.54 U	0.64 J	0.36 U	0.056 U	0.085 U	0.053 U	650	130 J-	7.4
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.20 U	5.5 J	5.3 J	5.1 J	2.0 J	0.25 U	0.066 U	0.056 U	6800	1000	73
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.93 U	0.38 J	0.45 U	0.26 J	0.28 U	0.24 J	0.61 J	0.24 J	4.8 J	0.84 J	0.68 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.13 U	1.5 J	1.2 J	1.4 J	0.48 J	0.050 J	0.065 U	0.054 U	1800	240 J-	18
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.6 J	0.65 J	0.89 J	0.35 J	0.24 U	0.098 J	1.2 J	0.060 U	25	4.0 J	1.5 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 U	0.17 U	0.16 U	0.14 U	0.11 U	0.032 U	0.13 U	0.039 U	110 J	9.6	1.4 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.4 J	1.5 J	1.8 J	0.81 J	0.53 U	0.21 U	4.4 J	0.12 U	9.5 J	2.4 J	2.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.14 J	4.9 J	3.0 J	2.6 J	1.2 J	0.15 J	0.076 U	0.055 U	5000	410 J-	57
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.35 J	0.34 J	0.44 J	0.34 J	0.20 J	0.069 U	0.29 J	0.075 U	320	35	5.3 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.060 U	0.22 U	0.18 U	0.14 U	0.11 U	0.033 U	0.048 U	0.040 U	200	18	2.1 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.090 J	2.1 J	1.7 J	1.3 J	0.68 J	0.050 U	0.079 U	0.057 U	2600	230 J-	34
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2.7	100	84	70 J	38 J	3.7	1.1 J	0.60 J	110000 J	12000 J	2000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.0 J	39	32	25 J	14 J	1.5	0.60 J	0.24 J	49000 J	5100 J	700 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.30 J	2.6 J	2.4 J	3.1 J	0.98 J	0.13 J	0.085 U	0.053 U	3100 J	610 J	36 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	90 J	98 J	49 J	28 J	8.9 J	160 J	3.0 J	740 J	190 J	120 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.55 J	8.3 J	7.6 J	7.6 J	3.0 J	0.30 J	0.13 J	0.056 U	9800 J	1400 J	100 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	43 J	21 J	27 J	13 J	7.5 J	3.1 J	47 J	1.5 J	180 J	40 J	26 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.23 J	11 J	7.2 J	5.9 J	2.8 J	0.15 J	0.090 U	0.060 U	12000 J	1000 J	140 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.7 J	4.1 J	4.6 J	1.9 J	1.2 J	0.64 J	9.1 J	0.25 U	330 J	39 J	8.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	4.7 J	200 J	160 J	140 J	64 J	7.2 J	2.0 J	0.89 J	220000 J	25000 J	3600 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.3 J	45 J	37 J	29 J	15 J	2.1 J	7.4 J	0.60 J	56000 J	5800 J	780 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	3.1 J	52 J	43 J	34 J	19 J	1.0 J	2.3 J	0.33 J	62000 J	6600 J	930 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	3.1 J	52 J	43 J	34 J	19 J	2.0 J	2.3 J	0.40 J	62000 J	6600 J	930 J

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00184

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB090 11215702-080221-BN-SJSB090(6-8) 08/02/2021 (6-8) ft bgs	SJSB090 11215702-080221-BN-DUP-11 08/02/2021 (6-8) ft bgs Field Duplicate	SJSB090 11215702-080221-BN-SJSB090(8-10) 08/02/2021 (8-10) ft bgs	SJSB090 11215702-080221-BN-SJSB090 (8-10)-R 08/02/2021 (8-10) ft bgs Lab Duplicate	SJSB090 11215702-080221-BN-SJSB090(10-12) 08/02/2021 (10-12) ft bgs	SJSB090 11215702-080221-BN-SJSB090(12-14) 08/02/2021 (12-14) ft bgs	SJSB090 11215702-080221-BN-SJSB090(14-16) 08/02/2021 (14-16) ft bgs	SJSB090 11215702-080221-BN-SJSB090(16-18) 08/02/2021 (16-18) ft bgs	SJSB091 11215702-080321-BN-SJSB091(0-2) 08/03/2021 (0-2) ft bgs	SJSB091 11215702-080321-BN-SJSB091(2-4) 08/03/2021 (2-4) ft bgs	SJSB091 11215702-080321-BN-SJSB091(4-6) 08/03/2021 (4-6) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.67 U	0.67 U	3.3 U	5.0 J	0.67 U	1.8 U	0.67 U	0.88 U	3.3 U	0.67 U	0.67 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	250	280	630	490	1400	890	780	780	4400	770	340
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.22 U	0.057 U	7.8	12	0.23 J	1.9 J	0.45 J	0.12 U	0.50 J	0.21 J	0.21 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11	12	28	28	59	36	31	31	130	32	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.25 U	0.062 U	2.8 J	4.2 J	0.049 U	0.83 J	0.050 U	0.14 U	0.14 U	0.045 U	0.044 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.88 J	0.25 J	31	48	0.54 J	4.8 J	0.61 J	0.13 U	1.1 J	0.51 J	0.35 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.55 J	0.33 J	0.49 J	0.40 U	0.76 J	0.55 J	0.57 J	0.84 J	1.5 J	0.58 J	0.33 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.21 U	0.11 J	8.2	13	0.14 J	1.1 J	0.19 J	0.14 U	0.39 J	0.19 J	0.12 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.39 J	0.44 J	0.75 J	0.68 J	1.3 J	0.81 J	0.72 J	0.89 J	3.0 J	0.91 J	0.28 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.14 U	0.11 J	0.66 J	0.89 J	0.14 J	0.17 J	0.10 J	0.10 J	0.19 J	0.080 J	0.080 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.27 U	0.75 J	1.5 J	1.3 J	3.2 J	1.8 J	1.8 J	2.8 J	5.6 J	2.1 J	0.57 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.71 J	0.19 J	29	42	0.51 J	0.86 J	0.28 J	0.17 U	1.1 J	0.56 J	0.31 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.38 U	0.089 U	1.7 J	2.8 J	0.31 J	0.22 J	0.075 U	0.23 U	0.26 U	0.31 J	0.11 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 U	0.048 U	1.0 J	1.5 J	0.033 U	0.092 J	0.027 U	0.096 U	0.076 U	0.040 J	0.065 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.27 U	0.16 J	15	21	0.19 J	0.39 J	0.18 J	0.17 U	0.50 J	0.23 J	0.23 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	12	4.9	620 J	1200 J	7.5	16	7.4	2.9	31	11	14
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.5	1.9	190 J	420 J	2.5	5.5	2.3	0.87 J	8.6	4.2	3.2
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.25 U	0.062 U	13 J	20 J	0.23 J	3.3 J	0.45 J	0.14 U	0.50 J	0.21 J	0.21 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	36 J	47 J	73 J	71 J	190 J	110 J	120 J	120 J	300 J	83 J	38 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.88 J	0.47 J	45 J	72 J	0.83 J	6.5 J	0.90 J	0.11 U	1.7 J	0.82 J	0.62 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.1 J	13 J	16 J	16 J	48 J	26 J	28 J	35 J	51 J	21 J	11 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.71 J	0.35 J	70 J	99 J	0.92 J	2.0 J	0.79 J	0.19 U	2.8 J	2.1 J	0.75 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.38 U	1.3 J	3.7 J	4.7 J	7.3 J	4.1 J	3.0 J	4.3 J	5.0 J	4.5 J	1.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	23 J	8.0 J	1100 J	2500 J	14 J	29 J	14 J	4.2 J	58 J	25 J	32 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.5 J	2.8 J	210 J	470 J	8.6 J	8.9 J	5.5 J	4.5 J	12 J	9.5 J	5.4 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	6.1 J	2.9 J	260 J	560 J	5.3 J	9.1 J	4.1 J	2.2 J	16 J	6.7 J	5.2 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	6.4 J	2.9 J	260 J	560 J	5.3 J	9.1 J	4.1 J	2.3 J	16 J	6.7 J	5.2 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00185

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB091 11215702-080321-BN-SJSB091(6-8) 08/03/2021 (6-8) ft bgs	SJSB091 11215702-080321-BN-DUP-18 08/03/2021 (6-8) ft bgs Field Duplicate	SJSB091 11215702-080321-BN-SJSB091(8-10) 08/03/2021 (8-10) ft bgs	SJSB091 11215702-080321-BN-SJSB091(10-12) 08/03/2021 (10-12) ft bgs	SJSB091 11215702-080321-BN-SJSB091(12-14) 08/03/2021 (12-14) ft bgs	SJSB091 11215702-080321-BN-SJSB091(14-16) 08/03/2021 (14-16) ft bgs	SJSB091 11215702-080321-BN-SJSB091(16-18) 08/03/2021 (16-18) ft bgs	SJSB092 11215702-072521-BN-SJSB092(0-2) 07/25/2021 (0-2) ft bgs	SJSB092 11215702-072521-BN-SJSB092(2-4) 07/25/2021 (2-4) ft bgs	SJSB092 11215702-072521-BN-SJSB092(4-6) 07/25/2021 (4-6) ft bgs	SJSB092 11215702-072521-BN-SJSB092(6-8) 07/25/2021 (6-8) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	450	250	1.6 U	0.075 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	930	1700	1400	1500	1100	1200	1900	1800	1200	640	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.057 U	0.12 J	0.038 U	0.20 J	0.049 U	0.063 J	0.042 U	910	540	1.9 J	0.050 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	39	63	55	62	47	59	82	110	72 J	28	43
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.065 U	0.062 U	0.043 U	0.068 U	0.055 U	0.046 U	0.046 U	330	170	1.0 J	0.048 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.096 J	0.15 J	0.076 J	0.071 U	0.048 U	0.048 U	0.040 U	3300	1800	11	0.036 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.66 J	0.77 J	0.71 J	1.0 J	0.75 J	0.81 J	0.84 J	1.9 U	1.1 U	0.15 U	0.31 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.068 J	0.047 U	0.033 U	0.071 U	0.050 U	0.049 U	0.039 U	880	500	2.8 J	0.039 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	1.4 J	1.3 J	1.7 J	1.3 J	1.5 J	2.2 J	9.4 J	7.0 J	0.16 U	0.35 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 J	0.20 J	0.14 J	0.14 J	0.086 J	0.087 J	0.14 J	46 J	28 J	0.11 U	0.037 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	3.3 J	3.1 J	2.4 J	2.6 J	3.2 J	4.5 J	6.3 U	1.1 U	0.14 U	0.30 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.11 J	0.16 J	0.099 J	0.058 U	0.057 U	0.051 U	0.048 U	2200	1400 J	9.9	0.058 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.29 J	0.30 J	0.082 U	0.27 J	0.30 J	0.12 U	0.12 U	290	200	0.19 U	0.17 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.043 J	0.035 U	0.023 U	0.054 U	0.036 U	0.037 U	0.030 U	82 J	57 J	0.12 U	0.036 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.057 U	0.059 U	0.048 J	0.062 U	0.057 U	0.054 U	0.049 U	1500	1100	6.6 J	0.066 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3.1	1.3 U	1.4 U	0.91 U	1.3 U	0.93 U	0.51 U	210000	110000	340	7.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.72 J	0.56 J	0.50 J	0.51 J	0.74 J	0.53 J	0.39 J	21000 J	16000 J	93	3.1
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.065 U	0.27 J	0.043 U	0.20 J	0.055 U	0.063 J	0.046 U	1500 J	820 J	3.6 J	0.083 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130 J	210 J	190 J	190 J	130 J	150 J	210 J	260 J	170 J	94 J	160 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.35 J	0.34 J	0.24 J	0.14 J	0.086 J	0.087 J	0.14 J	4800 J	2700 J	14 J	0.077 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	40 J	54 J	51 J	50 J	36 J	45 J	58 J	37 J	35 J	24 J	38 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.11 J	0.16 J	0.15 J	0.089 J	0.080 J	0.063 J	0.049 U	5700 J	3800 J	24 J	0.066 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.3 J	10 J	8.5 J	9.5 J	9.2 J	11 J	13 J	290 J	200 J	1.9 U	2.9 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	4.3 J	2.5 J	2.6 J	1.6 J	2.9 J	1.9 J	1.3 J	160000 J	130000 J	670 J	13 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.4 J	7.4 J	6.2 J	9.0 J	7.3 J	8.6 J	9.2 J	23000 J	17000 J	93 J	3.1 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2.5 J	2.6 J	2.0 J	2.4 J	2.3 J	2.0 J	2.6 J	43000 J	28000 J	130 J	4.6
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2.5 J	2.7 J	2.1 J	2.4 J	2.4 J	2.2 J	2.7 J	43000 J	28000 J	130 J	4.8

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00186

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB092 11215702-072521-BN-SJSB092(8-10) 07/25/2021 (8-10) ft bgs	SJSB092 11215702-072521-BN-SJSB092(10-12) 07/25/2021 (10-12) ft bgs	SJSB092 11215702-072521-BN-SJSB092(12-14) 07/25/2021 (12-14) ft bgs	SJSB092 11215702-072521-BN-SJSB092(14-16) 07/25/2021 (14-16) ft bgs	SJSB092 11215702-072521-BN-SJSB092(16-18) 07/25/2021 (16-18) ft bgs	SJSB093 11215702-082421-BN-SJSB093(0-2) 08/24/2021 (0-2) ft bgs	SJSB093 11215702-082421-BN-SJSB093(2-4) 08/24/2021 (2-4) ft bgs	SJSB093 11215702-082421-BN-SJSB093(4-6) 08/24/2021 (4-6) ft bgs	SJSB093 11215702-082421-BN-SJSB093(6-8) 08/24/2021 (6-8) ft bgs	SJSB093 11215702-082421-BN-SJSB093(8-10) 08/24/2021 (8-10) ft bgs	SJSB093 11215702-082421-BN-SJSB093(10-12) 08/24/2021 (10-12) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4.9 J	0.11 U	110	0.55 U	0.067 U	650 J	580 J	7.9 U	0.051 U	30 J	9.2 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	870	1100	1300	340	450	920 J	680 J	460	420	810	480
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.66 U	0.87 U	200	0.40 U	0.44 U	1500	1200	16 J	0.62 U	63 J	19 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	46	52	55	12	20	110 J	99 J	22 J	22 J	51 J	31 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.66 J	0.046 U	69	0.20 U	0.047 U	520 J	350 J	5.7 J	0.36 U	22 J	8.7 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.4 J	2.0 J	660	0.78 J	0.66 J	3900	3000	53 J	0.53 U	180	86
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.20 U	0.16 U	0.86 U	0.35 U	0.33 U	1.2 U	0.29 U	2.1 U	0.22 U	0.056 U	1.3 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.47 J	0.51 J	180	0.29 J	0.029 U	1000	760	13 J	0.040 U	46 J	22 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.23 U	0.17 U	0.98 U	0.32 J	0.61 J	33 J	10 J	0.098 U	0.22 U	2.2 J	2.4 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.053 U	0.38 U	11 J	0.18 U	0.41 U	5.7 U	2.4 U	4.6 U	0.75 U	0.20 U	0.23 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	2.6 J	0.85 U	0.77 J	1.6 J	13 J	11 J	2.5 J	0.22 U	2.1 J	2.3 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.9 J	1.4 J	550	0.54 J	0.063 U	2900	2500	43 J	0.084 U	140	91
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.20 U	0.22 U	82	0.24 J	0.11 U	390 J	430 J	6.0 J	0.19 U	20 J	13 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.055 U	0.084 U	22 J	0.12 J	0.028 U	190 J	160 J	4.0 U	0.035 U	8.0 J	5.6 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.92 J	0.97 J	420	0.42 J	0.065 U	2900	2400	40 J	0.30 U	120	82
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	70	71	33000	27	20	120000 J	110000 J	1600	0.11 U	5000	4200
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	18	17 J	6800 J	7.2	4.5	27000	29000	450	0.17 U	1300	1000
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.3 J	0.87 J	310 J	0.68 J	0.44 J	2300 J	1700 J	25 J	0.97 J	98 J	33 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	150 J	150 J	38 J	64 J	240 J	180 J	67 J	87 J	140 J	91 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.9 J	2.9 J	990 J	1.4 J	1.1 J	5600 J	4300 J	81 J	1.5 J	260 J	130 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	42 J	39 J	26 J	8.6 J	16 J	120 J	86 J	19 J	31 J	36 J	38 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	3.6 J	2.4 J	1500 J	1.3 J	0.24 U	8600 J	7300 J	120 J	0.84 J	400 J	270 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.1 U	3.3 U	82 J	1.3 J	1.7 U	620 J	490 J	9.0 J	5.1 J	36 J	33 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	130 J	150 J	50000 J	47 J	33 J	260000 J	240000 J	3700 J	1.7 J	11000 J	9500 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	18 J	17 J	7400 J	8.3 J	4.5 J	30000 J	31000 J	500 J	1.3 J	1400 J	1100 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	27 J	26 J	10000 J	11 J	7.1 J	41000 J	42000 J	640 J	0.35 J	1900 J	1500 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	27 J	26 J	10000 J	11 J	7.2 J	41000 J	42000 J	640 J	0.68 J	1900 J	1500 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00187

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB093 11215702-082421-BN-SJSB093(12-14) 08/24/2021 (12-14) ft bgs	SJSB093 11215702-082421-BN-SJSB093(14-16) 08/24/2021 (14-16) ft bgs	SJSB093 11215702-082421-BN-SJSB093(16-18) 08/24/2021 (16-18) ft bgs	SJSB094 11215702-072621-BN-SJSB094(0-2) 07/26/2021 (0-2) ft bgs	SJSB094 11215702-072621-BN-SJSB094(2-4) 07/26/2021 (2-4) ft bgs	SJSB094 11215702-072621-BN-SJSB094(4-6) 07/26/2021 (4-6) ft bgs	SJSB094 11215702-072621-BN-SJSB094(6-8) 07/26/2021 (6-8) ft bgs	SJSB094 11215702-072621-BN-SJSB094 (6-8)-R 07/26/2021 (6-8) ft bgs Lab Duplicate	SJSB094 11215702-072621-BN-DUP-8 07/26/2021 (6-8) ft bgs Field Duplicate	SJSB094 11215702-072621-BN-DUP-8-R 07/26/2021 (6-8) ft bgs Lab Duplicate	SJSB094 11215702-072621-BN-SJSB094(8-10) 07/26/2021 (8-10) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4.7 U	1.1 U	1.2 U	460 J	530	570	180 J	130	12 J	9.5 J	56 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	340	170	220	720 J	750	1700	680 J	1200 J	1200	1100	620
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	7.7 J	0.72 U	0.60 U	1100	1100	1300	290 J	300	19 J	21	110
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	19 J	12 J	13 J	68 J	70 J	140	42 J	61	48	42	32 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	3.9 U	0.48 U	0.41 U	280	360	360	110	100	5.9 J	5.9 J	39
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	35 J	1.2 U	0.81 U	3200	3600	4400	1300 J	1100	62 J	61	430
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 U	1.2 U	0.70 U	3.6 J	0.97 U	1.5 UJ	1.2 U	3.5 U	1.0 J	0.65 U	0.45 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	8.8 J	0.50 U	0.78 U	740	960	1100	330 J	230	16 J	16	130
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.69 U	1.4 U	1.0 U	7.0 J	0.93 U	9.1 J	1.2 U	3.9 J	1.2 J	1.1 J	0.52 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.2 U	0.55 U	0.87 U	42 J	57 J	45 J	16 J	16 J	0.99 J	1.1 J	5.5 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.2 U	1.6 U	1.5 U	5.6 J	0.88 U	7.0 J	1.1 U	4.1 U	2.7 J	2.5 J	0.45 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	30 J	1.5 U	1.4 U	2200	2700	2900	920 J	740	51 J	50	320
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.4 U	2.8 U	0.96 U	290	370	340	100 J	110	7.1	6.3 J	41
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.2 U	0.49 U	0.61 U	100	130	140	32 J	27 J	2.6 J	1.9 J	13 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	26 J	1.4 U	0.079 U	1600	2000	2000	700 J	700	47 J	36	240
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1100	45	10 J	110000 J	140000 J	130000 J	47000 J	45000 J	2300 J	2400 J	16000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	300	10 J	2.4 J	24000 J	23000 J	26000 J	10000 J	12000 J	570 J	720 J	3700 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	14 J	1.4 J	1.2 J	1500 J	1700 J	1900 J	480 J	470 J	30 J	31 J	180 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	77 J	47 J	58 J	130 J	140 J	320 J	89 J	150 J	160 J	140 J	87 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	52 J	2.7 J	3.1 J	4600 J	5400 J	6500 J	1900 J	1500 J	92 J	91 J	650 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	36 J	27 J	28 J	48 J	17 J	37 J	9.9 J	43 J	42 J	37 J	16 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	83 J	4.5 J	1.4 J	6200 J	7500 J	7800 J	2600 J	2300 J	150 J	140 J	860 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	15 J	13 J	10 J	290 J	370 J	340 J	100 J	120 J	12 J	12 J	41 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2300 J	120 J	18 J	210000 J	210000 J	220000 J	87000 J	80000 J	4400 J	5000 J	26000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	340 J	16 J	7.8 J	26000 J	26000 J	28000 J	11000 J	14000 J	620 J	790 J	4100 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	420 J	15 J	3.6 J	36000 J	39000 J	41000 J	15000 J	17000 J	830 J	990 J	5500 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	430 J	17 J	4.4 J	36000 J	39000 J	41000 J	15000 J	17000 J	830 J	990 J	5500 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00188

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB094 11215702-072621-BN-SJSB094(10-12) 07/26/2021 (10-12) ft bgs	SJSB094 11215702-072621-BN-SJSB094(12-14) 07/26/2021 (12-14) ft bgs	SJSB094 11215702-072621-BN-SJSB094(14-16) 07/26/2021 (14-16) ft bgs	SJSB094 11215702-072621-BN-SJSB094(16-18) 07/26/2021 (16-18) ft bgs	SJSB095 11215702-072821-BN-SJSB095(0-2) 07/28/2021 (0-2) ft bgs	SJSB095 11215702-072821-BN-SJSB095(2-4) 07/28/2021 (2-4) ft bgs	SJSB095 11215702-072821-BN-SJSB095(4-6) 07/28/2021 (4-6) ft bgs	SJSB095 11215702-072821-BN-SJSB095(6-8) 07/28/2021 (6-8) ft bgs	SJSB095 11215702-072821-BN-DUP-10 07/28/2021 (6-8) ft bgs Field Duplicate	SJSB095 11215702-072821-BN-SJSB095(8-10) 07/28/2021 (8-10) ft bgs	SJSB095 11215702-072821-BN-SJSB095 (8-10)-R 07/28/2021 (8-10) ft bgs Lab Duplicate
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.17 U	0.15 U	0.11 U	0.11 U	340 J	18 J	0.17 U	0.12 U	0.61 J	25	13
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	840	1400	1300	45	1400	1700	240	190	240	1300 J	550 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.1 U	0.086 U	0.079 U	0.33 U	790	4.4 J	0.26 U	0.060 U	0.34 U	33	24
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	36	65	60	2.6 J	88 J	60	12	10 J	11	38 J	18 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.091 U	0.080 U	0.077 U	0.058 U	250	2.0 J	0.068 U	0.057 U	0.054 U	10	6.5
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.7 J	0.047 U	0.046 U	0.029 U	2800	7.0	0.045 U	0.029 U	1.2 J	100	62
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.27 U	0.37 U	0.91 J	0.097 U	1.2 U	0.33 U	0.13 U	0.080 U	0.14 U	0.71 J	0.36 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.62 J	0.047 U	0.045 U	0.030 U	740	1.6 J	0.044 U	0.027 U	0.42 J	28	17
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.31 U	0.41 U	1.6 J	0.11 U	1.3 U	0.40 U	0.15 U	0.091 U	0.15 U	1.3 J	0.63 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.047 U	0.046 U	0.029 U	40 J	0.36 U	0.045 U	0.026 U	0.040 U	1.3 J	0.98 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.4 J	4.8 J	4.4 J	0.096 U	4.8 J	0.33 U	0.74 J	0.50 J	1.0 J	1.7 J	0.99 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.7 J	0.066 U	0.063 U	0.047 U	2100	0.54 U	0.078 U	0.044 U	0.55 J	74	50
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.32 U	0.24 U	0.23 U	0.11 U	290	0.50 U	0.17 U	0.099 U	0.13 U	9.3	6.3
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.11 U	0.048 U	0.046 U	0.028 U	88 J	0.36 U	0.041 U	0.027 U	0.038 U	3.6 J	1.9 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.3 J	0.068 U	0.069 U	0.047 U	1700	0.57 U	0.085 U	0.051 U	0.48 J	55	37
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	83	4.3 U	2.4 U	6.4 U	110000 J	140	11 U	5.5 UJ	27 J	3500 J	2400 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	22	0.13 U	1.3 J	1.4 J	23000 J	42	0.16 U	1.7 J	6.3 J	810 J	710 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.1 J	0.086 U	0.23 U	0.33 J	1200 J	8.3 J	0.26 J	0.060 U	0.34 J	50 J	35 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	130 J	190 J	190 J	8.1 J	200 J	150 J	45 J	38 J	44 J	100 J	58 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	3.3 J	0.074 U	0.11 U	0.036 U	4100 J	8.6 J	0.078 U	0.036 U	1.6 J	160 J	92 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	32 J	52 J	50 J	2.0 J	32 J	18 J	9.1 J	8.9 J	11 J	20 J	14 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	4.0 J	0.068 U	0.069 U	0.14 U	6200 J	2.6 J	0.27 U	0.094 U	1.0 J	190 J	130 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.2 J	8.8 J	8.4 J	0.26 U	290 J	1.3 U	1.2 U	0.48 U	0.90 J	10 J	7.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	160 J	8.1 J	3.0 J	9.8 J	200000 J	240 J	19 J	8.9 J	49 J	6400 J	4900 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	22 J	1.1 J	4.1 J	1.4 J	25000 J	42 J	0.45 U	1.7 J	6.3 J	880 J	780 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	32 J	1.6 J	3.0 J	1.4 J	35000 J	58 J	0.27 J	1.9 J	9.6 J	1200 J	980 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	32 J	2.0 J	3.2 J	1.9 J	35000 J	59 J	1.0 J	2.3 J	9.7 J	1200 J	980 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00189

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB095 11215702-072821-BN-SJSB095(10-12) 07/28/2021 (10-12) ft bgs	SJSB095 11215702-072821-BN-SJSB095 (10-12)-R 07/28/2021 (10-12) ft bgs Lab Duplicate	SJSB095 11215702-072821-BN-SJSB095(12-14) 07/28/2021 (12-14) ft bgs	SJSB095 11215702-072821-BN-SJSB095(14-16) 07/28/2021 (14-16) ft bgs	SJSB095 11215702-072821-BN-SJSB095 (14-16)-R 07/28/2021 (14-16) ft bgs Lab Duplicate	SJSB095 11215702-072821-BN-SJSB095(16-18) 07/28/2021 (16-18) ft bgs	SJSB096 11215702-072721-BN-SJSB096(0-2) 07/27/2021 (0-2) ft bgs	SJSB096 11215702-072721-BN-SJSB096(2-4) 07/27/2021 (2-4) ft bgs	SJSB096 11215702-072721-BN-SJSB096(4-6) 07/27/2021 (4-6) ft bgs	SJSB096 11215702-072721-BN-SJSB096(6-8) 07/27/2021 (6-8) ft bgs	SJSB096 11215702-072721-BN-DUP-9 07/27/2021 (6-8) ft bgs Field Duplicate
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.10 U	0.92 U	0.12 U	0.70 J	1.1 U	0.12 U	700	290	3.8 J	0.51 J	0.13 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	200 J	500 J	130	170 J	400 J	260	1100	610	950	980	820
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.62 U	0.52 U	0.29 U	0.66 U	1.6 U	0.28 U	1500	650	7.6	0.18 J	0.071 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	11	19	6.5	7.7	17	15	130	43 J	36	39	34
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.35 J	0.26 U	0.043 U	0.28 J	0.51 U	0.061 U	450	200	2.6 J	0.041 U	0.072 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.8 J	0.69 J	0.032 U	2.1 J	4.0 J	0.019 U	4400	2000	25	0.74 J	0.29 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.097 U	0.34 U	0.057 U	0.33 J	0.39 U	0.28 U	5.9 J	2.1 J	0.26 U	0.59 J	0.23 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.91 J	0.30 J	0.032 U	0.64 J	1.3 J	0.018 U	1200	500	6.4 J	0.25 J	0.033 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.11 U	0.53 J	0.060 U	0.20 J	0.38 J	0.29 U	13	4.0 J	0.27 U	0.81 J	0.82 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.17 J	0.15 U	0.030 U	0.17 J	0.15 U	0.018 U	89	23 J	0.26 U	0.12 J	0.034 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	1.5 J	0.054 U	0.78 J	1.4 J	0.26 U	10	2.6 J	2.1 J	2.9 J	0.23 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.9 J	0.58 J	0.071 U	2.7 J	3.2 J	0.052 U	3500	1300	18	0.86 J	0.042 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.14 U	0.22 J	0.10 U	0.43 J	0.47 J	0.15 U	550	130	2.6 J	0.29 J	0.15 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.14 J	0.089 J	0.029 U	0.13 J	0.16 J	0.017 U	150	47 J	0.73 J	0.043 J	0.032 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.1 J	0.41 J	0.078 U	2.7 J	2.2 J	0.056 U	3200	930	13	0.35 J	0.041 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	150 J	27 J	17	170	150	3.6 U	250000 J	61000 J	910 J	8.8	8.6
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	40 J	7.0 J	4.1	35	38	0.13 U	60000 J	15000 J	210	2.4	2.5
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.1 J	0.82 J	0.29 J	1.1 J	2.5 J	0.28 J	2200 J	980 J	12 J	0.18 J	0.072 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	44 J	78 J	25 J	32 J	72 J	66 J	230 J	88 J	120 J	150 J	130 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	5.0 J	1.2 J	0.075 U	3.3 J	5.6 J	0.052 U	6200 J	2900 J	32 J	1.3 J	0.29 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	13 J	18 J	6.2 J	9.3 J	18 J	17 J	99 J	27 J	25 J	38 J	30 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	7.0 J	1.2 J	0.078 U	7.6 J	8.3 J	0.056 U	9300 J	3400 J	48 J	1.9 J	0.057 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.42 U	2.9 J	0.69 U	1.5 J	3.6 J	5.9 J	590 J	150 J	5.7 J	5.9 J	5.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	300 J	48 J	25 J	300 J	280 J	6.1 J	390000 J	110000 J	1500 J	15 J	14 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	40 J	9.3 J	4.1 J	40 J	43 J	1.2 J	70000 J	16000 J	230 J	7.9 J	4.1 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	57 J	11 J	5.9	54 J	55 J	0.23	87000 J	22000 J	310 J	4.9 J	4.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	57 J	11 J	6.0	54 J	55 J	0.60	87000 J	22000 J	310 J	4.9 J	4.2 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00190

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB096 11215702-072721-BN-SJSB096(8-10) 07/27/2021 (8-10) ft bgs	SJSB096 11215702-072721-BN-SJSB096 (8-10)-R 07/27/2021 (8-10) ft bgs Lab Duplicate	SJSB096 11215702-072721-BN-SJSB096(10-12) 07/27/2021 (10-12) ft bgs	SJSB096 11215702-072721-BN-SJSB096 (10-12)-R 07/27/2021 (10-12) ft bgs Lab Duplicate	SJSB096 11215702-072721-BN-SJSB096(12-14) 07/27/2021 (12-14) ft bgs	SJSB096 11215702-072721-BN-SJSB096(14-16) 07/27/2021 (14-16) ft bgs	SJSB096 11215702-072721-BN-SJSB096(16-18) 07/27/2021 (16-18) ft bgs	SJSB097 11215702-082221-BN-SJSB097(0-2) 08/22/2021 (0-2) ft bgs	SJSB097 11215702-082221-BN-SJSB097(2-4) 08/22/2021 (2-4) ft bgs	SJSB097 11215702-082221-BN-SJSB097(4-6) 08/22/2021 (4-6) ft bgs	SJSB097 11215702-082221-BN-SJSB097(6-8) 08/22/2021 (6-8) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	37	63	0.74 J	0.66 U	0.095 U	0.74 J	0.60 J	58 J	0.71 U	0.76 U	0.98 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1000	610	1200	940	460	360	600	2500	350	430	320
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	68 J	160 J	1.4 J	1.2 U	0.050 U	0.039 U	0.40 J	9.0 J	0.021 U	0.57 U	0.31 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	41	31	51	40	24	18	27	73 J	23 J	25 J	17 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	22 J	60 J	0.39 J	0.45 U	0.048 U	0.036 U	0.059 U	0.84 U	0.025 U	0.039 U	0.27 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	200 J	630 J	4.9 J	3.7 J	0.038 U	0.024 U	0.91 J	2.3 U	0.024 U	0.42 U	0.31 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.79 J	1.1 U	0.49 J	0.68 U	0.19 U	0.29 J	0.29 U	1.7 U	0.52 U	0.59 U	0.48 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	51 J	140 J	1.2 J	1.1 J	0.038 U	0.025 U	0.036 U	1.0 U	0.24 U	0.44 U	0.23 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.8 J	1.3 J	1.1 J	0.21 U	0.54 J	0.33 U	2.0 J	0.048 U	0.093 U	1.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	3.3 J	8.5	0.25 J	0.17 U	0.037 U	0.024 U	0.036 U	0.79 U	0.21 U	0.53 U	0.69 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	1.3 U	3.3 J	2.9 J	2.3 J	1.6 J	2.5 J	2.7 U	1.2 U	1.6 J	1.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	150 J	410 J	3.6 J	3.7 J	0.26 J	0.037 U	0.53 J	1.5 J	0.51 J	0.17 U	0.65 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	24 J	62 J	0.16 U	0.73 J	0.10 U	0.11 U	0.15 U	0.095 U	0.15 U	0.12 U	0.10 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.5 J	15	0.066 U	0.14 J	0.038 U	0.024 U	0.034 U	0.86 U	0.20 U	0.57 U	0.32 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	120 J	380 J	2.6 J	2.7 J	0.16 J	0.040 U	0.12 U	1.6 U	0.52 U	0.58 U	0.038 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	8000 J	25000 J	190	230	11	3.9	32	26	0.067 U	3.8 J	2.3 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1900 J	5700 J	45	58	3.3	0.95 J	8.7	0.062 U	0.54 J	1.1 U	0.95 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	100 J	260 J	1.8 J	2.0 J	0.050 U	0.039 U	0.40 J	20 J	0.42 J	1.3 J	0.71 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	140 J	95 J	160 J	140 J	100 J	71 J	130 J	230 J	94 J	110 J	66 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	290 J	880 J	6.4 J	6.0 J	0.038 U	0.027 U	0.91 J	9.7 J	0.65 J	2.2 J	1.6 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	36 J	32 J	41 J	42 J	28 J	24 J	42 J	47 J	28 J	31 J	22 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	400 J	1200 J	8.5 J	9.8 J	0.43 J	0.040 U	0.53 J	9.1 J	1.5 J	1.1 J	1.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	24 J	75 J	7.7 J	8.4 J	3.9 J	4.8 J	9.2 J	7.4 J	6.1 J	11 J	4.0 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	14000 J	44000 J	360 J	440 J	17 J	5.6 J	60 J	52 J	0.94 J	4.3 J	2.9 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2100 J	6300 J	45 J	68 J	3.3 J	2.2 J	8.7 J	3.5 J	3.5 J	1.1 J	2.3 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2800 J	8500 J	67 J	84 J	5.1 J	1.9 J	13 J	4.4 J	0.89 J	0.92 J	0.78 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2800 J	8500 J	67 J	84 J	5.2 J	1.9 J	13 J	5.2 J	1.2 J	1.8 J	1.4 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00191

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location:		SJSB097	SJSB097	SJSB097	SJSB097	SJSB097	SJSB098	SJSB098	SJSB098	SJSB098	SJSB098	SJSB098
Sample Identification:		11215702-082221-BN-DUP-20	11215702-082221-BN-SJSB097(8-10)	11215702-082221-BN-SJSB097(10-12)	11215702-082221-BN-SJSB097(12-14)	11215702-082221-BN-SJSB097(14-16)	11215702-082021-BN-SJSB098(0-2)	11215702-082021-BN-SJSB098(2-4)	11215702-082021-BN-SJSB098(4-6)	11215702-082021-BN-SJSB098(6-8)	11215702-082021-BN-SJSB098(8-10)	11215702-082021-BN-SJSB098(10-12)
Sample Date:	Units	08/22/2021	08/22/2021	08/22/2021	08/22/2021	08/22/2021	08/20/2021	08/20/2021	08/20/2021	08/20/2021	08/20/2021	08/20/2021
Sample Depth:		(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs	(12-14) ft bgs	(14-16) ft bgs	(0-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(6-8) ft bgs	(8-10) ft bgs	(10-12) ft bgs
Parameters		Field Duplicate										
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.3 J	1.0 U	0.089 U	0.089 U	0.089 U	39 J	73 J	120 J	57 J	130 J	82
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	420	66 J	22	26	26	1800	1800	3000	1900	1700	1600
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.5 J	0.62 U	0.082 U	0.064 U	0.064 U	8.3 J	31 J	38 J	13 J	250	150
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	24 J	3.6 U	1.1 J	1.6 J	1.7 J	58 J	71 J	120	77	95	71
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.082 U	0.29 U	0.079 U	0.047 U	0.0030 U	1.3 U	9.9 J	12 J	3.0 J	80	48
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.86 U	0.69 U	0.064 U	0.067 U	0.063 U	8.5 J	120	130	24 J	790	450
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.17 U	0.76 U	0.055 J	0.10 J	0.069 J	0.76 U	1.6 J	0.18 U	2.2 U	2.0 U	0.94 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.84 U	0.92 U	0.056 U	0.050 U	0.047 U	2.3 J	29 J	31 J	6.5 J	200	110
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.18 U	0.74 J	0.098 U	0.16 J	0.12 U	2.5 J	6.3 J	3.7 J	2.7 J	7.8 J	4.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.52 J	0.94 U	0.016 U	0.083 U	0.083 U	1.5 U	15 J	13 J	0.10 U	0.62 U	39
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.52 U	0.96 J	0.21 U	0.25 U	0.17 U	2.7 U	3.8 J	5.0 J	1.6 J	3.7 J	1.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.2 J	1.2 J	0.10 U	0.14 U	0.074 U	4.7 J	120	130	16 J	620	340
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.14 U	0.15 U	0.15 J	0.16 J	0.16 J	2.1 J	14 J	16 J	2.8 J	76	48
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.63 U	0.44 U	0.014 U	0.085 U	0.085 U	1.1 U	9.2 J	8.6 U	1.5 U	40 J	23
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.2 J	0.68 U	0.096 U	0.096 U	0.096 U	4.5 J	100	110	12 J	530	280
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1.4 J	9.3 J	1.2 J	1.1	0.11 U	180	5500	4500	360	21000	10000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.095 U	2.1 U	0.44 J	1.0 J	0.050 J	47	1300	1300	110	7100 J	2700 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	3.0 J	1.1 J	0.22 J	0.088 J	0.12 J	18 J	59 J	72 J	28 J	430 J	260 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	93 J	11 J	3.9 J	6.5 J	5.4 J	190 J	240 J	370 J	77 J	230 J	190 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	3.3 J	3.2 J	0.12 J	0.20 J	0.23 J	20 J	200 J	210 J	42 J	1100 J	690 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	25 J	7.3 J	1.9 J	2.0 J	2.1 J	34 J	81 J	93 J	50 J	50 J	38 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.8 J	3.0 J	0.24 J	0.23 J	0.36 J	19 J	350 J	370 J	50 J	1800 J	1200 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.0 J	2.4 J	0.41 J	0.34 J	0.86 J	9.7 J	21 J	46 J	13 J	96 J	56 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2.4 J	14 J	1.8 J	8.0 J	0.11 J	360 J	10000 J	10000 J	480 J	46000 J	34000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1.4 J	3.7 J	0.81 J	1.1 J	0.32 J	51 J	1400 J	1500 J	130 J	7900 J	7300 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.97 J	1.2 J	0.73 J	1.3 J	0.24 J	71 J	1900 J	1800 J	160 J	9600 J	3900 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.3 J	2.6 J	0.77 J	1.4 J	0.29 J	71 J	1900 J	1800 J	160 J	9600 J	3900 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00192

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB098 11215702-082021-BN-SJSB098(12-14) 08/20/2021 (12-14) ft bgs	SJSB098 11215702-082021-BN-SJSB098(14-16) 08/20/2021 (14-16) ft bgs	SJSB098 11215702-082021-BN-SJSB098(16-18) 08/20/2021 (16-18) ft bgs	SJSB099 11215702-072421-SS-SJSB099(0-2) 07/24/2021 (0-2) ft bgs	SJSB099 11215702-072421-SS-SJSB099(2-4) 07/24/2021 (2-4) ft bgs	SJSB099 11215702-072421-SS-SJSB099(4-6) 07/24/2021 (4-6) ft bgs	SJSB099 11215702-072421-SS-SJSB099(6-8) 07/24/2021 (6-8) ft bgs	SJSB099 11215702-072421-SS-SJSB099(8-10) 07/24/2021 (8-10) ft bgs	SJSB099 11215702-072421-SS-SJSB099(10-12) 07/24/2021 (10-12) ft bgs	SJSB099 11215702-072421-SS-SJSB099 (10-12)-R 07/25/2021 (10-12) ft bgs Lab Duplicate	SJSB099 11215702-072421-SS-SJSB099(12-14) 07/24/2021 (12-14) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	9.8 J	0.39 U	0.22 U	1700	1300 J+	2.9 J	0.53 J	0.063 U	5.4 J	4.3 U	0.094 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	610	610	19	11000	11000	160	110	120	440	360	220
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	19	0.38 U	0.14 U	2800	2100	3.1 J	0.45 J	0.61 J	6.5 J	6.1 J	0.057 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	36	37	1.2 J	670	640	6.3	3.4 J	4.8 J	28	22	12
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	6.5 J	0.20 U	0.057 U	790	620	1.0 J	0.055 U	0.20 J	2.5 J	2.5 J	0.055 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	61	1.3 J	0.051 U	6600	6000	11	1.2 J	1.6 J	21	22	0.021 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.83 J	0.60 J	0.044 U	6.3 J	8.2 J	0.30 J	0.32 J	0.058 U	0.52 J	0.73 U	0.31 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	15	0.43 J	0.064 U	1500	1700	2.9 J	0.31 J	0.43 J	5.8 J	4.9 J	0.022 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	1.1 J	0.088 U	49 J	41 J	0.41 J	0.069 U	0.068 U	1.1 J	0.91 J	0.51 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.051 U	0.15 U	0.082 U	84 J	100 J	0.071 U	0.028 U	0.049 U	0.52 J	0.51 J	0.30 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.3 J	2.2 J	0.099 U	12 J	8.3 J	0.067 U	0.23 J	0.058 U	1.8 J	1.7 U	0.82 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	48	0.93 J	0.11 U	4000	4300	9.4	1.0 J	1.2 J	13	12	0.26 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.4 J	0.47 J	0.015 U	390	430	1.0 J	0.068 U	0.064 U	0.16 U	1.4 J	0.092 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.1 J	0.16 U	0.064 U	170	220	0.27 J	0.028 U	0.046 U	0.81 J	0.63 J	0.021 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	40	0.53 U	0.073 U	2500	2700	5.5 J	0.51 J	0.71 J	8.0	8.9	0.037 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1600	20	0.44 J	160000 J	120000 J	290	27	34	390	480	2.8 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	490	6.8	0.10 U	35000 J	40000 J	94	10	11	130	150	1.3 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	31 J	0.93 J	0.29 J	4500 J	3600 J	5.4 J	0.74 J	1.0 J	11 J	11 J	0.057 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	150 J	160 J	4.0 J	1500 J	1400 J	22 J	13 J	19 J	94 J	74 J	41 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	87 J	2.2 J	0.31 J	9400 J	9100 J	16 J	1.5 J	2.0 J	32 J	31 J	0.30 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	54 J	48 J	1.6 J	190 J	180 J	4.5 J	2.9 J	3.9 J	28 J	21 J	13 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	130 J	2.5 J	0.40 J	10000 J	11000 J	23 J	2.0 J	2.3 J	34 J	34 J	0.26 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	19 J	7.0 J	0.86 J	390 J	430 J	1.0 J	0.068 U	0.064 U	0.16 U	4.8 J	0.86 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	3300 J	52 J	0.99 J	250000 J	280000 J	590 J	59 J	70 J	830 J	870 J	4.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	540 J	14 J	0.20 J	38000 J	43000 J	100 J	10 J	11 J	140 J	170 J	1.3 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	680 J	10 J	0.062 J	53000 J	54000 J	130 J	13 J	15 J	180 J	210 J	1.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	680 J	11 J	0.16 J	53000 J	54000 J	130 J	13 J	15 J	180 J	210 J	1.9 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00193

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB099 11215702-072421-SS-SJSB099(14-16) 07/24/2021 (14-16) ft bgs	SJSB099 11215702-072421-SS-SJSB099(16-18) 07/24/2021 (16-18) ft bgs	SJSB099 11215702-072421-DUP-6 07/24/2021 (16-18) ft bgs Field Duplicate	SJSB100 11215702-082321-BN-SJSB100(0-2) 08/23/2021 (0-2) ft bgs	SJSB100 11215702-082321-BN-SJSB100(2-4) 08/23/2021 (2-4) ft bgs	SJSB100 11215702-082321-BN-SJSB100(4-6) 08/23/2021 (4-6) ft bgs	SJSB100 11215702-082321-BN-SJSB100(6-8) 08/23/2021 (6-8) ft bgs	SJSB100 11215702-082321-BN-SJSB100(8-10) 08/23/2021 (8-10) ft bgs	SJSB100 11215702-082321-BN-SJSB100(10-12) 08/23/2021 (10-12) ft bgs	SJSB100 11215702-082321-BN-SJSB100(12-14) 08/23/2021 (12-14) ft bgs	SJSB100 11215702-082321-BN-SJSB100(14-16) 08/23/2021 (14-16) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1.0 J	0.59 J	1.1 J	170 J	2.9 J	4.2 U	0.82 U	2.2 U	0.16 U	0.092 U	0.16 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	350	280	360	4600	380	220	340	200	52	15	49
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.90 J	0.50 J	0.90 J	23 J	0.83 J	1.3 U	1.6 U	0.61 U	0.22 U	0.14 U	0.24 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	17	13	17	170	18 J	15 J	25 J	8.8 J	2.8 J	1.1 J	2.9 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.24 J	0.15 J	0.058 U	5.1 J	0.50 J	0.63 U	0.036 U	0.61 U	0.12 U	0.052 U	0.073 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.5 J	0.76 J	1.4 J	15 J	0.82 J	1.7 U	1.7 U	1.4 U	0.26 U	0.14 U	0.29 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.11 U	0.14 U	0.48 J	5.0 J	0.67 J	0.84 U	0.051 U	0.48 U	0.28 J	0.18 J	0.14 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.55 J	0.30 J	0.54 J	7.9 J	0.63 J	0.41 U	1.3 U	0.48 U	0.28 J	0.22 U	0.17 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.12 U	0.15 U	0.50 J	6.3 J	0.69 J	1.2 J	1.3 J	0.76 J	0.23 J	0.17 J	0.18 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.050 U	0.032 U	0.045 U	5.0 J	0.44 J	1.2 U	0.055 U	0.43 U	0.13 U	0.11 U	0.098 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.3 J	0.72 J	1.3 J	8.6 J	1.3 J	2.2 J	0.052 U	1.3 J	0.43 J	0.21 U	0.21 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.8 J	0.47 J	1.1 J	12 J	1.2 J	1.5 J	0.082 U	0.15 U	0.31 U	0.22 U	0.28 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.11 U	0.089 U	0.11 U	5.7 J	0.64 J	1.3 J	0.13 U	1.2 J	0.32 J	0.29 J	0.23 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.050 U	0.035 U	0.044 U	4.4 J	0.13 J	0.45 U	0.65 U	0.64 U	0.14 U	0.18 U	0.085 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.2 J	0.36 J	0.67 J	10 J	1.1 J	1.2 U	0.066 U	0.90 U	0.26 U	0.25 U	0.012 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	55	14	27	230	7.3 J	15	0.076 U	3.4 J	0.33 U	0.28 U	0.54 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	19	5.0	10	66	1.2 J	5.4 J	0.10 U	0.14 U	0.0048 U	0.13 J	0.13 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1.1 J	0.65 J	1.3 J	52 J	2.1 J	3.1 J	1.6 J	1.6 J	0.46 J	0.23 J	0.48 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	64 J	55 J	66 J	530 J	63 J	54 J	95 J	32 J	8.0 J	3.3 J	9.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	3.1 J	1.1 J	1.9 J	50 J	2.3 J	5.1 J	4.3 J	3.1 J	0.80 J	0.70 J	0.91 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	18 J	16 J	21 J	120 J	18 J	22 J	28 J	11 J	3.3 J	1.7 J	2.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	4.1 J	0.84 J	1.7 J	38 J	4.2 J	5.2 J	2.9 J	4.9 J	0.58 J	0.55 J	0.73 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.4 J	1.5 J	1.5 J	15 J	2.7 J	3.3 J	6.2 J	1.2 J	1.1 J	0.68 J	0.36 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	100 J	23 J	48 J	420 J	9.6 J	24 J	2.8 J	6.2 J	0.33 J	0.28 J	1.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	19 J	5.0 J	10 J	78 J	3.7 J	9.5 J	1.5 J	0.85 J	0.66 J	0.30 J	0.36 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	26 J	6.9 J	14 J	110 J	3.7 J	8.8 J	0.48 J	1.9 J	0.49 J	0.47 J	0.44 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	26 J	7.0 J	14 J	110 J	3.7 J	9.2 J	0.81 J	2.3 J	0.58 J	0.57 J	0.51 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00194

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB101 11215702-072521-SS-SJSB101(0-2) 07/25/2021 (0-2) ft bgs	SJSB101-Waste 11215702-072521-SS-SJSB101(0-2)-WC 07/25/21 (0-2) ft bgs	SJSB101 11215702-072521-SS-SJSB101(2-4) 07/25/2021 (2-4) ft bgs	SJSB101-Waste 11215702-072521-SS-SJSB101(2-4)-WC 07/25/21 (2-4) ft bgs	SJSB101 11215702-072521-SS-SJSB101(4-6) 07/25/2021 (4-6) ft bgs	SJSB101 11215702-072521-SS-SJSB101(6-8) 07/25/2021 (6-8) ft bgs	SJSB101 11215702-072521-SS-SJSB101(8-10) 07/25/2021 (8-10) ft bgs	SJSB101 11215702-072521-SS-SJSB101(10-12) 07/25/2021 (10-12) ft bgs	SJSB101 11215702-072521-SS-SJSB101 (10-12)-R 07/25/2021 (10-12) ft bgs Lab Duplicate	SJSB101 11215702-072521-SS-SJSB101(12-14) 07/25/2021 (12-14) ft bgs	SJSB101 11215702-072521-SS-SJSB101(14-16) 07/25/2021 (14-16) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1700	1400	1400	1200	640	0.61 J	0.095 U	5.0 J	3.5 U	1.7 J	0.66 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	10000	10000	9700	5800	4500	110	88	170	150	180	95
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	3100	2500	2300	2800	1100	0.72 J	0.20 J	7.5	6.6	0.94 J	0.24 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	540	670	610	470	280	3.9 J	3.2 J	7.0	7.1	11	5.1 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1000	890	700	860	370	0.26 J	0.034 U	2.5 J	4.2 J	0.060 U	0.044 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	10000	8500	7300	10000	3400	2.3 J	0.56 J	26	36	0.72 J	0.029 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	6.1 J	4.5 J	7.5 J	7.1 J	2.4 J	0.24 J	0.20 J	0.073 U	0.33 U	0.13 U	0.085 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2800	2200	1800	2600	1000	0.57 J	0.14 J	6.7	7.6	0.038 U	0.030 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	36 J	40 J	44 J	30 J	18 J	0.19 J	0.23 J	0.076 U	0.23 J	0.14 U	0.095 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	180	120	110 J	140 J	65 J	0.36 U	0.025 U	0.74 U	0.69 J	0.28 U	0.25 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	18 J	16 J	11 J	15 J	6.9 J	0.26 J	0.059 U	0.37 J	0.45 U	1.1 J	0.083 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7000	5500	4700	5500	2200	1.7 J	0.31 J	18	11	0.045 U	0.035 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	400 J	370	380	280	160	0.079 U	0.080 U	1.6 J	0.77 J	0.11 U	0.083 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	340	250	220	260	120	0.046 U	0.028 U	0.52 J	0.76 J	0.035 U	0.029 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	3400	2900	2700	2400	1300	0.83 J	0.051 U	11	6.0	0.045 U	0.038 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	160000 J	140000 J	150000 J	100000 J	62000 J	42	6.9	540 J	290 J	1.1 J	0.71 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	44000 J	35000 J	42000 J	34000 J	18000 J	13	1.8	170 J	92 J	0.11 U	0.077 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	4900 J	4300 J	3800 J	4300 J	1900 J	1.3 J	0.20 J	13 J	14 J	0.94 J	0.24 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1100 J	1400 J	1300 J	970 J	590 J	12 J	13 J	20 J	19 J	35 J	18 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	15000 J	13000 J	11000 J	15000 J	5200 J	3.2 J	0.70 J	39 J	51 J	1.0 J	0.25 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	190 J	190 J	190 J	150 J	82 J	3.2 J	3.1 J	5.5 J	7.2 J	12 J	5.5 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	16000 J	14000 J	12000 J	12000 J	5300 J	3.7 J	0.31 J	40 J	27 J	0.17 U	0.038 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	400 J	370 J	380 J	280 J	160 J	0.079 U	0.080 U	1.6 J	2.4 J	1.2 J	0.083 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	260000 J	230000 J	250000 J	170000 J	100000 J	72 J	9.6 J	1100 J	530 J	1.6 J	0.71 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	48000 J	38000 J	46000 J	37000 J	19000 J	13 J	1.8 J	190 J	100 J	1.0 J	0.15 U
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	63000 J	52000 J	59000 J	47000 J	25000 J	18 J	2.7 J	230 J	130 J	0.47 J	0.15 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	63000 J	52000 J	59000 J	47000 J	25000 J	18 J	2.7 J	230 J	130 J	0.62 J	0.27 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00195

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB101 11215702-072521-SS-SJSB101(16-18) 07/25/2021 (16-18) ft bgs	SJSB101 11215702-072521-SS-SJSB101(18-20) 07/25/2021 (18-20) ft bgs	SJSB102 11215702-081921-BN-SJSB102(0-2) 08/19/2021 (0-2) ft bgs	SJSB102 11215702-081921-BN-SJSB102(2-4) 08/19/2021 (2-4) ft bgs	SJSB102 11215702-081921-BN-SJSB102(4-6) 08/19/2021 (4-6) ft bgs	SJSB102 11215702-081921-BN-SJSB102(6-8) 08/19/2021 (6-8) ft bgs	SJSB102 11215702-081921-BN-SJSB102(8-10) 08/19/2021 (8-10) ft bgs	SJSB102 11215702-081921-BN-SJSB102(10-12) 08/19/2021 (10-12) ft bgs	SJSB102 11215702-081921-BN-SJSB102(12-14) 08/19/2021 (12-14) ft bgs	SJSB102 11215702-081921-BN-SJSB102 (12-14)-R 08/19/2021 (12-14) ft bgs Lab Duplicate	SJSB102 11215702-081921-BN-SJSB102(14-16) 08/19/2021 (14-16) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	19	0.38 U	150 J	12 U	13 J	1.4 U	1.1 U	0.26 U	1.9 J	2.7 J	0.0043 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	180	150	2900	160	710	580	590	890	590	620	800
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.2 J	0.15 U	120 J	3.0 U	12 J	0.63 U	0.34 U	0.13 U	1.0 J	5.9 J	0.11 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	9.3	7.3	180 J	14 J	34 J	49 J	27 J	39	25	28	35
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.088 U	0.074 U	15 J	1.1 U	3.9 J	0.044 U	0.22 U	0.0079 U	0.34 J	2.9 J	0.0058 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.3 J	0.38 J	120 J	1.1 U	28 J	3.1 U	2.0 U	0.24 U	3.3 J	45 J	0.093 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.097 U	0.26 J	7.0 J	0.099 U	1.4 U	0.90 U	0.091 U	0.58 J	0.43 J	0.37 U	0.44 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.052 U	0.18 U	37 J	0.23 U	8.1 J	0.87 U	0.041 U	0.21 U	0.88 J	10	0.0039 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.11 U	0.21 U	13 J	1.3 U	2.8 J	0.14 U	0.63 J	1.2 J	0.63 J	0.65 J	0.94 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.29 U	0.092 U	1.0 U	1.2 U	0.13 U	0.31 U	0.35 U	0.0084 U	0.0093 U	5.6 J	0.15 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.096 U	0.34 J	11 J	1.1 U	1.4 J	3.7 J	1.9 J	1.2 J	1.1 J	1.5 J	1.4 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.0 J	0.33 J	98 J	1.6 U	23 J	1.5 J	3.4 J	0.35 U	2.9 J	28 J	0.20 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	0.19 U	20 J	1.0 U	3.8 J	1.4 J	0.31 U	0.50 J	0.43 J	0.39 J	0.15 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.049 U	0.074 U	13 J	0.80 U	2.2 U	0.038 U	0.037 U	0.22 U	0.24 U	2.5 J	0.0037 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.077 U	0.25 U	95 J	1.2 U	23 J	1.8 U	1.9 U	0.0070 U	2.3 J	9.5	0.096 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	24	6.6	3900	17	960	54	41	3.1	87	55	3.5
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.5	2.1	960	3.0 J	230	16	0.16 U	0.71 J	23	14	0.014 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	3.0 J	0.38 J	220 J	10 J	20 J	0.63 J	0.56 J	0.20 J	1.9 J	11 J	0.18 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	34 J	29 J	450 J	25 J	91 J	100 J	82 J	120 J	84 J	86 J	110 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1.6 J	0.74 J	250 J	5.0 J	41 J	4.8 J	2.4 J	0.67 J	5.0 J	68 J	0.25 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	9.6 J	13 J	120 J	7.6 J	33 J	22 J	31 J	43 J	26 J	23 J	33 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1.0 J	19 J	380 J	4.5 J	66 J	3.9 J	5.8 J	0.72 J	7.8 J	53 J	0.47 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.16 U	4.2 J	30 J	2.1 J	11 J	4.7 J	4.0 J	8.3 J	5.1 J	3.7 J	6.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	42 J	13 J	8900 J	20 J	2400 J	110 J	57 J	4.6 J	190 J	120 J	9.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.5 J	4.9 J	1100 J	3.8 J	270 J	17 J	0.16 U	6.9 J	27 J	18 J	4.1 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	11 J	3.0 J	1400 J	4.9 J	340 J	24 J	4.9 J	2.5 J	34 J	31 J	1.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	11 J	3.2 J	1400 J	5.9 J	340 J	24 J	5.6 J	2.5 J	34 J	31 J	1.4 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00196

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Depth: / Parameters	Units	SJSB102 11215702-081921-BN-SJSB102(16-18) 08/19/2021 (16-18) ft bgs	SJSB102 11215702-081921-BN-SJSB102 (16-18)-R 08/19/2021 (16-18) ft bgs Lab Duplicate	SJSB102 11215702-081921-BN-SJSB102(18-20) 08/19/2021 (18-20) ft bgs	SJSB102 11215702-081921-BN-SJSB102(20-22) 08/19/2021 (20-22) ft bgs	SJSB102 11215702-081921-BN-SJSB102(22-24) 08/19/2021 (22-24) ft bgs	SJSB103 11215702-082121-BN-SJSB103(0-2) 08/21/2021 (0-2) ft bgs	SJSB103 11215702-082121-BN-SJSB103(2-4) 08/21/2021 (2-4) ft bgs	SJSB103 11215702-082121-BN-SJSB103(4-6) 08/21/2021 (4-6) ft bgs	SJSB103 11215702-082121-BN-SJSB103(6-8) 08/21/2021 (6-8) ft bgs	SJSB103 11215702-082121-BN-SJSB103(8-10) 08/21/2021 (8-10) ft bgs	SJSB103 11215702-082121-BN-SJSB103(10-12) 08/21/2021 (10-12) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	7.6 U	8.5 J	2.0 U	1.4 U	0.69 U	1.6 U	0.10 U	2.5 U	1.4 U	0.76 U	0.089 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	900	760	810	790	730	35 U	35 U	220	14 J	8.4 U	28
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	3.5 U	3.7 J	1.4 U	0.51 U	0.93 U	0.67 U	1.3 U	1.1 U	0.88 U	0.55 U	0.064 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	40 J	38 J	52 J	40 J	40 J	2.6 U	0.14 U	11 J	2.1 U	1.9 U	1.0 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.7 U	0.70 U	1.3 U	0.57 U	0.69 U	0.057 U	0.39 U	0.60 U	0.62 U	0.53 U	0.047 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	10 J	5.6 J	2.9 U	1.2 U	0.87 U	0.29 U	0.81 U	1.7 U	1.3 U	1.3 U	0.063 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 U	0.64 U	2.6 U	3.3 U	1.5 U	0.062 U	0.46 U	0.40 U	0.82 U	1.0 U	0.043 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.0 U	2.4 J	1.4 U	0.68 U	0.48 U	0.38 U	0.83 U	0.91 U	1.5 U	1.2 U	0.051 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.7 U	0.76 U	4.1 U	3.9 U	2.7 U	0.27 U	0.14 U	1.0 J	0.62 J	1.4 J	0.055 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.6 U	0.22 U	2.6 U	1.2 U	0.57 U	0.47 U	0.13 U	0.62 U	0.72 U	1.3 U	0.083 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6 J	1.2 J	5.1 U	2.7 U	3.2 U	0.55 U	0.14 U	1.0 J	0.86 J	1.7 J	0.12 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.9 J	4.5 J	1.6 U	1.9 U	1.4 U	0.36 J	0.18 U	1.2 J	2.8 J	2.6 J	0.074 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.3 U	0.15 U	4.1 U	3.6 U	3.9 U	1.4 J	1.0 U	0.46 J	2.0 J	1.8 J	0.043 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.91 U	0.13 U	1.5 U	0.64 U	0.59 U	0.48 U	0.41 U	0.39 U	0.88 U	0.85 U	0.085 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.7 J	3.4 J	3.2 U	1.3 U	0.48 U	0.11 U	0.53 U	1.3 U	2.1 U	1.6 U	0.096 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	290 J	140 J	16	1.4 U	0.50 U	5.6 J	2.1 J	13	7.4 J	5.2 J	0.96 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	72 J	38 J	6.0 U	0.98 U	1.7 U	0.12 U	0.34 U	11	2.4 U	1.2 U	0.29 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	7.7 J	5.6 J	2.6 J	1.1 J	1.6 J	1.6 J	2.7 J	2.3 J	2.1 J	1.4 J	0.12 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	120 J	120 J	130 J	95 J	100 J	5.5 J	4.3 J	42 J	4.3 J	4.0 J	4.0 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	19 J	10 J	8.8 J	4.0 J	2.8 J	3.7 J	2.7 J	4.1 J	4.6 J	4.8 J	0.21 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	33 J	27 J	55 J	40 J	40 J	1.9 J	1.3 J	12 J	3.4 J	5.8 J	1.7 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	26 J	13 J	6.5 J	7.8 J	4.5 J	4.0 J	6.0 J	2.8 J	5.5 J	5.0 J	0.26 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.6 J	4.1 J	15 J	10 J	15 J	1.4 J	4.1 J	5.5 J	3.4 J	3.9 J	0.61 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	600 J	270 J	28 J	2.6 J	1.7 J	11 J	5.3 J	64 J	8.7 J	6.8 J	2.7 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	84 J	48 J	7.6 J	6.2 J	4.1 J	0.12 U	0.34 U	11 J	2.4 J	1.2 J	0.56 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	110 J	55 J	2.4 J	0.64 J	0.62 J	1.0 J	0.21 J	13 J	3.0 J	2.7 J	0.45 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	110 J	55 J	8.9 J	3.9 J	4.0 J	2.2 J	1.1 J	14 J	4.8 J	3.9 J	0.49 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00197

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB103 11215702-082121-BN-SJSB103(12-14) 08/21/2021 (12-14) ft bgs	SJSB104 11215702-072421-BN-SJSB104(0-2) 07/24/2021 (0-2) ft bgs	SJSB104 11215702-072421-BN-SJSB104(2-4) 07/24/2021 (2-4) ft bgs	SJSB104 11215702-072421-BN-SJSB104(4-6) 07/24/2021 (4-6) ft bgs	SJSB104 11215702-072421-BN-SJSB104(6-8) 07/24/2021 (6-8) ft bgs	SJSB104 11215702-072421-BN-SJSB104(8-10) 07/24/2021 (8-10) ft bgs	SJSB104 11215702-072421-BN-SJSB104(10-12) 07/24/2021 (10-12) ft bgs	SJSB104 11215702-072421-BN-SJSB104(12-14) 07/24/2021 (12-14) ft bgs	SJSB104 11215702-072421-BN-SJSB104(14-16) 07/24/2021 (14-16) ft bgs	SJSB104 11215702-072421-BN-SJSB104(16-18) 07/24/2021 (16-18) ft bgs	SJSB105 11215702-072321-BN-SJSB105(0-2) 07/23/2021 (0-2) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.099 U	1.5 U	0.25 U	0.54 U	0.86 U	1.7 U	0.075 U	1.7 U	0.042 U	0.092 U	470
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	49	1300	1100	710	1300	770	1400	430	80	130	3200
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.064 U	0.48 U	0.14 U	0.33 U	0.14 U	0.59 U	0.043 U	0.021 U	0.030 U	0.038 U	800
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3.0 J	41	46	29	48	32	56	17	2.4 J	3.6 J	180
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.047 U	0.10 J	0.028 U	0.089 J	0.040 U	0.068 J	0.041 U	0.021 U	0.029 U	0.036 U	240
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.063 U	0.90 J	0.12 J	0.76 J	0.10 J	0.33 J	0.049 U	0.024 U	0.019 U	0.042 U	2500
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.13 J	0.56 U	0.66 U	0.45 U	0.58 U	0.59 U	0.33 U	0.11 U	0.060 U	0.058 U	3.0 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.041 U	0.30 J	0.080 J	0.25 J	0.049 J	0.087 J	0.051 U	0.026 U	0.021 U	0.046 U	710
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.21 J	0.84 J	0.87 J	0.66 J	0.81 J	0.73 J	0.37 U	0.12 U	0.076 U	0.065 U	11
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.083 U	0.22 U	0.35 U	0.27 U	0.29 U	0.28 U	0.36 U	0.026 U	0.27 U	0.35 U	40
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.24 U	1.7 J	2.4 J	1.4 J	2.2 J	2.1 J	3.6 J	0.11 U	0.062 U	0.056 U	6.7 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.088 U	0.91 J	0.30 J	0.75 J	0.26 J	0.24 J	0.074 U	0.046 U	0.046 U	0.056 U	2000
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.25 J	0.31 J	0.23 J	0.22 J	0.20 J	0.21 J	0.21 U	0.082 U	0.068 U	0.083 U	240
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.085 U	0.047 J	0.032 J	0.055 J	0.017 U	0.019 U	0.049 U	0.025 U	0.020 U	0.045 U	80
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.096 U	0.54 J	0.12 J	0.43 J	0.095 J	0.034 U	0.074 U	0.049 U	0.046 U	0.055 U	1400
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.28 U	38	3.2	24	2.6	1.2 J	2.2	1.3	0.91 J	0.063 U	83000 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.075 J	9.9	1.0 J	7.0	0.91 J	0.38 J	0.11 U	0.051 U	0.081 U	0.071 U	27000 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.11 J	0.78 J	0.11 J	0.57 J	0.12 J	0.77 J	0.13 U	0.20 U	0.030 U	0.038 U	1200 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	8.5 J	140 J	160 J	110 J	160 J	100 J	160 J	46 J	8.5 J	12 J	420 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.28 J	1.5 J	0.59 J	1.3 J	0.44 J	0.78 J	0.36 J	0.051 U	0.27 J	0.35 J	3700 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.7 J	28 J	43 J	26 J	40 J	30 J	47 J	8.7 J	3.2 J	1.1 J	110 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.36 J	2.1 J	0.54 J	1.7 J	0.47 J	0.36 J	0.11 U	0.13 U	0.083 U	0.056 U	5400 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.39 J	5.2 J	9.8 J	5.4 J	8.0 J	6.9 J	4.5 U	1.1 U	0.92 U	0.35 U	260 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.43 J	68 J	5.9 J	43 J	5.1 J	2.6 J	2.4 J	1.7 J	0.91 J	0.18 U	160000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.39 J	14 J	7.2 J	10 J	5.5 J	5.1 J	1.3 U	0.60 U	2.1 J	0.22 U	30000 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.40 J	15 J	2.7 J	11 J	2.6 J	1.6 J	1.7 J	0.43	0.14 J	0.075 J	36000 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.46 J	15 J	2.8 J	11 J	2.6 J	1.7 J	1.8 J	0.53	0.25 J	0.20 J	36000 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00198

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB105 11215702-072321-BN-SJSB105(2-4) 07/23/2021 (2-4) ft bgs	SJSB105 11215702-072321-BN-SJSB105(4-6) 07/23/2021 (4-6) ft bgs	SJSB105 11215702-072321-BN-SJSB105(6-8) 07/23/2021 (6-8) ft bgs	SJSB105 11215702-072321-BN-SJSB105(8-10) 07/23/2021 (8-10) ft bgs	SJSB105 11215702-072321-BN-SJSB105(10-12) 07/23/2021 (10-12) ft bgs	SJSB105 11215702-072321-BN-SJSB105(12-14) 07/23/2021 (12-14) ft bgs	SJSB105 11215702-072321-BN-SJSB105 (12-14)-R 07/23/2021 (12-14) ft bgs Lab Duplicate	SJSB105 11215702-072321-BN-SJSB105(14-16) 07/23/2021 (14-16) ft bgs	SJSB105 11215702-072321-BN-SJSB105 (14-16)-R 07/23/2021 (14-16) ft bgs Lab Duplicate	SJSB105 11215702-072321-BN-SJSB105(16-18) 07/23/2021 (16-18) ft bgs	SJSB106 11215702-080821-BN-SJSB106(0-2) 08/08/2021 (0-2) ft bgs
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	480	3.9 J	0.47 U	0.49 U	0.39 U	4.3 J	13 J	2.9 J	0.87 U	0.32 U	31
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1600	1500	1800	1600	1100	1600	1300	1400	1600	1400	4400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1200	5.0 J	0.52 U	0.15 U	0.32 U	7.0 J	25 J	1.3 J	1.1 U	0.20 U	4.7 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	110	49	68	64	37	64	49	57	70	57	130
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	440	1.6 J	0.18 U	0.080 U	0.062 U	2.1 J	9.0	0.68 U	0.41 U	0.049 U	0.78 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4200	17	1.8 J	0.55 J	1.0 J	24 J	98 J	3.3 J	3.6 J	0.38 J	2.2 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.4 J	0.54 U	0.50 U	0.92 U	0.63 U	0.58 U	0.77 U	0.62 U	1.1 U	0.76 U	2.5 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1100	5.2 J	0.53 J	0.22 U	0.29 J	6.8 J	22	1.0 J	0.96 J	0.14 U	1.1 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.4 J	0.90 J	1.9 J	1.4 J	0.89 J	1.2 J	1.4 J	1.2 J	1.8 J	1.3 J	3.0 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	54 J	0.38 U	0.053 U	0.046 U	0.040 U	0.41 U	1.4 J	0.21 U	0.22 U	0.11 U	0.18 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.1 J	2.1 J	3.2 J	3.1 J	1.8 J	2.8 J	2.0 J	2.6 J	3.1 J	3.6 J	6.4 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2600	12	1.2 J	0.44 J	0.86 J	18 J	68 J	2.9 J	2.6 J	0.39 J	2.0 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	300	1.9 J	0.15 U	0.16 U	0.27 J	2.6 J	7.9	0.59 J	0.71 J	0.32 J	0.58 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	110	0.53 J	0.051 U	0.044 U	0.039 U	0.79 J	2.8 J	0.12 J	0.16 U	0.029 U	0.18 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1900	9.2	1.0 J	0.39 J	0.54 J	13 J	58 J	2.1 J	2.3 J	0.18 J	1.1 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	130000 J	610 J	71	33	39	900 J	3700 J	160	150	14	71 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	33000 J	170	20	8.1	11	250 J	970 J	41	41	4.3	27 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1900 J	8.0 J	0.70 J	0.15 J	0.32 J	11 J	42 J	2.2 J	1.9 J	0.20 J	8.9 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	230 J	170 J	190 J	200 J	110 J	200 J	150 J	180 J	210 J	200 J	310 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	6000 J	24 J	2.3 J	0.78 J	1.3 J	36 J	140 J	5.3 J	5.6 J	0.62 J	6.6 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	59 J	33 J	40 J	51 J	26 J	45 J	39 J	42 J	54 J	51 J	65 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	6800 J	34 J	3.4 J	0.83 J	1.7 J	48 J	200 J	7.9 J	8.0 J	0.72 J	6.1 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	320 J	7.7 J	8.3 J	13 J	6.0 J	12 J	14 J	8.6 J	11 J	11 J	0.58 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	210000 J	1100 J	120 J	57 J	70 J	1600 J	6300 J	290 J	280 J	27 J	110 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	37000 J	190 J	26 J	16 J	18 J	270 J	1100 J	50 J	51 J	11 J	27 J
TEQ												
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	48000 J	240 J	29 J	13 J	17 J	350 J	1400 J	60 J	60 J	7.6 J	39 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	48000 J	240 J	29 J	13 J	17 J	350 J	1400 J	60 J	60 J	7.7 J	39 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

ED_014247_00001351-00199

Table 2-4

Supplemental Design Investigation Analytical Results - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Parameters	Units	SJSB106 11215702-080821-BN-SJSB106 (0-2)-R 08/08/2021 (0-2) ft bgs Lab Duplicate	SJSB106 11215702-080821-BN-SJSB106(2-4) 08/08/2021 (2-4) ft bgs	SJSB106 11215702-080821-BN-SJSB106(4-6) 08/08/2021 (4-6) ft bgs	SJSB106 11215702-080821-BN-SJSB106(6-8) 08/08/2021 (6-8) ft bgs	SJSB106 11215702-080821-BN-DUP-15 08/08/2021 (6-8) ft bgs Field Duplicate	SJSB106 11215702-080821-BN-SJSB106(8-10) 08/08/2021 (8-10) ft bgs	SJSB106 11215702-080821-BN-SJSB106(10-12) 08/08/2021 (10-12) ft bgs	SJSB106 11215702-080821-BN-SJSB106(12-14) 08/08/2021 (12-14) ft bgs	SJSB106 11215702-080821-BN-SJSB106(14-16) 08/08/2021 (14-16) ft bgs	SJSB106 11215702-080821-BN-SJSB106(16-18) 08/08/2021 (16-18) ft bgs
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	5.6 U	0.69 J	3.1 J	0.65 J	0.078 U	0.65 J	0.77 J	0.61 J	0.80 J	0.80 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	3600	950 J	2700	1400	810	1000	1900	1300	990	1100
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.2 U	0.39 U	1.0 U	0.37 U	0.084 U	0.47 U	0.45 U	0.37 U	0.51 U	0.37 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	100	36	73	58	35	47	85	61	46	53
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.093 U	0.12 U	0.26 J	0.076 U	0.076 U	0.092 U	0.13 U	0.097 U	0.11 U	0.095 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.67 U	0.42 J	0.92 J	0.037 U	0.030 U	0.065 U	0.046 U	0.058 U	0.078 U	0.057 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 U	0.79 J	0.77 J	0.94 J	0.25 U	0.68 J	0.75 J	1.0 J	0.38 U	0.87 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.27 U	0.069 U	0.46 J	0.037 U	0.029 U	0.063 U	0.047 U	0.054 U	0.078 U	0.057 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.8 J	1.0 J	1.5 J	1.3 J	0.27 U	1.4 J	2.1 J	1.9 J	0.44 U	1.4 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.12 U	0.27 J	0.21 J	0.036 U	0.024 U	0.056 U	0.044 U	0.055 U	0.071 U	0.15 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.6 J	2.7 J	3.1 J	3.3 J	2.8 J	3.3 J	5.2 J	3.8 J	3.9 J	3.8 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.50 J	0.69 J	0.13 U	0.072 U	0.053 U	0.37 J	0.076 U	0.076 U	0.10 U	0.093 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.39 J	0.29 U	0.32 U	0.25 U	0.23 U	0.38 U	0.35 U	0.30 U	0.24 U	0.28 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 U	0.18 J	0.073 U	0.037 U	0.026 U	0.058 U	0.045 U	0.054 U	0.076 U	0.053 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.41 J	0.17 U	0.13 U	0.075 U	0.062 U	0.080 U	0.076 U	0.078 U	0.11 U	0.11 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	22 J	4.5	17	2.7	0.79 U	3.5	0.77 U	0.99 U	2.3 U	3.2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6.6 J	1.8	5.3	0.90 J	0.098 U	1.5 J	0.19 U	0.69 J	0.18 U	1.4 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	2.0 J	0.39 J	1.3 J	0.57 J	0.084 U	0.47 J	0.45 J	0.27 J	0.51 J	0.28 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	240 J	100 J	190 J	190 J	110 J	130 J	240 J	180 J	140 J	160 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.0 J	0.87 J	1.6 J	0.037 U	0.030 U	0.065 U	0.047 U	0.058 U	0.14 U	0.15 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	42 J	24 J	35 J	55 J	38 J	38 J	64 J	54 J	43 J	48 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.7 J	3.8 J	0.51 U	0.075 U	0.062 U	0.75 J	0.076 U	0.078 U	0.11 U	0.14 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	8.0 J	0.29 U	0.32 U	0.25 U	0.23 U	0.38 U	0.35 U	0.30 U	0.24 U	0.28 U
Total tetrachlorodibenzofuran (TCDF)	pg/g	39 J	6.4 J	27 J	2.4 J	0.79 J	5.7 J	0.77 J	0.99 J	1.6 J	2.8 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	12 J	4.6 J	5.3 J	5.6 J	2.4 J	4.4 J	1.8 J	4.9 J	2.3 J	1.4 J
TEQ											
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	12 J	3.4 J	9.2 J	2.7 J	0.87 J	3.2 J	2.2 J	2.4 J	1.2 J	3.2 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	12 J	3.6 J	9.4 J	2.9 J	1.1 J	3.4 J	2.6 J	2.6 J	1.6 J	3.4 J

Notes:

U - Not detected at the associated reporting limit
J - Estimated concentration
UJ - Not detected; associated reporting limit is estimated
J- - Estimated concentration, result may be biased low
J+ - Estimated concentration, result may be biased high
TEQ - Toxicity Equivalent Quotient
ft bgs - Feet below ground surface
pg/g - picogram per grams

Table 2-5

Supplemental Design Investigation Waste Characterization Results
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth: Sample Type:	Units	SJSB101-Waste 11215702-072521-SS-SJSB101(0-2)-WC 07/25/21 (0-2) ft bgs	SJSB101-Waste 11215702-072521-SS-SJSB101(2-4)-WC 07/25/21 (2-4) ft bgs	SJSB102-Waste 11215702-081921-BN-SJSB102(8-10)-WC 08/19/21 (8-10) ft bgs	SJSB102-Waste 11215702-081921-BN-SJSB102(10-12)-WC 08/19/21 (10-12) ft bgs	SJSB083-Waste 11215702-072221-BN-SJSB083(8-10)-WC 07/22/21 (8-10) ft bgs	SJSB083-Waste 11215702-072221-BN-SJSB083(10-12)-WC 07/22/21 (10-12) ft bgs
TCLP Herbicides							
2,4,5-TP (Silvex)	mg/L	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
TCLP Metals							
Arsenic	mg/L	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U
Barium	mg/L	1.4 J	0.98 J	0.22 J	0.28 J	0.86 J	0.39 J
Cadmium	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chromium	mg/L	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
Lead	mg/L	0.033 J	0.029 U	0.029 U	0.029 U	0.029 U	0.029 U
Mercury	mg/L	0.00013 U	0.00016 J	0.00013 U	0.00013 U	0.00013 U	0.00013 U
Selenium	mg/L	0.036 U	0.036 U	0.036 U	0.036 U	0.50 U	0.036 U
Silver	mg/L	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U
Polychlorinated Biphenyls							
Aroclor-1016 (PCB-1016)	ug/kg	13 U	10 U	7.2 U	8.5 U	11 U	8.0 U
Aroclor-1221 (PCB-1221)	ug/kg	14 U	11 U	7.9 U	9.2 U	12 U	8.7 U
Aroclor-1232 (PCB-1232)	ug/kg	9.5 U	7.7 U	5.4 U	6.4 U	8.2 U	6.0 U
Aroclor-1242 (PCB-1242)	ug/kg	5.7 U	4.6 U	3.3 U	3.8 U	4.9 U	3.6 U
Aroclor-1248 (PCB-1248)	ug/kg	9.3 U	7.6 U	5.3 U	6.3 U	8.1 U	5.9 U
Aroclor-1254 (PCB-1254)	ug/kg	12 U	9.5 U	6.7 U	7.8 U	10 U	7.4 U
Aroclor-1260 (PCB-1260)	ug/kg	1500	1900	6.3 U	7.4 U	670	7.0 U
TCLP Pesticides							
Chlordane, technical	mg/L	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U
Endrin	mg/L	0.000091 U	0.000091 U	0.000091 U	0.000091 U	0.000091 U	0.000091 U
gamma-BHC (lindane)	mg/L	0.00012 U	0.00012 U	0.00012 U	0.00012 U	0.00012 U	0.00012 U
Heptachlor	mg/L	0.00018 U	0.00018 U	0.00018 U	0.00018 U	0.00018 U	0.00018 U
Heptachlor epoxide	mg/L	0.00014 U	0.00014 U	0.00014 U	0.00014 U	0.00014 U	0.00014 U
Methoxychlor	mg/L	0.00031 U	0.00031 U	0.00031 U	0.00031 U	0.00031 U	0.00031 U
Toxaphene	mg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
TCLP Semi-Volatile Organic Compounds (SVOCs)							
1,4-Dichlorobenzene	mg/L	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U
2,4,5-Trichlorophenol	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
2,4,6-Trichlorophenol	mg/L	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U
2,4-Dinitrotoluene	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
2-Methylphenol	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
3&4-Methylphenol	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
Hexachlorobenzene	mg/L	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
Hexachlorobutadiene	mg/L	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U	0.0084 U
Hexachloroethane	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
Methylphenol (cresol)	mg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Nitrobenzene	mg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	mg/L	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U
Pyridine	mg/L	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U
TCLP Volatile Organic Compounds (VOCs)							
1,1-Dichloroethene	mg/L	0.057 U	0.057 U	0.11 U	0.11 U	0.057 U	0.057 U
1,2-Dichloroethane	mg/L	0.029 U	0.029 U	0.058 U	0.058 U	0.029 U	0.029 U
1,4-Dichlorobenzene	mg/L	0.020 U	0.020 U	0.041 U	0.041 U	0.020 U	0.020 U
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	0.058 U	0.058 U	0.12 U	0.12 U	0.058 U	0.058 U
Benzene	mg/L	0.039 U	0.039 U	0.079 U	0.079 U	0.039 U	0.039 U
Carbon tetrachloride	mg/L	0.066 U	0.066 U	0.13 U	0.13 U	0.066 U	0.066 U
Chlorobenzene	mg/L	0.032 U	0.032 U	0.063 U	0.063 U	0.032 U	0.032 U
Chloroform (Trichloromethane)	mg/L	0.042 U	0.042 U	0.085 U	0.085 U	0.042 U	0.042 U
Tetrachloroethene	mg/L	0.040 U	0.040 U	0.080 U	0.080 U	0.040 U	0.040 U
Trichloroethene	mg/L	0.030 U	0.030 U	0.060 U	0.060 U	0.030 U	0.030 U
Vinyl chloride	mg/L	0.073 U	0.073 U	0.15 U	0.15 U	0.073 U	0.073 U
General Chemistry							
Cyanide (total)	mg/kg	0.51 U	0.50 U	0.29 U	0.36 U	0.48 U	0.37 U
Free liquid	none	0.10 CNF	0.10 CNF	0.10 CNF	0.10 CNF	0.10 CNF	0.10 CFL
Ignitability	Deg F	140	140	140	140	140	140
pH, lab	s.u.	9.5 J-	8.0 J-	8.8 J-	8.4 J-	8.6 J-	8.9 J-
Reactive cyanide	mg/kg	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U	0.012 U
Reactive sulfide	mg/kg	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	25
Sulfide	mg/kg	15 U	17 U	8.2 U	9.1 U	13 U	11 U

Notes:
U - Not detected at the associated reporting limit
J - Estimated concentration
J- - Estimated concentration, result may be biased low
CNL - Contains Free Liquid
CNF - Contains No Free Liquid
TCLP - Toxicity Characteristic Leaching Procedure
mg/L - milligrams per liter
ug/kg - micrograms per kilogram
ft bgs - feet below ground surface
mg/kg - micrograms per kilogram
s.u. - standard units

Table 2-6

RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJGB010	SJGB011	SJGB012	SJGB013	SJGB014	SJGB015	SJGB016	SJGB017	SJSB028	DUP (28 8-10)	SJSB029	SJSB030	SJSB031	DUP (31 0-2)	SJSB032	DUP (32 4-6)	SJSB033	SJSB034	SJSB035	DUP (35 12-14)	SJSB036	SJSB037	SJSB038
+5									59.2 J			5.54 J	2.46 J	1.72 J				5.12 J	1.32 J				
+4									2.4 J		14.9 J	1.9 J	0.77 J				95.6 J	1.17 J	0.585 J				
+3									35.9 J		2.95 J	0.735 J	0.666 J		3,410 J		1,050	3.04 J	0.995				
+2									12.3 J		2.12 J	2.81 J	0.719 J		7,660 J		7,120 J	0.988 J	0.896 J		50,500 J		
+1	4,720 J	12,700 J	4,050 J		31,600 J		3,520 J	1.95 J	7.13 J	21.2 J	1.48 J	0.44 J	0.726 J		3,170 J	1,740 J	5,740 J	0.98 J	0.64 J			40,400	
0	26,900 J	22,200 J	25,100 J		210 J	1.22 J	75.3 J	1.46 J	3.35 J		1.35 J	0.82 J	0.97 J		6.19 J		1,700	0.812 J	0.801 J		276 J	0.873 J	
-1	6,350 J	9,430 J	24,400 J		531 J	0.640 J	0.464 J	0.909 J	2.59 J		2.45 J	0.453 J	0.333 J		85.8 J		157 J	0.592 J	1.26 J	0.471 J			
-2	194 J	14,800 J	17,700 J	5,100 J	213 J	1.48 J	2.33 J	0.853 J	2.39 J		1.36 J	0.592	0.653 J		26.5 J		24 J	1.5 J	0.962 J		519 J		
-3		8,710 J		1,740 J	18.6 J	1.51 J	6.15 J	0.177 J	1.19 J		0.769 J	0.982 J	0.362 J		15.9 J		17.6 J	0.897 J	0.516 J		19 J	618 J	
-4		3.37 J		338 J	1.29 J	0.850 J					9.13 J				2.13 J		12.5 J				189 J	2.59 J	96,700
-5				104 J											12.7 J							11.5 J	364 J
-6				25.2 J																			152 J
-7																							4.71 J
-8																							
-9																							
-10																							
-11																							
-12																							
-13																							
-14																							
-15																							
-16																							
-17																							
-18																							
-19																							
-20																							
-21																							
-22																							
-23																							
-24																							
-25																							
-26																							
-27																							
-28																							
-29																							
-30																							
-31																							
-32																							
-33																							
-34																							
-35																							

Note:
J - Estimated concentration

Table 2-6

RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB045	DUP (45 2-4)	DUP (45 6-8)	SJSB045-C1	SJSB046	DUP (46 12-14)	SJSB046-C1	DUP (46-C1 16-18)	SJSB047	SJSB047-C1	SJSB048	SJSB048-C1	SJSB049	SJSB050	DUP (50 2-4)	SJSB050-C1	DUP (50-C1 16-18)	SJSB051	DUP (51 16-18)	SJSB052	DUP (52 16-18)	SJSB052-C1	SJSB053
+5																							
+4																							
+3																							
+2																							
+1																							
0																							
-1				286 J																			
-2	10.3 J			190 J	636 J		1,550 J		1.19 J		1.7 J			7.41 J				3.02 J				9.22 J	
-3	3.42 J	5.26 J		286 J	2,660 J		3,350 J		1.35 J	7,470 J	1.02 J	623 J	23,600 J	3.05 J	3.13 J			4.98 J		2.07 J		1.2 J	
-4	5.58 J			46.8 J	8,610 J		2,820 J		1.53 J	6,310 J	1.72 J	55.1 J	6,640 J	1.33 J		2.27 J		2.48 J		1.94 J		0.493 J	
-5	2.16 J		4.88 J	54.6 J	28,500 J		11,700 J		2.73 J	139 J	2.46 J	592 J	2,350 J	1.48 J		1.97 J		2.64 J		1.99 J		1.47 J	1.79 J
-6	3.25 J			50.4 J	6,930 J		14,900 J		2.03 J	29.4 J	2.52 J	4.95 J	110 J	3.38 J		2.22 J		3.03 J		1.99 J		2.32 J	0.917 J
-7	0.717 J			3.79 J	111 J		55.1 J		1.41 J	769 J	1.77 J	323 J	251 J	2.71 J		3.1 J		1.71 J		2.01 J		1.39 J	1.44 J
-8	1.52 J			22.4 J	3,420 J	3,370 J	2,230 J		1.69 J	685 J	2.03 J	6.35 J	112 J	1.81 J		1.31 J		2.91 J		2.8 J		1.71 J	1.44 J
-9	2.36 J			5.81 J	1,710 J		205 J		1.98 J	821 J	1.66 J	147 J	117 J	1.77 J		1.54 J		2.35 J		2.24 J		1.79 J	1.28 J
-10	4.96 J				3,400 J		5,690 J	3,980 J	1.67 J	327 J	2.56 J	143 J	28.1 J	0.351 J		3.38 J		2.48 J	1.7 J	0.694 J		2.08 J	1.79 J
-11					4.82 J					7.35 J		219 J	5.87 J			2.88 J				12.1 J	10.1 J		0.22 J
-12												11.8 J				1.33 J	0.473 J						3.33 J
-13												1.07 J											0.35 J
-14																							
-15																							
-16																							
-17																							
-18																							
-19																							
-20																							
-21																							
-22																							
-23																							
-24																							
-25																							
-26																							
-27																							
-28																							
-29																							
-30																							
-31																							
-32																							
-33																							
-34																							
-35																							

Note:
J - Estimated concentration

Table 2-6

RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB053-C1	SJSB054	SJSB055	SJSB055-C1	SJSB056	SJSB056-C1	DUP (56-C1 14-16)	SJSB057	SJSB058	SJSB070	SJSB071	SJSB072	SJSB072-R	SJSB073	SJSB074	DUP-5 (74 2-4)	SJSB075	SJSB076	SJSB076-R	SJSB077	DUP-3 (77 6-8)	SJSB077-R
+5																						
+4															7,800 J							
+3																	NA	3,000 J				
+2												NA		9.6 J	70,000 J	59,000 J				NA		
+1									12 J								NA	49,000 J				
0									36,100 J	43,900 J	34,700 J	NA		31,000 J	30,000 J					NA		
-1									48,400 J	68,600 J	45,900 J	NA		26,000 J	87 J		55,000 J	63,000 J		NA		
-2									324 J	45,600 J	26.8 J	NA		68,000 J	5.1 J		NA	210 J		63,000 J	61,000 J	
-3			1.36 J			0.792 J			1,160 J	24,300 J	2.24 J	12 J		83,000 J	3.1 J		NA	11 J		77,000 J		
-4			1.07 J			1.14 J			376 J	16,700 J	1.03 J	340 J		41 J	0.37 J		270 J	150 J	110 J	50 J		150 J
-5			0.814 J			0.26 J			9,890 J	1,000 J	1.48 J	1.3 J		5.2 J	2.6 J		0.88 J	21 J		24 J		23 J
-6	0.806 J	16,600 J	1.28 J	34.3 J		0.597 J			136 J	609 J	0.523 J	1.7 J		15 J	0.84 J		1.8 J	5.2 J		350 J		330 J
-7	0.855 J	1,550 J	2.53 J	31.1 J		1.4 J			788 J	6.9 J	44.6 J	34 J		5.6 J			6.7 J	3.7 J		0.21 J		
-8	1.34 J	6.43 J	0.89 J	1.34 J	3.35 J	1.33 J			0.524 J	4.69 J	45.4 J	0.52 J										
-9	1.4 J	5.94 J	1.09 J	0.697 J	1.65 J	0.596 J						74 J	120 J									
-10	0.936 J	17.6 J	1.42 J	1.07 J	0.803 J	0.593 J	0.624 J	24,200 J				0.81 J										
-11	1.76 J	5.28 J	0.92 J	1.16 J	0.782 J	0.962 J		37,600 J														
-12	1.15 J	369 J		0.671 J	3.76 J			3,540 J														
-13	2.2 J	32.7 J		1.12 J	0.928 J			372 J														
-14		6.52 J		5.49 J	2.91 J			7.6 J														
-15					4.44 J			2.93 J														
-16					0.457 J			15.9 J														
-17								1.59 J														
-18								1.5 J														
-19																						
-20																						
-21																						
-22																						
-23																						
-24																						
-25																						
-26																						
-27																						
-28																						
-29																						
-30																						
-31																						
-32																						
-33																						
-34																						
-35																						

Note:
J - Estimated concentration

Table 2-6

RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB078	DUP-2 (78 14-16)	SJSB078-R	SJSB079	DUP-7 (79 8-10)	SJSB080	DUP-4 (80 16-18)	SJSB081	DUP-13 (81 6-8)	SJSB081-R	SJSB082	DUP-16 (82 6-8)	SJSB082-R	SJSB083	SJSB083 WC	SJSB084	SJSB085	SJSB085-R	SJSB086	DUP-12 (86 6-8)	SJSB087	DUP-17 (87 6-8)	SJSB087-R
+5																							
+4																							
+3																							
+2	33,000 J			32,000 J		23,000 J																	
+1	47,000 J			52,000 J		14,000 J																	
0	86,000 J			28,000 J		9,200 J		2,300 J			15,000 J			46,000 J					5.0 J		4,600 J		
-1	32 J		140 J	50,000 J		3,200 J		47,000 J			670 J			2,200 J		12,000 J			2.3 J		25,000 J		
-2	64 J		100 J	45,000 J	50,000 J	1,500 J		47,000 J			2,000 J			9.8 J		3,200 J	42,000 J		1.3 J		2,300 J		
-3	91 J		110 J	190 J		12 J		5.3 J	2.1 J		7.7 J	5.4 J		14 J		45 J	720 J		1.2 J	1.1 J	10 J	2.4 J	
-4	16 J			3.1 J		1.5 J		19,000 J		11,000 J	120 J		42 J	15,000 J	4,400 J	23 J	27 J		2.2 J		570 J		
-5	7.3 J	12 J		16 J		0.44 J		280 J		200 J	4.1 J			200 J	47 J	6.1 J	44 J	7.4 J	2.3 J		3.5 J		
-6	120 J		140 J	0.64 J		13 J	3.0 J	2.8 J			1.1 J			24 J		7.8 J	25 J		3.2 J		110 J		110 J
-7	2.7 J							1.7 J			3.7 J			9.0 J		6.1 J	4.3 J		2.9 J		570 J		1,500 J
-8	260 J		200 J					0.87 J			0.99 J			0.72 J		3.7 J	7.0 J		1.6 J		3.0 J		
-9	0.42 J													4.8 J		3.9 J	11 J						
-10																	7.8 J						
-11																							
-12																							
-13																							
-14																							
-15																							
-16																							
-17																							
-18																							
-19																							
-20																							
-21																							
-22																							
-23																							
-24																							
-25																							
-26																							
-27																							
-28																							
-29																							
-30																							
-31																							
-32																							
-33																							
-34																							
-35																							

Note:
J - Estimated concentration

Table 2-6

RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB088	DUP-14 (88 6-8)	SJSB088-R	SJSB089	SJSB089-R	DUP-19 (89 6-8)	SJSB089 (DUP-19)-R	SJSB090	DUP-11 (90 6-8)	SJSB090-R	SJSB091	DUP-18 (91 6-8)	SJSB092	SJSB093	SJSB094	SJSB094-R	DUP-8 (94 6-8)	SJSB094 (DUP-8)-R	SJSB095	DUP-10 (95 6-8)	SJSB095-R	SJSB096	DUP-9 (96 6-8)	SJSB096-R
+5																								
+4																								
+3																								
+2																								
+1																								
0																								
-1								62,000 J						41,000 J										
-2	39,000 J			820 J				6,600 J			16 J		43,000 J	42,000 J					35,000 J					
-3	43,000 J			53 J				930 J			6.7 J		28,000 J	640 J	36,000 J				59 J					
-4	50,000 J			18 J				6.4 J	2.9 J		5.2 J		130 J	0.68 J	39,000 J				1.0 J			87,000 J		
-5	54,000 J	63,000 J	71,000 J	2.5 J		3.5 J	3.1 J	260 J		560 J	2.5 J	2.7 J	4.8	1,900 J	41,000 J				2.3 J	9.7 J		22,000 J		
-6	51,000 J			52 J	43 J			5.3 J			2.1 J		27 J	1,500 J	15,000 J	17,000 J	830 J	990 J	1,200 J		980 J	310 J		
-7	5.3 J			34 J	19 J			9.1 J			2.4 J		26 J	430 J	5,500 J				57 J		11 J	4.9 J	4.2 J	
-8	0.68 J			2.0 J				4.1 J			2.4 J		10,000 J	17 J	32 J				6.0			2,800 J		8,500 J
-9	1.3 J			2.3 J				2.3 J			2.2 J		11 J	4.4 J	2.0 J				54 J		55 J	67 J		84 J
-10	520 J		1,800 J	0.40 J							2.7 J		7.2 J		3.2 J				0.60			5.2 J		
-11	2.5 J														1.9 J							1.9 J		
-12	2.2 J																					13 J		
-13	1.1 J																							
-14																								
-15																								
-16																								
-17																								
-18																								
-19																								
-20																								
-21																								
-22																								
-23																								
-24																								
-25																								
-26																								
-27																								
-28																								
-29																								
-30																								
-31																								
-32																								
-33																								
-34																								
-35																								

Note:
J - Estimated concentration

Table 2-6

RI, PDI-1, PDI-2, and SDI Dioxins and Furans Results Summary - Northern Impoundment
Pre- Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

ELEVATION	SJSB097	DUP-20 (97 6-8)	SJSB098	SJSB099	DUP-6 (99 16-18)	SJSB099-R	SJSB100	SJSB101	SJSB101 WC	SJSB101-R	SJSB102	SJSB102-R	SJSB103	SJSB104	SJSB105	SJSB105-R	SJSB0106	DUP-15 (106 6-8)	SJSB106-R
+5																			
+4																			
+3																			
+2																			
+1																			
0				53,000 J				63,000 J	52,000 J										
-1				54,000 J				59,000 J	47,000 J		1,400 J								
-2				130 J				25,000 J			5.9 J			15 J	36,000 J		39 J		12 J
-3				13 J				18 J			340 J			2.8 J	48,000 J		3.6 J		
-4				15 J				2.7 J			24 J			11 J	240 J		9.4 J		
-5				180 J		210 J		230 J		130 J	5.6 J			2.6 J	29 J		2.9 J	1.1 J	
-6				1.9 J				0.62 J			2.5 J			1.7 J	13 J		3.4 J		
-7			71 J	26 J			110 J	0.27 J			34 J	31 J		1.8 J	17 J		2.6 J		
-8	5.2 J		1,900 J	7.0 J	14 J		3.7 J	11 J			1.4 J		2.2 J	0.53	350 J	1,400 J	2.6 J		
-9	1.2 J		1,800 J				9.2 J	3.2 J			110 J	55 J	1.1 J	0.25 J	60 J	60 J	1.6 J		
-10	1.8 J		160 J				0.81 J				8.9 J		14 J	0.20 J	7.7 J		3.4 J		
-11	1.4 J	1.3 J	9,600 J				2.3 J				3.9 J		4.8 J						
-12	2.6 J		3,900 J				0.58 J				4.0 J		3.9 J						
-13	0.77 J		680 J				0.57 J						0.49 J						
-14	1.4 J		11 J				0.51 J						0.46 J						
-15	0.29 J		0.16 J																
-16																			
-17																			
-18																			
-19																			
-20																			
-21																			
-22																			
-23																			
-24																			
-25																			
-26																			
-27																			
-28																			
-29																			
-30																			
-31																			
-32																			
-33																			
-34																			
-35																			

Note:
J - Estimated concentration

Table 3-1

2019 Treatability Waste Material Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area: Sample Location: Sample Identification: Sample Date: Report Sample Delivery Group (SDG):	Units	Initial Sample - Southwest Initial 11187072-NORTH-IMPCT-INITIALS 10/15/2019 180-97287-1, 180-97287-2	Composite Sample 2 - Northwest Area 2 11187072-N.TREATMENT AREA #2 12/18/2019 180-100205-1	Composite Sample 3 - Northeast Area 3 11187072-N.TREATMENT AREA #3 12/18/2019 180-100205-1	Composite Sample 4 - Southeast Area 4 11187072-N.TREATMENT AREA #4 12/18/2019 180-100205-1
General Chemistry					
Cyanide (total)	mg/kg	0.43 U	0.37 U	0.40 U	0.40 U
Free liquid	none	U	U	U	U
Ignitability	Deg F	> 140	> 140	> 140	> 140
Percent solids	%	--	71.4	67.4	66.7
pH, lab	s.u.	7.9 J	8.5 J	8.7 J	7.9 J
Sulfide	mg/kg	76 J	72	59	24 J
TCLP-Dioxins/Furans					
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	7.6 U	95 J	19 U	16 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	34 U	77 J	11 U	9.9 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	5.3 U	9.0 U	8.5 U	8.3 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	3.4 U	23 J	7.5 U	5.9 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	6.2 U	31 J	12 U	11 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	2.9 U	15 U	12 U	10 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.5 U	20 J	8.7 U	6.9 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	3.1 U	13 U	11 U	11 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.7 U	7.9 U	9.2 U	7.5 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	2.2 U	15 J	7.3 U	7.1 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.3 U	6.7 U	7.9 U	6.3 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	4.6 U	10 U	8.4 U	8.3 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	8.4 U	19 U	20 U	16 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	2.5 U	9.2 U	7.5 U	6.8 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	4.6 U	11 U	9.2 U	9.4 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	2.8 U	11 J	6.5 U	6.6 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	3.4 U	12 U	12 U	12 U
Total heptachlorodibenzofuran (HpCDF)	pg/L	6.2 U	31 J	12 U	11 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	10 U	23 J	7.5 U	5.9 U
Total hexachlorodibenzofuran (HxCDF)	pg/L	3.1 U	15 J	12 U	11 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.7 U	20 J	9.2 U	7.5 U
Total pentachlorodibenzofuran (PeCDF)	pg/L	4.6 U	11 U	9.2 U	9.4 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	8.4 U	19 U	20 U	16 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	2.8 U	11 J	6.5 U	6.6 U
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	4.4 J	12 U	12 U	12 U
TCLP-Glycol					
2-Ethoxyethanol	mg/L	2.5 U	2.5 U	2.5 U	2.5 U
Ethylene glycol	mg/L	1.9 U	1.9 U	1.9 U	1.9 U
Ethylene glycol monomethyl ether (2-methyoxyethanol)	mg/L	2.4 U	2.4 U	2.4 U	2.4 U
TCLP-Herbicides					
2,4,5-TP (Silvex)	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	0.020 U	0.020 U	0.020 U	0.020 U
Dinoseb	mg/L	0.038 U	0.038 U	0.038 U	0.038 U
TCLP-Metals					
Arsenic	mg/L	0.041 U	0.041 U	0.041 U	0.041 U
Barium	mg/L	1.1 J	0.53 J	0.44 J	0.48 J
Cadmium	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chromium	mg/L	0.0078 U	0.0078 U	0.011 J	0.0078 U
Lead	mg/L	0.029 U	0.029 U	0.029 U	0.029 U
Mercury	mg/L	0.00010 U	0.00010 U	0.00010 U	0.00010 U
Selenium	mg/L	0.036 U	0.036 U	0.036 U	0.036 U
Silver	mg/L	0.0085 U	0.0085 U	0.0085 U	0.0085 U

Table 3-1

2019 Treatability Waste Material Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area: Sample Location: Sample Identification: Sample Date: Report Sample Delivery Group (SDG):	Units	Initial Sample - Southwest Initial 11187072-NORTH-IMPCT-INITIALS 10/15/2019 180-97287-1, 180-97287-2	Composite Sample 2 - Northwest Area 2 11187072-N.TREATMENT AREA #2 12/18/2019 180-100205-1	Composite Sample 3 - Northeast Area 3 11187072-N.TREATMENT AREA #3 12/18/2019 180-100205-1	Composite Sample 4 - Southeast Area 4 11187072-N.TREATMENT AREA #4 12/18/2019 180-100205-1
Misc					
Methomyl	ug/L	0.12 U	0.13 U	0.12 U	0.13 U
TCLP-PCBs					
Aroclor-1016 (PCB-1016)	mg/L	0.00018 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1221 (PCB-1221)	mg/L	0.00022 U	0.00022 U	0.00023 U	0.00023 U
Aroclor-1232 (PCB-1232)	mg/L	0.00020 U	0.00020 U	0.00021 U	0.00021 U
Aroclor-1242 (PCB-1242)	mg/L	0.00035 U	0.00036 U	0.00036 U	0.00036 U
Aroclor-1248 (PCB-1248)	mg/L	0.00012 U	0.00012 U	0.00012 U	0.00012 U
Aroclor-1254 (PCB-1254)	mg/L	0.00037 U	0.00037 U	0.00038 U	0.00038 U
Aroclor-1260 (PCB-1260)	mg/L	0.00015 U	0.00015 U	0.00016 U	0.00016 U
TCLP-Pesticides					
4,4'-DDD	mg/L	0.00021 U	0.00021 U	0.00021 U	0.00021 U
4,4'-DDE	mg/L	0.00012 U	0.00012 U	0.00012 U	0.00012 U
4,4'-DDT	mg/L	0.00012 U	0.00012 U	0.00012 U	0.00012 U
alpha-Chlordane	mg/L	--	0.00015 U	0.00015 U	0.00015 U
Chlordane	mg/L	0.0029 U	0.0029 U	0.0029 U	0.0029 U
Dieldrin	mg/L	0.00011 U	0.00011 U	0.00011 U	0.00011 U
Endosulfan I	mg/L	0.00027 U	0.00027 U	0.00027 U	0.00027 U
Endosulfan II	mg/L	0.00013 U	0.00013 U	0.00013 U	0.00013 U
Endosulfan sulfate	mg/L	0.00026 U	0.00026 U	0.00026 U	0.00026 U
Endrin	mg/L	0.000091 U	0.000091 U	0.000091 U	0.000091 U
gamma-BHC (lindane)	mg/L	0.00012 U	0.00012 U	0.00012 U	0.00012 U
gamma-Chlordane	mg/L	--	0.00016 U	0.00016 U	0.00016 U
Heptachlor	mg/L	0.00018 U	0.00018 U	0.00018 U	0.00018 U
Heptachlor epoxide	mg/L	0.00014 U	0.00014 U	0.00014 U	0.00014 U
Methoxychlor	mg/L	0.00031 U	0.00031 U	0.00031 U	0.00031 U
Mirex	mg/L	0.000084 U	0.000084 U	0.000084 U	0.000084 U
Toxaphene	mg/L	0.020 U	0.020 U	0.020 U	0.020 U
TCLP-Semi-Volatile Organic Compounds (SVOCs)					
1,4-Dichlorobenzene	mg/L	0.0045 U	0.0045 U	0.0045 U	0.0045 U
2,4,5-Trichlorophenol	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U
2,4,6-Trichlorophenol	mg/L	0.0095 U	0.0095 U	0.0095 U	0.0095 U
2,4-Dinitrotoluene	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U
2-Methylphenol	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U
3&4-Methylphenol	mg/L	0.0079 U	0.0079 U	0.0079 U	0.0079 U
Hexachlorobenzene	mg/L	0.0055 U	0.0055 U	0.0055 U	0.0055 U
Hexachlorobutadiene	mg/L	0.0084 U	0.0084 U	0.0084 U	0.0084 U
Hexachloroethane	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U
Nitrobenzene	mg/L	0.012 U	0.012 U	0.012 U	0.012 U
Pentachlorophenol	mg/L	0.0075 U	0.0075 U	0.0075 U	0.0075 U
Pyridine	mg/L	0.0082 U	0.0082 U	0.0082 U	0.0082 U

Table 3-1

2019 Treatability Waste Material Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area: Sample Location: Sample Identification: Sample Date: Report Sample Delivery Group (SDG):	Units	Initial Sample - Southwest Initial 11187072-NORTH-IMPCT-INITIALS 10/15/2019 180-97287-1, 180-97287-2	Composite Sample 2 - Northwest Area 2 11187072-N.TREATMENT AREA #2 12/18/2019 180-100205-1	Composite Sample 3 - Northeast Area 3 11187072-N.TREATMENT AREA #3 12/18/2019 180-100205-1	Composite Sample 4 - Southeast Area 4 11187072-N.TREATMENT AREA #4 12/18/2019 180-100205-1
TCLP-Volatile Organic Compounds (VOCs)					
1,1,1,2-Tetrachloroethane	mg/L	0.16 U	0.16 U	0.16 U	0.16 U
1,1,1-Trichloroethane	mg/L	0.10 U	0.10 U	0.10 U	0.10 U
1,1,2,2-Tetrachloroethane	mg/L	0.12 U	0.12 U	0.12 U	0.12 U
1,1,2-Trichloroethane	mg/L	0.096 U	0.096 U	0.096 U	0.096 U
1,1-Dichloroethene	mg/L	0.11 U	0.11 U	0.11 U	0.11 U
1,2,3-Trichloropropane	mg/L	0.11 U	0.11 U	0.11 U	0.11 U
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.11 U	0.11 U	0.11 U	0.11 U
1,2-Dichloroethane	mg/L	0.058 U	0.058 U	0.058 U	0.058 U
1,3-Dichloropropene	mg/L	0.13 U	0.13 U	0.13 U	0.13 U
1,4-Dichlorobenzene	mg/L	0.041 U	0.041 U	0.041 U	0.041 U
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	0.12 U	0.12 U	0.12 U	0.12 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	0.074 U	0.074 U	0.074 U	0.074 U
Acetone	mg/L	0.13 U	0.13 U	0.13 U	0.13 U
Acetonitrile	mg/L	2.0 U	2.0 U	2.0 U	2.0 U
Acrylonitrile	mg/L	1.3 U	1.3 U	1.3 U	1.3 U
Benzene	mg/L	0.079 U	0.079 U	0.079 U	0.079 U
Bromodichloromethane	mg/L	0.094 U	0.094 U	0.094 U	0.094 U
Bromoform	mg/L	0.10 U	0.10 U	0.10 U	0.10 U
Bromomethane (Methyl bromide)	mg/L	0.18 U	0.18 U	0.18 U	0.18 U
Carbon disulfide	mg/L	0.12 U	0.12 U	0.12 U	0.12 U
Carbon tetrachloride	mg/L	0.13 U	0.13 U	0.13 U	0.13 U
Chlorobenzene	mg/L	0.063 U	0.063 U	0.063 U	0.063 U
Chloroform (Trichloromethane)	mg/L	0.085 U	0.085 U	0.085 U	0.085 U
Dichlorodifluoromethane (CFC-12)	mg/L	0.12 U	0.12 U	0.12 U	0.12 U
Ethylbenzene	mg/L	0.086 U	0.086 U	0.086 U	0.086 U
Hexachlorobutadiene	mg/L	0.073 U	0.073 U	0.073 U	0.073 U
Isobutanol (isobutyl alcohol)	mg/L	3.6 U	3.6 U	3.6 U	3.6 U
Methyl acrylonitrile	mg/L	1.6 U	1.6 U	1.6 U	1.6 U
Methylene chloride	mg/L	0.15 U	0.15 U	0.15 U	0.15 U
Styrene	mg/L	0.053 U	0.053 U	0.053 U	0.053 U
Tetrachloroethene	mg/L	0.080 U	0.080 U	0.080 U	0.080 U
Toluene	mg/L	0.067 U	0.067 U	0.067 U	0.067 U
trans-1,3-Dichloropropene	mg/L	0.069 U	0.069 U	0.069 U	0.069 U
Trichloroethene	mg/L	0.060 U	0.060 U	0.060 U	0.060 U
Trichlorofluoromethane (CFC-11)	mg/L	0.058 U	0.058 U	0.058 U	0.058 U
Vinyl chloride	mg/L	0.15 U	0.15 U	0.15 U	0.15 U
Xylenes (total)	mg/L	0.17 U	0.17 U	0.17 U	0.17 U

Notes:
TCLP - Toxicity Characteristic Leaching Procedure
mg/L - milligrams per Liter
ug/L - microgram per Liter
mg/kg - milligram per kilogram
Deg F - Degrees in Fahrenheit
s.u. - standard unit
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- Data not available

Table 3-2

2019 Pilot Test Effluent Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Estimated Discharge Criteria [1,2]	Non-homogenized Contact Water	Excavation Seepage Water	Homogenized Contact Water - from tank feeding clarifier	Homogenized Contact Water - from tank feeding clarifier/filter	Equalized Contact Water - from tank feeding clarifier/filter	Clarified Effluent - from mix tank	Filter Effluent - from mix tank	Clarifier Underflow - composite	Settled Sludge - from bottom of cone bottom tank
Sample Location:			Contact-Initial	EXC-1	INF3	INF4	INF4	CEFF	FEFF	CUI	SS
Sample Identification:			11187072-CONTACT-INITIAL	11187072-091319-LL-EXC-1	INF 3	INF 4	DUP	1. CEFF, CEFF-Filtered	FEFF 1, FEFF-Filtered	CUI	SS
Sample Date:			9/24/2019	9/13/2019	10/25/2019	10/25/2019	10/25/2019	10/25/2019 , 11/5/2019	10/26/2019, 11/5/2019	10/26/2019	10/26/2019
Sample Type:							Duplicate				
Report Sample Delivery Group (SDG):			180-96144-1	600-191956-1, 600-191956-2	600-194690-1	600-194690-1	600-194690-1	600-194690-1, 320-56102-1	600-194690-1, 320-56102-1	600-194690-1	600-194690-1
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	100	130	5.8 U	590	370 J-	--	6.4 U	5.5 U	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	100	3300	90 J	15000 J+	8800 J	--	44 U	44 U	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	50	160	6.9 U	880 J-	600 J-	--	2.9 U	1.9 U	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	50	150	4.1 U	840	540 J-	--	4.9 J	6.7 J	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	50	58	1.8 U	320	240 J-	--	1.4 U	1.3 U	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	50	410	19 J	3100	2500 J-	--	3.9 J	1.6 J	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	2.8 U	0.82 U	11 U	4.9 U	--	2.6 U	0.83 U	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	50	110	5.6 J	790	650 J-	--	1.7 J	0.77 U	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	4.1 U	0.83 U	30 J	20 J-	--	1.6 J	0.79 U	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	50	4.2 U	0.68 U	53	40 J-	--	2.0 U	0.52 U	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	50	1.8 U	0.74 U	18 J-	8.5 J-	--	1.4 U	0.73 U	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	50	200	11 J	2100	1900	--	2.5 J	1.5 J	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	50	18 U	1.1 U	160	130	--	0.94 U	0.99 U	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	50	12 U	0.73 U	93	73 J-	--	1.2 U	0.52 U	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	50	110	6.2 J	1200	1100	--	0.65 U	0.63 U	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	10	3900	220	50000	46000	--	37	7.1 J	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	10	1500	61	18000	15000	--	13	3.2 J	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/L	NL	280 J	11 J	1600 J	1100 J	--	4.3 J	1.9 J	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	NL	370 J	10 J	2000 J	1300 J	--	8.2 J	13 J	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/L	NL	620 J	25 J	4600 J	3800 J	--	8.8 J	1.6 J	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	NL	35 J	0.83 U	260 J	180 J	--	5.6 J	0.83 U	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/L	NL	490 J	26 J	5000 J	4600 J	--	2.5 J	1.5 J	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	NL	20 J	1.1 U	190 J	160 J	--	0.94 U	0.99 U	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/L	NL	8100 J	390 J	100000 J	100000 J	--	68 J	11 J	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	NL	1600 J	66 J	20000 J	16000 J	--	13 J	3.2 J	--	--
Dioxins/Furans (dissolved)											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) (dissolved)	pg/L	100	--	2.1 U	170	11 U	--	13 J	22 J	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) (dissolved)	pg/L	100	--	17 UJ	5400 J+	280 J+	--	21 U	29 U	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	50	--	3.6 J	240	12 J	--	2.5 J	6.0 J	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) (dissolved)	pg/L	50	--	1.1 U	250	27 J	--	2.4 J	6.4 J	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	50	--	2.8 J	88	4.9 U	--	1.1 U	4.9 J	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	--	7.6 J	750	31 J	--	0.91 U	3.1 J	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	--	1.2 U	4.6 U	3.1 U	--	2.9 J	4.9 J	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	--	2.7 J	190	9.8 J	--	0.89 U	3.5 J	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	--	1.2 U	6.7 J	2.1 J	--	1.1 U	4.4 J	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	--	2.0 U	14 J	4.8 U	--	1.9 J	3.8 J	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	50	--	1.1 U	5.7 J	1.7 U	--	0.97 U	4.8 J	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	50	--	3.4 U	450	20 J	--	1.2 U	3.2 J	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD) (dissolved)	pg/L	50	--	1.6 U	40 J	3.0 J	--	3.1 J	4.6 J	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	50	--	0.71 U	23 J	2.8 U	--	1.5 J	3.0 J	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	50	--	1.7 U	250	11 J	--	1.2 U	1.3 U	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF) (dissolved)	pg/L	10	--	21	11000	540 J	--	2.7 J	1.1 U	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (dissolved)	pg/L	10	--	7.1 J	3800	150 J	--	1.1 U	1.6 U	--	--
Total heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	NL	--	6.4 J	430 J	20 J	--	2.5 J	11 J	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD) (dissolved)	pg/L	NL	--	1.1 U	630 J	51 J	--	2.4 J	6.4 J	--	--
Total hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	NL	--	12 J	1100 J	48 J	--	3.4 J	13 J	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	NL	--	1.2 U	74 J	6.9 J	--	2.9 J	14 J	--	--
Total pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	NL	--	3.4 J	1100 J	44 J	--	1.3 U	3.2 J	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD) (dissolved)	pg/L	NL	--	1.6 U	51 J	3.0 J	--	4.4 J	4.6 J	--	--
Total tetrachlorodibenzofuran (TCDF) (dissolved)	pg/L	NL	--	39 J	21000 J	920 J	--	2.7 J	1.1 U	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD) (dissolved)	pg/L	NL	--	7.1 J	4000 J	170 J	--	1.1 U	1.6 U	--	--
Herbicides											
2,4,5-TP (Silvex)	ug/L	NL	0.29 U	0.020 U	--	--	--	--	--	--	--
2,4-Dichlorophenoxyacetic acid (2,4-D)	ug/L	NL	1.9 U	0.040 U	--	--	--	--	--	--	--
Metals											
Aluminum	mg/L	NL	0.048 U	--	--	--	--	--	--	--	--
Antimony	mg/L	25.623	0.0098 U	0.0039 U	0.0039 U	0.0039 U	--	0.0039 U	0.0039 U	--	--
Arsenic	mg/L	0.164	0.012 U	0.089	0.026	0.023	--	0.0029 U	0.0029 U	--	--
Barium	mg/L	N/A	0.17	2.1	1.1	0.96	--	0.29	0.28	--	--
Beryllium	mg/L	NL	0.00037 J	0.00042 U	0.0074	0.0062	--	0.00042 U	0.00042 U	--	--
Boron	mg/L	NL	--	1.1	0.26	0.25	--	0.21	0.20	--	--
Cadmium	mg/L	0.0439	0.00050 U	0.00080 J	0.0028 J	0.0025 J	--	0.00040 J	0.00028 U	--	--
Calcium	mg/L	NL	35	250	130	120	--	55	53	--	--
Chromium	mg/L	0.389	0.0012 U	0.0017 J	0.12	0.11	--	0.0016 U	0.0016 U	--	--
Cobalt	mg/L	NL	0.0030 U	0.0066 J	0.051	0.043	--	0.00040 J	0.00031 U	--	--
Copper	mg/L	0.0167	0.011 U	0.0081 U	0.11	0.093	--	0.0081 U	0.0081 U	--	--
Iron	mg/L	NL	0.022 J	13	110	88	--	0.29 J	0.13 J	--	--
Lead	mg/L	0.107	0.0025 U	0.0022 U	0.12	0.098	--	0.0022 U	0.0022 U	--	--
Magnesium	mg/L	NL	22	250	58	54	--	33	31	--	--
Manganese	mg/L	NL	0.14	2.7	1.1	1.0	--	0.088	0.029	--	--
Mercury	mg/L	0.000598	0.00010 U	--	--	--	--	--	--	--	--
Mercury	ng/L	598	--	--	28 J	--	6.3 J	18 J	2.5 J	--	--
Mercury	ug/L	0.598	--	0.10 U	--	--	--	--	--	--	--
Molybdenum	mg/L	NL	0.0079 J	0.0068 J	0.0084 J	0.0090 J	--	0.010	0.010	--	--
Nickel	mg/L	0.103	0.0024 U	0.0036 J	0.095	0.081	--	0.0021 J	0.0020 J	--	--
Phosphorus	mg/L	NL	0.050 U	--	--	--	--	--	--	--	--
Potassium	mg/L	NL	12	27	25	23	--	12	12	--	--
Selenium	mg/L	0.619	0.013 U	0.0029 U	0.0029 U	0.0029 U	--	0.0029 U	0.0029 U	--	--
Silver	mg/L	0.00493	0.00084 U	0.0013 U	0.0013 U	0.0013 U	--	0.0013 U	0.0013 U	--	--
Sodium	mg/L	NL	250	2400	340	350	--	350	360	--	--
Strontium	mg/L	NL	0.31	2.5	0.84	0.79	--	0.48	0.46	--	--
Thallium	mg/L	0.5	0.0090 U	--	0.0042 U	0.0042 U	--	0.0042 U	0.026 U	--	--
Thallium	ug/L	500	--	0.14 U	--	--	--	--	--	--	--
Tin	mg/L	NL	--	0.00059 U	0.0048 J	0.0057 J	--	0.00059 U	0.00059 U	--	--
Titanium	mg/L	NL	--	0.0077 J	0.23	0.22	--	0.0011 J	0.00070 J	--	--
Vanadium	mg/L	NL	0.0019 U	0.00047 U	0.20	0.17	--	0.0036 J	0.0028 J	--	--
Zinc	mg/L	0.165	0.011 U	0.031	0.40	0.36	--	0.045	0.036	--	--

ED_014247_00001351-00211

Table 3-2

2019 Pilot Test Effluent Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Estimated Discharge Criteria [1,2]	Non-homogenized Contact Water	Excavation Seepage Water	Homogenized Contact Water - from tank feeding clarifier	Homogenized Contact Water - from tank feeding clarifier/filter	Equalized Contact Water - from tank feeding clarifier/filter	Clarified Effluent - from mix tank	Filter Effluent - from mix tank	Clarifier Underflow - composite	Settled Sludge - from bottom of cone bottom tank
Sample Location:			Contact-Initial	EXC-1	INF3	INF4	INF4	CEFF	FEFF	CUI	SS
Sample Identification:			11187072-CONTACT-INITIAL	11187072-091319-LL-EXC-1	INF 3	INF 4	DUP	1. CEFF, CEFF-Filtered	FEFF 1, FEFF-Filtered	CUI	SS
Sample Date:			9/24/2019	9/13/2019	10/25/2019	10/25/2019	10/25/2019	10/25/2019 , 11/5/2019	10/26/2019, 11/5/2019	10/26/2019	10/26/2019
Sample Type:							Duplicate				
Report Sample Delivery Group (SDG):			180-96144-1	600-191956-1, 600-191956-2	600-194690-1	600-194690-1	600-194690-1	600-194690-1, 320-56102-1	600-194690-1, 320-56102-1	600-194690-1	600-194690-1
Metals (dissolved)											
Aluminum (dissolved)	mg/L	NL	0.048 U	--	--	--	--	0.048 U	0.048 U	--	--
Antimony (dissolved)	mg/L	25.623	0.0098 U	0.0039 U	0.0039 U	0.0039 U	--	0.0098 U	0.0098 U	--	--
Arsenic (dissolved)	mg/L	0.164	0.012 U	0.037	0.014	0.0041 J	--	0.012 U	0.012 U	--	--
Barium (dissolved)	mg/L	N/A	0.18	1.9	0.55	0.30	--	0.30	0.32	--	--
Beryllium (dissolved)	mg/L	NL	0.00030 U	0.00042 U	0.0026 J	0.00042 U	--	0.00030 U	0.00030 U	--	--
Boron (dissolved)	mg/L	NL	--	1.1	0.22	0.20	--	--	--	--	--
Cadmium (dissolved)	mg/L	0.0439	0.00050 U	0.00080 J	0.0013 J	0.00040 J	--	0.00050 U	0.00050 U	--	--
Calcium (dissolved)	mg/L	NL	37	240	67	55	--	59	57	--	--
Chromium (dissolved)	mg/L	0.389	0.0012 U	0.0016 U	0.048	0.0039 J	--	0.0012 U	0.0012 U	--	--
Cobalt (dissolved)	mg/L	NL	0.0030 U	0.0064 J	0.017	0.0012 J	--	0.0030 U	0.0030 U	--	--
Copper (dissolved)	mg/L	0.0167	0.014	0.0081 U	0.036	0.0081 U	--	0.0072 J	0.0053 J	--	--
Iron (dissolved)	mg/L	NL	0.020 U	0.12 J	40	2.9	--	0.056 J	0.020 U	--	--
Lead (dissolved)	mg/L	0.107	0.0025 U	0.0022 U	0.037	0.0022 U	--	0.0025 U	0.0025 U	--	--
Magnesium (dissolved)	mg/L	NL	22	250	42	32	--	32	31	--	--
Manganese (dissolved)	mg/L	NL	0.15	2.6	0.34	0.035	--	0.064	0.028	--	--
Mercury (dissolved)	mg/L	0.000598	0.00037	--	--	--	--	--	--	--	--
Mercury (dissolved)	ng/L	598	--	--	--	22 J	--	1.7	1.7	--	--
Mercury (dissolved)	ug/L	0.598	--	0.10 U	--	--	--	--	--	--	--
Molybdenum (dissolved)	mg/L	NL	0.0076 J	0.011	0.0084 J	0.010	--	0.010 J	0.0096 J	--	--
Nickel (dissolved)	mg/L	0.103	0.0024 U	0.0050 J	0.033	0.0030 J	--	0.0024 U	0.0024 U	--	--
Phosphorus (dissolved)	mg/L	NL	0.066 J	--	--	--	--	0.050 U	0.050 U	--	--
Potassium (dissolved)	mg/L	NL	11	27	17	13	--	14	13	--	--
Selenium (dissolved)	mg/L	0.619	0.013 U	0.0029 U	0.0029 U	0.0029 U	--	0.013 U	0.013 U	--	--
Silver (dissolved)	mg/L	0.00493	0.00084 U	0.0013 U	0.0013 U	0.0013 U	--	0.00084 U	0.00084 U	--	--
Sodium (dissolved)	mg/L	NL	260	2400	340	350	--	330	330	--	--
Strontium (dissolved)	mg/L	NL	0.32	2.4	0.57	0.47	--	0.51	0.49	--	--
Thallium (dissolved)	mg/L	0.5	0.0090 U	--	0.0042 U	0.0042 U	--	0.0090 U	0.0090 U	--	--
Thallium (dissolved)	ug/L	500	--	0.14 J	--	--	--	--	--	--	--
Tin (dissolved)	mg/L	NL	--	0.0014 J	0.0012 J	0.00059 U	--	--	--	--	--
Titanium (dissolved)	mg/L	NL	--	0.0022 J	0.17	0.025	--	--	--	--	--
Vanadium (dissolved)	mg/L	NL	0.0019 U	0.00047 U	0.086	0.012	--	0.0038 J	0.0035 J	--	--
Zinc (dissolved)	mg/L	0.165	0.013 U	0.015 U	0.15	0.026 J	--	0.012	0.014	--	--
General Chemistry											
Alkalinity (as CaCO3 pH=4.5)	mg/L	NL	210	--	--	--	--	--	--	--	--
Alkalinity, bicarbonate	mg/L	NL	210	1000	190 J	170 J	--	160 J	140	--	--
Alkalinity, carbonate	mg/L	NL	5.0 U	20 U	20 UJ	20 UJ	--	20 UJ	20 U	--	--
Alkalinity, total (as CaCO3)	mg/L	NL	--	1000	190 J	170 J	--	160 J	140	--	--
Ammonia-N	mg/L	NL	2.7	7.1	0.073 J	0.23	--	0.067 U	0.067 U	--	--
Biochemical oxygen demand (BOD)	mg/L	NL	6.0 U	10 U	--	--	--	--	--	--	--
Bromide	mg/L	NL	1.5	9.9	0.12 J	0.15 J	--	0.20 J	0.30 J	--	--
Chemical oxygen demand (COD)	mg/L	NL	92	82	170	310	--	27	16	--	--
Chloride	mg/L	NL	400	4200	540	500	--	480	820	--	--
Cyanide (total)	mg/kg	NL	--	--	--	--	--	--	--	--	--
Cyanide (total)	ug/L	NL	--	3.1 U	--	--	--	--	--	--	--
Ferrous iron	mg/L	NL	--	0.016 UJ	--	--	--	--	--	--	--
Fluoride	mg/L	NL	--	--	1.2 U	0.26 J	--	0.34	0.060 UJ	--	--
Free liquid	none	NL	--	--	--	--	--	--	--	--	--
Hydrogen sulfide	mg/L	NL	--	0.048 U	--	--	--	--	--	--	--
Ignitability	Deg F	NL	--	--	--	--	--	--	--	--	--
Nitrate (as N)	mg/L	NL	--	0.025 U	R	R	--	R	R	--	--
Nitrite (as N)	mg/L	NL	--	0.030 U	R	R	--	R	R	--	--
Oil and grease (n-Hexane Extractable Material [HEM]), total	mg/L	NL	--	--	2.0 J	2.1 J	1.8 J	--	--	--	--
Oil and grease (Silica Gel Treated n-Hexane Extractable Material [SGT HEM]), non-polar material	mg/L	NL	--	--	1.0 U	1.0 U	1.0 U	--	--	--	--
Percent solids	%	NL	--	--	--	--	--	--	--	--	--
pH, lab	s.u.	NL	7.8 J	6.9 J	8.2 J	7.9 J	8.9 J	7.7 J	7.8 J	--	--
Phosphorus	mg/L	NL	--	0.031 J	1.1	0.25	--	0.066	0.095	--	--
Phosphorus, total (as PO4)	mg/L	NL	--	0.095 J	3.3	0.77	--	0.20	0.29	--	--
Sulfate	mg/L	NL	8.7	6.5	37	36	--	1.9 U	62	--	--
Sulfide	mg/kg	NL	--	--	--	--	--	--	--	--	--
Sulfide	mg/L	NL	--	0.045 U	0.57	0.061	0.19	0.0090 U	0.0090 U	--	--
TOC average duplicates	mg/L	NL	4.5	--	--	--	--	--	--	--	--
Total dissolved solids (TDS)	mg/L	NL	910	8800	980	1100	--	1300	1300	--	--
Total organic carbon (TOC)	mg/L	NL	--	24	17 J	9.2 J	--	5.0 J	4.3 J	--	--
Total suspended solids (TSS)	mg/L	NL	3400	240	3500	4600	--	11	2.2	16000	110000
PCBs											
Aroclor-1016 (PCB-1016)	ug/L	NL	0.18 U	0.56 U	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221)	ug/L	NL	0.22 U	0.46 U	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232)	ug/L	NL	0.20 U	0.13 U	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242)	ug/L	NL	0.34 U	0.17 U	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248)	ug/L	NL	0.11 U	0.21 U	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254)	ug/L	NL	0.36 U	0.15 U	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260)	ug/L	NL	0.15 U	0.35 U	--	--	--	--	--	--	--
PCBs (dissolved)											
Aroclor-1016 (PCB-1016) (dissolved)	ug/L	NL	--	0.64 U	--	--	--	--	--	--	--
Aroclor-1221 (PCB-1221) (dissolved)	ug/L	NL	--	0.52 U	--	--	--	--	--	--	--
Aroclor-1232 (PCB-1232) (dissolved)	ug/L	NL	--	0.14 U	--	--	--	--	--	--	--
Aroclor-1242 (PCB-1242) (dissolved)	ug/L	NL	--	0.19 U	--	--	--	--	--	--	--
Aroclor-1248 (PCB-1248) (dissolved)	ug/L	NL	--	0.24 U	--	--	--	--	--	--	--
Aroclor-1254 (PCB-1254) (dissolved)	ug/L	NL	--	0.17 U	--	--	--	--	--	--	--
Aroclor-1260 (PCB-1260) (dissolved)	ug/L	NL	--	0.40 U	--	--	--	--	--	--	--

Table 3-2

2019 Pilot Test Effluent Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Estimated Discharge Criteria [1,2]	Non-homogenized Contact Water	Excavation Seepage Water	Homogenized Contact Water - from tank feeding clarifier	Homogenized Contact Water - from tank feeding clarifier/filter	Equalized Contact Water - from tank feeding clarifier/filter	Clarified Effluent - from mix tank	Filter Effluent - from mix tank	Clarifier Underflow - composite	Settled Sludge - from bottom of cone bottom tank
Sample Location:			Contact-Initial	EXC-1	INF3	INF4	INF4	CEFF	FEFF	CUI	SS
Sample Identification:			11187072-CONTACT-INITIAL	11187072-091319-LL-EXC-1	INF 3	INF 4	DUP	1. CEFF, CEFF-Filtered	FEFF 1, FEFF-Filtered	CUI	SS
Sample Date:			9/24/2019	9/13/2019	10/25/2019	10/25/2019	10/25/2019	10/25/2019 , 11/5/2019	10/26/2019, 11/5/2019	10/26/2019	10/26/2019
Sample Type:							Duplicate				
Report Sample Delivery Group (SDG):			180-96144-1	600-191956-1, 600-191956-2	600-194690-1	600-194690-1	600-194690-1	600-194690-1, 320-56102-1	600-194690-1, 320-56102-1	600-194690-1	600-194690-1
Pesticides											
alpha-Chlordane	ug/L	NL	--	0.10 U	--	--	--	--	--	--	--
Chlordane	ug/L	NL	0.27 U	0.13 U	--	--	--	--	--	--	--
Endrin	ug/L	NL	0.0086 U	0.015 U	--	--	--	--	--	--	--
gamma-BHC (lindane)	ug/L	NL	0.011 U	0.013 U	--	--	--	--	--	--	--
gamma-Chlordane	ug/L	NL	--	0.015 U	--	--	--	--	--	--	--
Heptachlor	ug/L	NL	0.017 U	0.013 U	--	--	--	--	--	--	--
Heptachlor epoxide	ug/L	NL	0.013 U	0.015 U	--	--	--	--	--	--	--
Hexachlorobenzene	ug/L	NL	0.016 U	--	--	--	--	--	--	--	--
Methoxychlor	ug/L	NL	0.029 U	0.019 U	--	--	--	--	--	--	--
Toxaphene	ug/L	NL	1.9 U	5.1 U	--	--	--	--	--	--	--
Semi-Volatile Organic Compounds (SVOCs)											
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	ug/L	NL	0.56 U	--	--	--	--	--	--	--	--
2,4,5-Trichlorophenol	ug/L	NL	0.59 U	4.4 U	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	ug/L	NL	0.65 UJ	3.5 U	--	--	--	--	--	--	--
2,4-Dichlorophenol	ug/L	NL	0.49 UJ	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	ug/L	NL	0.39 UJ	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	ug/L	NL	15 U	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	ug/L	NL	0.49 U	2.2 U	--	--	--	--	--	--	--
2,6-Dinitrotoluene	ug/L	NL	0.58 U	2.9 U	--	--	--	--	--	--	--
2-Chloronaphthalene	ug/L	NL	0.57 UJ	--	--	--	--	--	--	--	--
2-Chlorophenol	ug/L	NL	0.62 UJ	--	--	--	--	--	--	--	--
2-Methylnaphthalene	ug/L	NL	0.60 UJ	--	--	--	--	--	--	--	--
2-Methylphenol	ug/L	NL	2.9 UJ	1.5 U	--	--	--	--	--	--	--
2-Nitroaniline	ug/L	NL	5.3 U	--	--	--	--	--	--	--	--
2-Nitrophenol	ug/L	NL	0.59 U	--	--	--	--	--	--	--	--
3&4-Methylphenol	ug/L	NL	3.6 UJ	1.4 U	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	ug/L	NL	5.6 U	--	--	--	--	--	--	--	--
3-Nitroaniline	ug/L	NL	0.64 U	--	--	--	--	--	--	--	--
4,6-Dinitro-2-methylphenol	ug/L	NL	14 U	--	--	--	--	--	--	--	--
4-Bromophenyl phenyl ether	ug/L	NL	0.61 U	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol	ug/L	NL	0.59 U	--	--	--	--	--	--	--	--
4-Chloroaniline	ug/L	NL	0.42 UJ	--	--	--	--	--	--	--	--
4-Chlorophenyl phenyl ether	ug/L	NL	0.59 UJ	--	--	--	--	--	--	--	--
4-Nitroaniline	ug/L	NL	0.56 U	--	--	--	--	--	--	--	--
4-Nitrophenol	ug/L	NL	1.4 U	--	--	--	--	--	--	--	--
Acenaphthene	ug/L	NL	0.63 UJ	--	--	--	--	--	--	--	--
Acenaphthylene	ug/L	NL	0.63 UJ	--	--	--	--	--	--	--	--
Acetophenone	ug/L	NL	0.60 U	--	--	--	--	--	--	--	--
Anthracene	ug/L	NL	0.47 U	--	--	--	--	--	--	--	--
Atrazine	ug/L	NL	6.1 U	--	--	--	--	--	--	--	--
Benzaldehyde	ug/L	NL	1.1 U	--	--	--	--	--	--	--	--
Benzo(a)anthracene	ug/L	NL	0.72 U	--	--	--	--	--	--	--	--
Benzo(a)pyrene	ug/L	NL	0.51 U	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	ug/L	NL	0.93 U	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	ug/L	NL	0.66 UJ	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	ug/L	NL	0.85 U	--	--	--	--	--	--	--	--
Biphenyl (1,1-Biphenyl)	ug/L	NL	0.57 UJ	--	--	--	--	--	--	--	--
bis(2-Chloroethoxy)methane	ug/L	NL	0.64 UJ	--	--	--	--	--	--	--	--
bis(2-Chloroethyl)ether	ug/L	NL	0.38 UJ	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate (DEHP)	ug/L	NL	60 U	--	--	--	--	--	--	--	--
Butyl benzylphthalate (BBP)	ug/L	NL	4.4 U	--	--	--	--	--	--	--	--
Caprolactam	ug/L	NL	4.5 U	--	--	--	--	--	--	--	--
Carbazole	ug/L	NL	0.49 U	--	--	--	--	--	--	--	--
Chrysene	ug/L	NL	0.78 U	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	ug/L	NL	0.69 U	--	--	--	--	--	--	--	--
Dibenzofuran	ug/L	NL	0.70 UJ	--	--	--	--	--	--	--	--
Diethyl phthalate	ug/L	NL	5.5 U	--	--	--	--	--	--	--	--
Dimethyl phthalate	ug/L	NL	0.54 U	--	--	--	--	--	--	--	--
Di-n-butylphthalate (DBP)	ug/L	NL	7.1 U	--	--	--	--	--	--	--	--
Di-n-octyl phthalate (DnOP)	ug/L	NL	6.6 U	--	--	--	--	--	--	--	--
Fluoranthene	ug/L	NL	0.58 U	--	--	--	--	--	--	--	--
Fluorene	ug/L	NL	0.66 UJ	--	--	--	--	--	--	--	--
Hexachlorobenzene	ug/L	NL	0.54 U	3.4 U	--	--	--	--	--	--	--
Hexachlorobutadiene	ug/L	NL	0.66 UJ	2.7 U	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	ug/L	NL	R	--	--	--	--	--	--	--	--
Hexachloroethane	ug/L	NL	0.60 UJ	3.4 U	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	ug/L	NL	0.82 U	--	--	--	--	--	--	--	--
Isophorone	ug/L	NL	0.52 U	--	--	--	--	--	--	--	--
Naphthalene	ug/L	NL	0.57 UJ	--	--	--	--	--	--	--	--
Nitrobenzene	ug/L	NL	4.8 U	2.7 U	--	--	--	--	--	--	--
N-Nitrosodi-n-propylamine	ug/L	NL	0.68 U	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	ug/L	NL	1.1 U	--	--	--	--	--	--	--	--
Pentachlorophenol	ug/L	NL	8.1 U	3.3 U	--	--	--	--	--	--	--
Phenanthrene	ug/L	NL	0.53 U	--	--	--	--	--	--	--	--
Phenol	ug/L	NL	4.7 UJ	--	--	--	--	--	--	--	--
Pyrene	ug/L	NL	0.52 U	--	--	--	--	--	--	--	--
Pyridine	ug/L	NL	5.2 UJ	2.3 U	--	--	--	--	--	--	--

ED_014247_00001351-00213

Table 3-2

2019 Pilot Test Effluent Characterization Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Estimated Discharge Criteria [1,2]	Non-homogenized Contact Water	Excavation Seepage Water	Homogenized Contact Water - from tank feeding clarifier	Homogenized Contact Water - from tank feeding clarifier/filter	Equalized Contact Water - from tank feeding clarifier/filter	Clarified Effluent - from mix tank	Filter Effluent - from mix tank	Clarifier Underflow - composite	Settled Sludge - from bottom of cone bottom tank
Sample Location:			Contact-Initial	EXC-1	INF3	INF4	INF4	CEFF	FEFF	CUI	SS
Sample Identification:			11187072-CONTACT-INITIAL	11187072-091319-LL-EXC-1	INF 3	INF 4	DUP	1. CEFF, CEFF-Filtered	FEFF 1, FEFF-Filtered	CUI	SS
Sample Date:			9/24/2019	9/13/2019	10/25/2019	10/25/2019	10/25/2019	10/25/2019 , 11/5/2019	10/26/2019, 11/5/2019	10/26/2019	10/26/2019
Sample Type:							Duplicate				
Report Sample Delivery Group (SDG):			180-96144-1	600-191956-1, 600-191956-2	600-194690-1	600-194690-1	600-194690-1	600-194690-1, 320-56102-1	600-194690-1, 320-56102-1	600-194690-1	600-194690-1
Volatile Organic Compounds (VOCs)											
1,1,1-Trichloroethane	ug/L	NL	2.5 U	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	ug/L	NL	2.4 U	--	--	--	--	--	--	--	--
1,1-Dichloroethane	ug/L	NL	1.8 U	--	--	--	--	--	--	--	--
1,1-Dichloroethene	ug/L	NL	2.9 U	0.76 U	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	ug/L	NL	3.7 U	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	ug/L	NL	2.0 U	--	--	--	--	--	--	--	--
1,2-Dichloroethane	ug/L	NL	1.5 U	1.0 U	--	--	--	--	--	--	--
1,2-Dichloropropane	ug/L	NL	2.5 U	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	ug/L	NL	1.6 U	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	ug/L	NL	1.0 U	0.91 U	--	--	--	--	--	--	--
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	NL	2.9 U	1.6 U	--	--	--	--	--	--	--
Benzene	ug/L	NL	2.0 U	0.56 U	--	--	--	--	--	--	--
Bromodichloromethane	ug/L	NL	2.4 U	--	--	--	--	--	--	--	--
Bromoform	ug/L	NL	2.6 U	--	--	--	--	--	--	--	--
Carbon disulfide	ug/L	NL	--	1.7 U	--	--	--	--	--	--	--
Carbon tetrachloride	ug/L	NL	3.3 U	0.92 U	--	--	--	--	--	--	--
Chlorobenzene	ug/L	NL	1.6 U	0.82 U	--	--	--	--	--	--	--
Chloroethane	ug/L	NL	2.6 U	--	--	--	--	--	--	--	--
Chloroform (Trichloromethane)	ug/L	NL	2.1 U	0.82 U	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	ug/L	NL	1.6 U	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	ug/L	NL	1.6 U	--	--	--	--	--	--	--	--
Ethylbenzene	ug/L	NL	2.2 U	--	--	--	--	--	--	--	--
Hexachlorobutadiene	ug/L	NL	--	1.2 U	--	--	--	--	--	--	--
m&p-Xylenes	ug/L	NL	1.9 U	1.3 U	--	--	--	--	--	--	--
o-Xylene	ug/L	NL	2.4 U	0.93 U	--	--	--	--	--	--	--
Tetrachloroethene	ug/L	NL	2.0 U	1.2 U	--	--	--	--	--	--	--
Toluene	ug/L	NL	1.7 U	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	ug/L	NL	2.5 U	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	ug/L	NL	1.7 U	--	--	--	--	--	--	--	--
Trichloroethene	ug/L	NL	1.5 U	1.6 U	--	--	--	--	--	--	--
Vinyl chloride	ug/L	NL	3.7 U	0.85 U	--	--	--	--	--	--	--
Xylenes (total)	ug/L	NL	4.3 U	2.0 U	--	--	--	--	--	--	--

Notes:
[1] Per an EPA email dated February 18, 2020, compliance with the Texas Surface Water Quality Standards will be determined using the minimum level from the EPA approved method (1613B), cited in 40 CFR Part 136, in sampling of dioxin concentrations for surface water discharges during the site remedial action.
[2] Estimated discharge criteria were calculated for all parameters except dioxins and furans utilizing the TCEQ model, TEXTOX MENU # 5 for bays or wide tidal rivers.

TCLP - Toxicity Characteristic Leaching Procedure
EPA - US Environmental Protection Agency
CFR - Code of Federal Regulations
TCEQ - Texas Commission on Environmental Quality
BHC - benzene hexachloride
PCB - polychlorinated biphenyl
mg/L - milligrams per Liter
ug/L - microgram per Liter
mg/kg - milligram per kilogram
pg/L - picograms per Liter

Deg F - Degrees in Fahrenheit
s.u. - standard unit
J - Estimated concentration.
J- - Estimated concentration, result may be biased high.
U - Not detected at the associated reporting limit.
Dup - indicates the result from a duplicate sample
UJ - Not detected; associated reporting limit is estimated.
NL - No limit
-- Data not available

ED_014247_00001351-00214

2019 Bench-Scale Contact Water Filtration Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Non-homogenized contact water - effluent from 100 µm filter	Non-homogenized contact water - effluent from 10 µm filter	Non-homogenized contact water - effluent from 1 µm filter	Non-homogenized contact water - effluent from 0.45 µm filter	Non-homogenized contact water - effluent from 0.1 µm filter
Sample Location:		Filter Test	Filter Test	Filter Test	Filter Test	Filter Test
Sample Identification:		11187072-Filter Test-1	11187072-Filter Test-3	11187072-Filter Test-4	11187072-Filter Test-5	11187072-Filter Test-6
Sample Date:		9/30/2019	9/30/2019	9/30/2019	9/30/2019	9/30/2019
Report Sample Delivery Group (SDG):		320-54852-1	320-54852-1	320-54852-1	320-54852-1	320-54852-1
Filter Size:		100 µm	10 µm	1 µm	0.45 µm	0.1 µm
Solids Collected on Filter						
	mg/L	9.53	4099	342	3.27	0.05
Dioxins/Furans						
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	61 J	24 U	0.90 U	1.9 U	1.8 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	1900	850	12 U	4.0 U	4.6 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	84	30 J	0.75 U	1.1 U	1.2 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	75	30 J	1.7 U	0.53 U	1.4 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	28 J	11 J	0.87 U	0.47 U	0.47 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	210	74	1.1 U	0.60 U	1.2 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	2.7 U	1.7 U	2.0 U	1.9 U	1.9 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	53	20 J	0.44 U	1.2 U	0.86 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	2.7 U	0.84 U	0.45 U	0.62 U	1.3 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	4.5 U	2.1 U	0.67 U	0.75 U	1.1 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	2.3 U	0.60 U	0.71 U	0.57 U	1.5 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	100	39 J	0.53 U	0.60 U	0.64 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	9.4 J	4.2 J	0.92 U	1.0 U	1.2 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	7.0 J	2.8 U	0.36 U	0.94 U	0.47 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	59	22 J	0.56 U	0.57 U	0.66 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	2500	820	8.7 J	1.6 J	0.93 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	800	270	3.6 J	0.76 U	0.65 U
Total heptachlorodibenzofuran (HpCDF)	pg/L	140 J	52 J	1.6 J	1.1 J	1.2 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	190 J	78 J	3.9 J	0.53 U	2.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/L	310 J	110 J	1.8 J	2.9 J	3.2 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	27 J	7.5 J	2.7 J	2.5 J	4.6 J
Total pentachlorodibenzofuran (PeCDF)	pg/L	250 J	91 J	0.56 U	0.69 U	0.66 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	9.4 J	4.2 J	0.92 U	1.0 U	1.2 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	4200 J	1400 J	13 J	1.6 J	0.93 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	860 J	290 J	5.0 J	0.76 U	0.65 U

Notes:
mg/L - milligrams per Liter
pg/L - picograms per Liter
µm - micron
U - Not detected at the associated reporting limit.
J - Estimated concentration.

ED_014247_00001351-00215

Table 3-4

2019 Focused Filtration Testing Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area: Sample Location: Sample Identification: Sample Date: Report Sample Delivery Group (SDG): Filter Size:	Units	Pilot Test Filter Effluent - effluent from 1 um filter FEFF 11187072-FEFF-1um 1/9/2020 320-57624-1 1 um	Pilot Test Filter Effluent - effluent from 0.45 um filter FEFF 11187072-FEFF-0.45um 1/9/2020 320-57624-1 0.45 um	Pilot Test Filter Effluent - effluent from 0.1 um filter FEFF 11187072-FEFF-0.1um 1/9/2020 320-57624-1 0.1um	Pilot Test Filter Effluent - effluent from 0.050 um filter FEFF 11187072-FEFF-0.050um 1/13/2020 320-57717-1 0.05 um	Pilot Test Filter Effluent - effluent from 0.025 um filter FEFF 11187072-FEFF-0.025um 1/13/2020 320-57717-1 0.025 um
Dioxins/Furans						
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	1.5 J	1.0 J	2.1 J	1.3 J	0.93 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	9.3 U	3.6 U	14 U	3.7 U	14 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	0.51 U	0.52 U	0.95 U	0.67 U	0.84 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	1.1 U	0.722 U	1.7 U	0.73 J	1.3 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	0.29 U	0.20 U	0.27 U	0.80 U	0.96 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	0.40 U	0.41 U	0.50 U	0.65 U	0.72 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.8 U	1.6 U	1.8 U	1.6 J	1.8 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	0.41 U	0.42 U	0.50 U	0.63 U	0.71 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	0.30 U	0.30 U	0.33 U	0.66 J	0.85 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	0.29 U	0.30 U	0.50 J	0.96 U	0.68 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	0.26 U	0.50 J	0.29 U	0.44 U	0.52 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	0.25 U	0.33 U	0.32 U	0.59 U	0.78 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	0.40 U	0.40 U	0.35 U	1.1 U	1.2 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	0.30 U	0.31 U	0.34 U	0.41 U	0.48 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	0.26 U	0.33 U	0.35 U	0.62 U	0.80 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	0.22 U	0.21 U	0.24 U	0.34 U	0.41 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	0.40 U	0.41 U	0.48 U	0.62 U	0.70 U
Total heptachlorodibenzofuran (HpCDF)	pg/L	0.51 J	0.52 J	0.95 J	0.80 U	0.96 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	2.5 J	0.72 J	3.2 J	1.8 J	2.9 J
Total hexachlorodibenzofuran (HxCDF)	pg/L	0.41 U	0.42 U	0.50 J	0.96 J	0.68 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.8 J	2.1 J	1.8 J	5.6 J	2.6 J
Total pentachlorodibenzofuran (PeCDF)	pg/L	0.30 U	0.33 U	0.43 U	0.62 U	0.80 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	0.40 U	0.40 U	0.35 U	1.1 U	1.2 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	0.22 U	0.21 U	0.24 U	0.34 U	0.41 U
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	0.40 U	0.41 U	0.48 U	1.0 J	0.90 J

Notes:
pg/L - picograms per Liter
µm - micron
U - Not detected at the associated reporting limit.
J - Estimated concentration.

ED_014247_00001351-00216

Table 3-5

2019 Armored Cap Test Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:		Elutriate From Armored Cap Material	Elutriate From Armored Cap Material	Elutriate From Armored Cap Material
Sample Location:	Units	Berm	Eastern	Western
Sample Identification:		11187072-Berm-GW	11187072-Eastern-GW	11187072-Western-GW
Sample Date:		1/29/2020	1/29/2020	1/29/2020
Report Sample Delivery Group (SDG):		320-58170-1	320-58170-1	320-58170-1
Dioxins/Furans				
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	21 U	14 U	13.8 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	83 U	94 U	51 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	7.54 U	7.54 U	7.54 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	9.52 U	9.52 U	9.52 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	5.85 U	5.85 U	0.71 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	5.92 U	5.92 U	0.79 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	7.72 U	7.72 U	7.72 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	6.14 U	0.81 U	0.70 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	0.48 U	0.52 U	0.48 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	6.25 U	6.25 U	0.53 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	6.10 U	6.10 U	6.10 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	0.46 U	0.48 U	0.42 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	6.12 U	6.12 U	0.47 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	5.39 U	0.55 U	0.49 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	0.51 U	0.55 U	0.46 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	0.28 U	0.36 U	0.35 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	0.60 U	0.44 U	3.4 J
Total heptachlorodibenzofuran (HpCDF)	pg/L	13 J	8.9 J	3.2 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	15 J	16 J	8.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/L	6.8 J	3.9 J	0.79 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	5.0 J	3.4 J	4.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/L	0.51 U	0.55 U	0.46 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	1.1 J	0.62 J	0.47 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	0.28 U	0.36 U	0.35 U
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	0.60 U	0.44 U	3.4 J

2019 Armored Cap Test Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:	Units	Solids Washed From Armored Cap Material	Solids Washed From Armored Cap Material	Solids Washed From Armored Cap Material
Sample Location:		Berm	Eastern	Western
Sample Identification:		11187072-Berm-Solids	11187072-Eastern-Solids	11187072-Western-Solids
Sample Date:		1/29/2020	1/29/2020	1/29/2020
Report Sample Delivery Group (SDG):		320-58170-1	320-58170-1	320-58170-1
Dioxins/Furans				
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	5.0 J	4.0 J	12 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	320	280	540
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.9 J	0.75 U	3.2 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	0.61 U	12	26
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.30 U	0.24 U	0.29 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.27 U	0.18 J	0.21 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.48 U	0.46 U	0.69 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.23 U	0.14 U	0.17 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.86 J	0.38 J	0.67 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.18 U	0.24 J	0.11 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.62 J	0.48 J	0.68 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.12 U	0.12 J	0.13 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.15 U	0.18 U	0.17 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.16 U	0.095 U	0.12 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.13 U	0.12 U	0.17 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.73 J	2.2	2.5
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.56 J	0.98 J	1.0 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	3.8 J	2.0 J	9.6 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	20 J	33 J	62 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.69 J	1.2 J	1.9 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.0 J	4.9 J	7.9 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.69 J	0.12 J	1.4 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.15 U	0.18 U	0.20 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.73 J	3.6 J	5.0 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.56 J	0.98 J	1.0 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.898	1.54	1.84
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	1.06	1.68	2.02
Percent solids	%	99.6	99.6	99.7

2019 Armored Cap Test Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area:		Crushed Rock Armored Cap Material	Crushed Rock Armored Cap Material	Crushed Rock Armored Cap Material
Sample Location:	Units	Berm	Eastern	Western
Sample Identification:		11187072-Berm-Rock	11187072-Eastern Rock	11187072-Western-Rock
Sample Date:		2/11/2020	2/11/2020	2/11/2020
Report Sample Delivery Group (SDG):		320-58545-1	320-58545-1	320-58545-1
Dioxins/Furans				
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	0.57 U	0.58 U	3.4 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	9.6 J	61	160
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	0.229 U	0.27 U	1.2 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	0.59 J	4.4 J	12
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.18 J	0.027 U	0.14 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.085 U	0.098 U	0.13 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.24 U	0.27 U	0.30 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.076 U	0.090 U	0.11 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.046 U	0.26 U	0.33 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.27 U	0.18 U	0.20 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.042 U	0.13 J	0.26 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.17 J	0.16 J	0.13 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.093 J	0.11 J	0.058 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.084 J	0.059 U	0.068 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.050 U	0.060 U	0.057 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	0.11 J	0.15 J	0.18 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.059 U	0.14 J	0.15 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	0.46 J	0.38 J	3.7 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1.3 J	12 J	26 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	0.35 J	0.18 J	0.98 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.24 J	1.1 J	2.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	0.17 J	0.16 J	0.13 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.093 J	0.11 J	0.24 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	0.23 J	0.15 J	0.18 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.059 U	0.14 J	0.15 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	0.128	0.345	0.379
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	0.204	0.404	0.474
Percent solids	%	99.7	94.4	94.2

Notes:
pg/L - picograms per Liter
U - Not detected at the associated reporting limit.
J - Estimated concentration.
TEQ - toxic equivalency
WHO - World Health Organization

Analytical Results from 2020 Field Filtration Testing
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Parameter	Units	Influent - Sand-Filtered and Clarified Contact Water	1 µm Filtrate	0.5 µm Filtrate
TSS	mg/L	11	3.8	2.0 U
Total TCDD	pg/L	6.5 J	3.6 J	3.8 J
Total TCDF	pg/L	20 J	5.6 J	0.96 J
2,3,7,8-TCDD	pg/L	1.9 J	0.72 U	0.56 U
2,3,7,8-TCDF	pg/L	12	3.4 J	0.96 J

Notes:
mg/L - milligram per liter
pg/L - picogram per liter
µm - micrometer
TSS = total suspended solids
Total TCDD = Total tetrachlorinated dibenzo-p-dioxin
Total TCDF = Total tetrachlorodibenzofuran
2,3,7,8-TCDD = 2,3,7,8 tetrachlorinated dibenzo-p-dioxin
2,3,7,8-TCDF = 2,3,7,8 tetrachlorodibenzofuran
J - Estimated concentration
U - Not detected at the associated reporting limit

Table 3-7

Results from Filtrate Generated from Particle Size Analysis - Approach B Filtration Testing
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Filter Size (µm)	With Chemical Addition						Without Chemical Addition					
	Solids on Filter (mg/L)	Solids Retained (%)	Total TCDD (pg/L)	Total TCDF (pg/L)	2,3,7,8-TCDD (pg/L)	2,3,7,8-TCDF (pg/L)	Solids on Filter (mg/L)	Solids Retained (%)	Total TCDD (pg/L)	Total TCDF (pg/L)	2,3,7,8-TCDD (pg/L)	2,3,7,8-TCDF (pg/L)
100	29.2	0.26	13,000 J	68,000 J	12,000	35,000	18	0.45	3,000 J	16,000 J	2,700	9,500
41	2,226	19.54	8,600 J	41,000 J	8,000	23,000	136.6	3.42	28,000 J	13,000 J	26,000	80,000
10	8,756	76.86	42 J	160 J	37	97	3,577	89.49	59 J	260 J	52	140
1	325.6	2.86	17 J	59 J	12	34	228.5	5.72	120 J	600 J	110	350
0.45	33.2	0.29	11 J	29 J	6.1 J	19	22.6	0.57	4.5 J	21 J	4.5 J	11
0.1	22.4	0.20	13 J	49 J	11	31	14.4	0.36	15 J	81 J	15	48

Notes:
mg/L - milligram per liter
pg/L - picogram per liter
µm - micrometer
Total TCDD = Total tetrachlorinated dibenzo-p-dioxin
Total TCDF = Total tetrachlorodibenzofuran
2,3,7,8-TCDD = 2,3,7,8 tetrachlorinated dibenzo-p-dioxin
2,3,7,8-TCDF = 2,3,7,8 tetrachlorodibenzofuran
J - Estimated concentration

Constituent Concentrations throughout Treatment Process - Additional WTS Treatability Testing
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Parameter	Units	Supernatant after Initial Setting	Supernatant after Chemical Addition and Settling	Chemical Addition Supernatant - 5-µm Filtrate	Chemical Addition Supernatant - 1-µm Filtrate
Total TCDD	pg/L	650 J	19 J	1.1 U	0.96 U
Total TCDF	pg/L	2,900 J	99 J	2.5 J	2.4 J
2,3,7,8-TCDD	pg/L	600	19	1.1 U	0.96 U
2,3,7,8-TCDF	pg/L	1,600	56	2.5 U	2.4 J
TSS	mg/L	1,050	5	2	2

Notes:
mg/L - milligram per liter
pg/L - picogram per liter
µm - micrometer
WTS - Water Treatment System
Total TCDD = Total tetrachlorinated dibenzo-p-dioxin
Total TCDF = Total tetrachlorodibenzofuran
2,3,7,8-TCDD = 2,3,7,8 tetrachlorinated dibenzo-p-dioxin
2,3,7,8-TCDF = 2,3,7,8 tetrachlorodibenzofuran
J - Estimated concentration
U - Not detected at the associated reporting limit

Table 4-1

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
1.	Surface Water	Clean Water Act (CWA): Sections 303 and 304: Federal Water Quality Criteria.	33 U.S.C. §§1313 and 1314 (304(a))	Under §303 (33 U.S.C. §1313), individual states have established water quality standards to protect existing and attainable uses. CWA §301(b)(1)(C) requires that pollutants contained in direct discharges be controlled beyond BCT/BAT equivalents. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121(d)(2)(B)(i) establishes conditions under which water quality criteria, which were developed by USEPA as guidance for states to establish location-specific water quality standards, are to be considered relevant and appropriate. Two kinds of water quality criteria have been developed under CWA §304 (33 U.S.C. §1314): one for protection of human health, and another for protection of aquatic life. These requirements include establishment of total maximum daily loads (TMDL).	A TMDL for dissolved nickel in the Houston Ship Channel System has been adopted and an implementation plan approved. Discharge criteria for the Northern Impoundment, including nickel, was determined by establishing Water Quality-Based Effluent Limitations (WQBELs) using TexTox Menus model provided by TCEQ; therefore, the use of the same model used to develop the TMDL ensures that the cumulative effects will not cause an exceedance of the water quality criteria for nickel. Per the 2020 Texas Integrated Report – Texas 303(d) list, San Jacinto River Segment 1005 is classified as impaired body of water for dioxin and polychlorinated biphenyls (PCBs) in edible tissues as category 5; therefore, it is suitable for development of a TMDL. A TMDL for dioxin and PCBs in edible tissues Segment 1005 has not been developed yet. The Texas Surface Water Quality Standard (TSWQS) for dioxins is applicable for surface water discharge from the Northern Impoundment, in accordance with the EPA's February 18, 2020, e-mail (included in Appendix D of this Northern Impoundment 90% RD Package), which stated: *EPA has determined that compliance with the TSWQS ARAR will be attained as follows:* *- The state surface water quality standard for Dioxins/Furans is 7.97 x 10-8 µg/L [0.0797 pg/L] (as TCDD equivalents);* *- Compliance with the TSWQS will be determined by using minimum level of the EPA approved method (1613B), cited in 40 CFR Part 136 (GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS), in sampling of surface water discharges during the Site remedial action.* *- If an effluent sample analyzed for dioxin is below the minimum level using the EPA approved method, the sample result would be identified as non-detect and the discharge would be determined to be in compliance with the ARAR.* *This approach is consistent with the state's guidance and other permits issued by TCEQ. EPA's determination is contingent on the water treatment facility using a 1 micron final filtration step in the water treatment process.*
2.	Surface Water	Clean Water Act (CWA): Criteria and standards for imposing technology -based treatment requirements under §402.	33 U.S.C. §1342; 40 CFR Part 125 Subpart A	Both on-site and off-site discharges from CERCLA Sites to surface waters are required to meet the substantive CWA (National Pollutant Discharge Elimination System) NPDES requirements.	On-site discharges to surface water must comply with the substantive technical requirements of the CWA but do not require a permit. Off-site discharges to a Publicly Owned Treatment Work (POTW) would be regulated under the conditions of a NPDES permit for the POTW. Water that is generated during removal activities in the Northern Impoundment will be treated and discharged to the San Jacinto River (Segment 1005). The discharge location(s) have yet to be determined but will be in close proximity to the Northern Impoundment, so only the substantive requirements of an NPDES permit, but not an NPDES permit, will be required. Water quality-based effluent limitations using TexTox menu # 5 for bay or wide tidal river were calculated and considered for the water treatment design. Development of the treatment system discharge limits are discussed further below.

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
3.	Surface Water	Clean Water Act (CWA): Section 307(b): Pretreatment standards.	33 U.S.C. §1317(b)	CERCLA §121(e) states that no Federal, state, or local permit for direct discharges is required for the portion of any removal or remedial action conducted entirely on-site (the aerial extent of contamination and all suitable areas in close proximity to the contamination necessary for implementation of the response action) (USEPA, 1988).	If off-site discharges from a CERCLA response activity were to enter receiving waters directly or indirectly, through treatment at a POTW, the POTW must comply with applicable Federal, State, and Local substantive requirements and formal administrative permitting requirements. Per the RD as described in this Northern Impoundment 90% RD Package, contact water generated during excavation activities will not be discharged to a POTW; therefore this regulation does not apply.
4.	Surface Water	Clean Water Act (CWA).	Section 401: Water Quality Certification 33 U.S.C. §1341 30 TAC Chapter 279	Requires activities that involve a discharge into navigable waters of the U.S. to obtain certification from state or regional regulatory agencies that the proposed discharge will comply with CWA Sections 301, 302, 303, 306, and 307.	Water Quality Certification is a requirement of projects that involve discharge of dredge/fill or would impact waters of the U.S. or wetland. The cofferdam barrier wall to be installed at the Northern Impoundment is considered "fill material"; therefore, Section 401 would apply to the project. The project will comply with substantive requirements of Section 401.
5.	Surface Water	Clean Water Act (CWA).	CWA Section 404 and 404(b)(1): Dredge and Fill 33 U.S.C. §1344 (b)(1); 33 CFR 320 and 330; 40 CFR 230	Discharges of dredged and fill material into waters of the U.S. must comply with the CWA §404 (33 U.S.C. 1344) guidelines and demonstrate the public interest is served.	The San Jacinto River is a water of the U.S. These requirements are applicable to dredging, in-water disposal, capping, construction of berms or levees, stream channelization, excavation and/or dewatering within the river. Therefore, they would apply to the work in the Northern Impoundment. Under the 404(b)(1) guidelines, efforts should be made to avoid, minimize, and mitigate adverse effects on the waters of the U.S. and, where possible, select a practicable (engineering feasible) alternative with the least adverse effects. A permit for the on-site work will not be required; however, the substantive technical requirements of Section 404 will apply in the development, evaluation, and implementation of the remedial action to minimize adverse impacts to waters of the U.S. AA "Waters and Wetlands Delineation Report" will be included in a submittal to the USACE following submittal of the Northern Impoundment 90% RD.
6.	Surface Water	Storm Water Discharge from Construction Activities.	40 CFR 450 30 TAC Chapter 205	Requires new construction project that will disturb 5 or more acres to request coverage under a Texas Commission on Environmental Quality (TCEQ) construction general permit (TX15000) and develop a storm water pollution prevention plan (SWPPP) to control discharges of storm water associated with construction activities in accordance with the NPDES program.	A permit is not required, however, the work must comply with the substantive technical requirements of these regulations. A SWPPP will be developed and implemented using best management practices to minimize erosion and entrainment of sediments in stormwater runoff.
7.	Surface Water	Texas Surface Water Quality Standards.	30 TAC §307.4-7, 10	These state regulations provide general narrative criteria, anti-degradation policy, numerical criteria for pollutants, numerical and narrative criteria for water-quality related uses (e.g., human use), and site-specific criteria for San Jacinto River basin.	The TSWQS for dioxins is applicable for surface water discharge from the Northern Impoundment, in accordance with EPA's February 18, 2020, e-mail quoted in Item No. 1, and included in Appendix D of this Northern Impoundment 90% RD Package.
8.	Surface Water	Texas Water Quality: Pollutant Discharge Elimination System (TPDES).	30 TAC §279.10	These state regulations require storm water discharge permits for either industrial discharge or construction-related discharge. The State of Texas was authorized by USEPA to administer the NPDES program in Texas on September 14, 1998.	No permit is required for on-site activities. A SWPPP will be developed and implemented using best management practices to minimize soil erosion and entrainment of sediments in stormwater runoff.

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
9.	Surface Water	Texas Water Quality: Water Quality Certification.	30 TAC §279.10	These state regulations establish procedures and criteria for applying for, processing, and reviewing state certifications under CWA, §401. It is the purpose of this chapter, consistent with the Texas Water Code and the federal CWA, to maintain the chemical, physical, and biological integrity of the state's waters.	Water Quality Certification is a requirement for projects that involve discharge of dredge fill or would impact waters of the U.S. or wetlands. The cofferdam barrier wall that will be installed at the Northern Impoundment, as described in this 90% Northern Impoundment RD Package, is considered "fill material"; therefore, Section 401 would apply to the project. The BMP installation and removal activities will comply with substantive requirements of Section 401.
10.	Surface Water	Water Use.	TWC Sections 11.121 and 11.138; 30 TAC §297.11	Impoundment, diversion and storage, taking or use of state water with certain exemptions as provided in state law require obtaining a water rights permit. These exemptions are not applicable to the Northern Impoundment. These state regulations establish procedures for applying for, and obtaining the temporary diversion of surplus state water under a temporary water rights permit.	A temporary use permit is a requirement for projects that involve the use of state water and/or divert water for up to three years. Projects that would use more than 10 acre-feet of water and/or exceed one year term are subject to public notice and hearing. Hydrodynamic modeling was performed at the request of the Harris County Flood Control District (HCFCD) to evaluate the effect the cofferdam barrier wall planned for the Northern Impoundment may have on the water levels of the surrounding floodplain. Results of the evaluation suggest that the effect of the structure on the floodplain would be negligible under 2-year, 10-year, and 100-year flood event scenarios. This evaluation was summarized in a letter submitted to the HCFCD on March 30, 2022. A revised version of the letter was submitted on May 6, 2022, which addressed comments from the HCFCD that were received on April 8, 2022. The revised letter is included in Appendix D of this Northern Impoundment 90% RD package. At the request of the Texas Department of Transportation (TxDOT) the Respondents also evaluated the potential effect the cofferdam barrier would have on the river velocity and shear stress. The results of this evaluation were submitted to TxDOT on April 11, 2022. This submittal is also included in Appendix D.
11.	Waste	Resource Conservation And Recovery Act (RCRA): Hazardous Waste Management.	42 U.S.C. §§6921 et seq.; 40 CFR Parts 260 - 268	RCRA Subtitle C and its implementing regulations contain the federal requirements for the management of hazardous wastes.	This requirement would apply to certain activities if the waste materials or affected soils contain RCRA listed hazardous waste or exhibit a hazardous waste characteristic. Waste management in the Northern Impoundment would be required to comply with these regulations. Based on the results of the pre-design investigations (PDI-1, PDI-2) and supplemental design investigation (SDI), the Northern Impoundment waste materials sampled to date are not listed hazardous waste, do not contain listed hazardous waste above RCRA-thresholds, and are not classified as characteristic hazardous waste. The evaluation and designation of the material as non-hazardous was summarized in a letter to the EPA dated October 20, 2020. The EPA provided a response letter dated November 19, 2020, supporting the waste classification. These letters are included in Appendix D of this Northern Impoundment 90% RD Package. The results of the SDI confirmed the waste classification, as described in Section 3.3 of the main text of the Northern Impoundment 90% RD Package.
12.	Waste	Toxic Substances Control Act (TSCA).	15 USC §2601, et. seq.; 40 CFR 761.61 (c)	40 CFR 761.61 provides TSCA clean-up and disposal options for PCB remediation waste, which includes PCB-contaminated soil, sediment, sewage or industrial sludge, and building material. 761.61(c) is the risk-based option for PCB remediation waste.	Total PCB concentrations in the Northern Impoundment are below the regulatory threshold of 50 mg/kg, calculated as specified in 40 CFR 761 that could require management of any waste materials as a TSCA waste.
13.	Waste	RCRA: General Requirements for Solid Waste Management.	42 U.S.C. §§6941, et seq.; 40 CFR 258)	Requirements for construction for municipal solid waste landfills that receive RCRA Subtitle D wastes, including industrial solid waste. Requirements for run-on/run-off control systems, groundwater monitoring systems, surface water requirements, etc.	The Northern Impoundment remedial activities will not involve the construction of a municipal landfill; therefore, this regulation does not apply.

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
14.	Waste	30 Texas Administrative Code (TAC) Part 1: Industrial Solid Waste and Municipal Hazardous Waste General Terms	30 TAC §§335.1 - 335.15	Substantive requirements for the transportation of industrial solid and hazardous wastes; requirements for the location, design, construction, operation, and closure of solid waste management facilities.	This regulation contains guidelines to promote the proper collection, handling, storage, processing, and disposal of industrial solid waste or municipal hazardous waste in a manner consistent with the purposes of Texas Health and Safety Code, Chapter 361. These regulations also define the classification of the Industrial Solid Waste from the Northern Impoundment. They are applicable and will be followed for waste materials from the Northern Impoundment that are transported to off-site landfills.
15.	Waste	30 TAC Part 1: Industrial Solid Waste and Municipal Hazardous Waste: Notification.	30 TAC Chapter 335 Subchapter P	Requires placement of warning signs in contaminated and hazardous areas if a determination is made by the executive director of the Texas Water Commission a potential hazard to public health and safety exists which will be eliminated or reduced by placing a warning sign on the contaminated property.	It is not expected that warning signs will be necessary based on this regulation. The Northern Impoundment will be protected with appropriate signage and other site controls as defined in the Health and Safety Plan. Any issues with respect to maintenance of current signage required pursuant to the Operations and Maintenance (O&M) Plan for the Time Critical Removal Action (TCRA) are expected to be addressed through modifications to the O&M Plan.
16.	Waste	30 TAC Part 1: Industrial Solid Waste and Municipal Hazardous Waste: Generators.	30 TAC Chapter 335, Subchapter C	Standards for hazardous waste generators either disposing of waste on-site or shipping off-site with the exception of conditionally exempt small quantity generators. The definition of hazardous involves state and federal standards.	Waste management with respect to RA activities associated with the Northern Impoundment would be required to comply with these regulations. Based on the results of the PDIs and SDI for the RD, the Northern Impoundment waste materials sampled to date are not listed hazardous waste, do not contain listed hazardous waste above RCRA -thresholds, and are not classified as characteristic hazardous waste. The evaluation and designation of the material as non-hazardous was summarized in a letter to the EPA dated October 20, 2020. The EPA provided a response letter dated November 19, 2020, supporting the waste classification. These letters are included in Appendix D of the Northern Impoundment 90% RD Package. The results of the SDI confirmed the waste classification, as described in Section 3.3 of the main text of the Northern Impoundment 90% RD Package.
17.	Waste	Hazardous Materials Transportation Act	49 U.S.C. §§1801, et seq.; 49 CFR Subchapter C	Establishes standards for packaging, documenting, and transporting hazardous materials.	These requirements would apply to all hazardous material transported to and from work sites for the Northern Impoundment RA. Based on the results of the PDIs and the SDI, it is not expected that the waste materials excavated from beneath the Northern Impoundment and transported off-site will be classified as hazardous material so these requirements would not apply.
18.	Air	Clean Air Act (CAA).	42 U.S.C. §§7401, et seq.	Authorization of potential emissions of dust, volatile organic compounds (VOCs), and/or hazardous air pollutants (HAP) resulting from the excavation, solidification and stabilization of the soil in the Northern Impoundment.	Any air discharges are required to be in compliance with the substantive technical requirements of the CAA and the work will be required to comply with any applicable TCEQ requirements regarding such emissions.
19.	Air	Texas Air Quality Rules.	30 TAC Chapter 116	Authorization of potential emissions of dust, VOCs, and/or HAP resulting from the excavation, solidification and stabilization of the soil in the Northern Impoundment.	TCEQ is the designated authority to issue air permits in Texas, so discharges must comply with the substantive technical requirements of this regulation. Emissions generated from equipment used to extract, handle, process, condition, reclaim or destroy contaminants for the purpose of remediation are covered by a TCEQ's permit by rule (PBR) as long as emissions are limited to 5 ton per year or 1 pound per hour for the site activities (30 TAC 106.533). Prior to commencing construction, emission calculations would be performed with respect to compliance with the PBR.
20.	Dredging/Floodplain	Rivers And Harbors Act of 1899: Obstruction of navigable waters (generally wharves, piers, etc.); excavation and fill.	33 U.S.C. §401	Controls the alteration of navigable waters (i.e., waters subject to ebb and flow of the tide shoreward to the mean high water mark). Activities controlled include construction of structures such as piers, berms, and installation of pilings as well as excavation and fill. Section 10 may be applicable for any action that may obstruct or alter a navigable waterway. No permit is required for on-site activities. However, substantive requirements might limit in-water construction activities.	The cofferdam barrier wall to be installed at the Northern Impoundment is considered "fill material"; therefore, Section 10 of the Rivers and Harbors Act of 1899 would apply to the BMP installation and removal activities and the work will be performed in a manner that complies with substantive requirements of Section 10.

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
21.	Dredging/Floodplain	Coastal Zone Management Act.	16 USC §§1451, et seq.; 15 CFR 930	Federal activities must be consistent with, to the maximum extent practicable, state coastal zone management programs. Federal agencies must supply the state with a consistency determination.	The San Jacinto River lies within the Coastal Zone Boundary (GLO TCMP). During the Remedial Investigation/Feasibility Study (RI/FS), an evaluation was made as to whether remedial alternatives may affect (adversely or not) the coastal zone and provides a technical basis for the lead agency (EPA) to determine whether the activity will be consistent with the state's TCMP. These requirements have been incorporated into the design as applicable.
22.	Dredging/Floodplain	FEMA (Federal Emergency Management Agency), Department of Homeland Security (Operating Regulations).	42 U.S.C. 4001, et seq.; 44 CFR Chapter 1	Prohibits alterations to river or floodplains that may increase potential for flooding.	The FEMA flood insurance rate map ID 48201C074M, effective on 1/6/2017, indicates that the Northern Impoundment is located within a designated coastal zone (Zone VE), which is within the Riverine Floodway. As stated in Item No. 10 above, hydrodynamic modeling was conducted as part of the RD to determine if the cofferdam structure, as described in the Northern Impoundment 90% RD Package, would have any adverse effect on the floodplain. The results of that evaluation suggest that the impacts would be negligible.
23.	Dredging/Floodplain	National Flood Insurance Program (NFIP) Regulations.	42 U.S.C. Subchapter III, §§4101, et seq.	Provides federal flood insurance to local authorities and requires that the local authorities not allow fill in the river that would cause an increase in water levels associated with floods.	As stated in Item No. 10 above, hydrodynamic modeling was conducted to determine if the cofferdam structure would have any adverse effect on the floodplain. The results of that evaluation suggest that the impacts would be negligible.
24.	Dredging/Floodplain	Floodplain Management and Wetlands Protection.	Executive Orders (EO) 11988 and 11990	Requires federal agencies to conduct their activities to avoid, if possible, adverse impacts associated with the destruction or modification of wetlands and occupation or modification of floodplains. Executive Orders 11988 and 11990 require federal projects to avoid adverse effects and minimize potential harm to wetlands and within flood plains. The EO 11990 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.	The Northern Impoundment is within a floodplain and the temporary structure (cofferdam barrier wall) will be constructed in the river. As stated in Item No. 10 above, hydrodynamic modeling was conducted to determine if the cofferdam structure would have any adverse effect on the floodplain. The results of that evaluation suggest that the impacts would be negligible. The Respondents will be preparing and submitting to the USACE a “Waters and Wetlands Delineation Report” to address requirements under EO 11990.
25.	Dredging/Floodplain	Texas Coastal Coordination Council Policies for Development in Critical Areas.	31 TAC §501.23	Dredging in critical areas is prohibited if activities have adverse effects or degradation on shellfish and/or jeopardize the continued existence of endangered species or results in an adverse effect on a coastal natural resource area (CNRA) 5; prohibits the location of facilities in coastal natural resource areas unless adverse effects are prevented and/or no practicable alternative. Specifies compensatory mitigation.	Any removal (excavation) activities will occur within the cofferdam wall and footprint of the Northern Impoundment and do not currently involve dredging, and therefore will not impact critical areas. An updated Threatened and Endangered (T&E) Species Habitat Suitability Evaluation will be included in a submittal to the USACE following submittal of the Northern Impoundment 90% RD.
26.	Dredging/Floodplain	Texas Coastal Management Plan (TCMP) Consistency.	31 TAC, §506.12	Specifies federal actions within the TCMP boundary that may adversely affect CNRAs, specifically, selection of remedial actions.	The San Jacinto River lies within the Coastal Zone Boundary (GLO TCMP). During the RI/FS, an evaluation was made as to whether remedial alternatives may affect (adversely or not) the coastal zone and provides a technical basis for the lead agency (EPA) to determine whether the activity will be consistent with the state's TCMP. These requirements will be incorporated into the design as applicable.
27.	Dredging/Floodplain	Texas State Code - obstructions to navigation.	Natural Resources Code §51.302 Prohibition and Penalty	Prohibits construction or maintenance of any structure or facility on land owned by the state without an easement, lease, permit, or other instrument from the state.	Because this is a CERCLA action, a formal instrument should not be required; however, the work will be coordinated with the State.

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
28.	Dredging/Floodplain	Floodplain Management of Harris County, Texas.	Texas Code Section 240.901 and TTC Sections 251.001-251.059 and Sections 254.001-254.019	Establishes construction requirements along the segment of the San Jacinto River at or near the Northern Impoundment.	The FEMA flood insurance rate map ID 48201C074M, effective on January 6, 2017, indicates that the Northern Impoundment is located within a designated coastal zone (Zone VE), which is within the Riverine Floodway. Much of the surrounding property that may be used for offices, laydown and staging areas are above an elevation with a 1 percent annual exceedance probability (AEP) for flooding Zone AE. Design of any temporary structure, including gas or liquid storage tanks, will comply with Harris County Texas floodplain management requirements. Additionally, at the request of HCFCD, as stated in Item No. 10 above, hydrodynamic modeling was conducted as part of the RD to determine if the cofferdam structure would have any adverse effect on the floodplain. The results of that evaluation suggest that the impacts would be negligible.
29.	Wildlife Protection	Endangered Species Act.	16 U.S.C. §§ 1531, et seq.	Federal agencies must ensure that actions they authorize, fund, or carry out are not likely to adversely modify or destroy critical habitat of endangered or threatened species. Actions authorized, funded, or carried out by federal agencies may not jeopardize the continued existence of endangered or threatened species as well as adversely modify or destroy their critical habitats.	During the RI/FS in 2010, a desktop review of photographs and U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) species and habitat maps was performed. Another evaluation was performed in 2021. Both evaluations concluded that there are no federally listed T&E or critical habitats present on the Northern Impoundment or in areas in the vicinity of the Northern Impoundment. An updated evaluation will be included in a submittal to the USACE following submittal of the Northern Impoundment 90% RD.
30.	Wildlife Protection	Fish and Wildlife Coordination Act.	16 U.S.C. §§661, et seq., 16 U.S.C. §742a, 16 U.S.C. § 2901	Requires adequate provision for protection of fish and wildlife resources. This title has been expanded to include requests for consultation with USFWS for water resources development projects (Mueller, 1980). Any modifications to rivers and channels require consultation with the USFWS, Department of Interior, and state wildlife resources agency. Project-related losses (including discharge of pollutants to water bodies) may require mitigation or compensation.	Depending on the site conditions after final restoration of the Northern Impoundment after remedial activities are completed, consultation with the USFWS, Department of Interior, and state wildlife resources agency may be required to address adequate protection of fish and wildlife resources.
31.	Wildlife Protection	Bald and Golden Eagle Protection Act.	16 U.S.C. §668a-d	Makes it unlawful to take, import, export, possess, buy, sell, purchase, or barter any bald or golden eagle, nest, or egg. "Take" is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping and collecting, molesting, or disturbing.	No readily available information suggests bald or golden eagles frequent the Northern Impoundment; however, if bald or golden eagles are identified prior to or during construction, activities will be designed to conserve the species and their habitat.
32.	Wildlife Protection	Migratory Bird Treaty Act.	16 U.S.C. §§703-712; 50 CFR §10.12	Makes it unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. "Take" is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, and trapping and collecting.	The Northern Impoundment remedy will be carried out in a manner to avoid adversely affecting migratory bird species, including individual birds or their nests.

Applicable or Relevant and Appropriate Requirements (ARAR)
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Item No.	Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
33.	Wildlife Protection	State of Texas Threatened and Endangered (T&E) Species Regulations.	31 TAC 65.171 - 65.176	No person may take, possess, propagate, transport, export, sell or offer for sale, or ship any species of fish or wildlife listed as threatened or endangered.	During the RI/FS in 2010, a desktop review of photographs and USFWS and NMFS species and habitat maps was performed. Another evaluation was performed in 2021. Both evaluations concluded that there are no federally listed T&E or critical habitats present on the Northern Impoundment or in areas in the vicinity of the Northern Impoundment. An updated T&E Habitat Suitability Evaluation will be included in a submittal to the USACE following submittal of the Northern Impoundment 90% RD.
34.	Historic Preservation	National Historic Preservation Act.	16 U.S.C. §§ 470, et seq.; 36 CFR 800	Section 106 of this statute requires federal agencies to consider effects of their undertakings on historic properties. Historic properties may include any district, Site, building, structure, or object included in or eligible for the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property.	According to the San Jacinto River Waste Pits RI/FS cultural resources assessment, no NRHP-eligible properties are documented in the area of concern. This was further confirmed by a cultural resources assessment completed in December 2021. This assessment will be included in a submittal to the USACE following submittal of the 90% RD. This requirement is therefore not applicable.
35.	Historic Preservation	Natural Resources Code, Antiquities Code of Texas.	Texas Parks and Wildlife Commission Regulations 191.092-171	Requires that the Texas Historical Commission staff review any action that has the potential to disturb historic and archeological Sites on public land. Actions that need review include any construction program that takes place on land owned or controlled by a state agency or a state political subdivision, such as a city or a county. Without local control, this requirement does not apply.	According to the San Jacinto River Waste Pits RI/FS cultural resources assessment, no NRHP-eligible properties are documented in the area of concern. This was further confirmed by a cultural resources assessment completed in December 2021. This assessment will be included in a submittal to the USACE following submittal of the Northern Impoundment 90% RD. This requirement is therefore not applicable.
36.	Historic Preservation	Practice and Procedure, Administrative Code of Texas.	13 TAC Part 2, Chapter 26	Regulations implementing the Antiquities Code of Texas. Describes criteria for evaluating archaeological Sites and permit requirements for archaeological excavation.	This requirement is only applicable if an archaeological site is found; based on evaluations during the RI/FS, it is unlikely that archaeological resources would be found on the Northern Impoundment. This was further confirmed by a cultural resources assessment completed in December 2021. This requirement is therefore not expected to be applicable.
37.	Noise	Noise Control Act.	42 U.S.C. §§4901, et seq.; 40 CFR Subchapter G §201, et seq.	Noise Control Act remains in effect but unfunded.	Noise is regulated at the state level.
38.	Noise	Noise Regulations.	Texas Penal Code Chapter 42, Section 42.01	The Texas Penal Code regulates any noise that exceeds 85 decibels after the noise is identified as a public nuisance.	A noise is presumed to be unreasonable if the noise exceeds a decibel level of 85 at the point of potential human exposure after the person making the noise receives notice from a magistrate or peace officer that the noise is a public nuisance. Activities associated with the Northern Impoundment RA, as described in the Northern Impoundment 90% RD Package, are not likely to exceed the 85-decibel level beyond the immediate work area. The activities are not anticipated to constitute a public nuisance due to the isolation of the work, its location adjacent to a freeway with high volumes of traffic during normal working hours, and the industrial nature of activities on the Northern Impoundment. As indicated in the Site-Wide Monitoring Plan (Appendix J), noise impacts from pile driving will be assessed and monitored by the remedial contractor at the start of work.

Area-Based Average Concentration (Excluding the Northwest Corner)	23.31

Table 5-1

Area-Based Average Concentration Calculations
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Starting Elevation (Mud-line)	1.29	0.62	-0.15	-0.80	1.43	-1.17	-0.61	-8.04	-13.36	-14.36	-18.39	-15.36	-15.64	-12.40	-4.29	-2.07	-9.54	-4.90	-6.55	-1.22	-7.40	-9.70	-7.40	-4.22	-2.20	-5.70	-2.70	-4.93
Assigned Polygon Area (Acres)	0.32	0.09	Paired with SJSB071[2]	0.21	0.18											0.16	0.13	0.07	0.14	0.21	0.06	0.01	0.07	0.13	0.18	0.07	Outside Excavation Area	0.29
Post-Excavation Surface Concentration	41.0	0.524	0.62		2.59											57.0	34.3	1.36	84.0	18.60	0.855	1.79	32.7	32.0	1.79	2.07	3.02	11.0
	SJSB073	SJSB058	SJSB101	SJSB071	SJSB037	SJSB070	SJSB099	SJGB013	SJSB100	SJSB098	SJSB057	SJSB103	SJSB097	SJSB056	SJSB056-C1	SJSB095	SJSB055-C1	SJSB055	SJSB096	SJGB014	SJSB053-C1	SJSB053	SJSB054	SJSB094	SJSB052-C1	SJSB052	SJSB051	SJSB092
ELEVATION (feet NAVD88)																												
+5																												
+4																												
+3																												
+2																												
+1	9.6	12			NA																							
0	9.6	12	63000		NA																							
-1	31000	36100	63000	34700	NA	43900	53000													31625								
-2	31000	36100	59000	34700	NA	43900	53000									35000				31625					9.22			
-3	26000	48400	59000	45900	40400	68600	54000									35000				210.4					9.22		3.02	
-4	26000	48400	25000	45900	40400	68600	54000								0.79	59				210.4				36000	1.2		3.02	
-5	68000	324	25000	26.8	0.87	45600	130								0.79	59		1.36		531.3				36000	1.2		4.98	43000
-6	68000	324	18	26.8	0.87	45600	130								1.14	1.0		1.36		531.3				39000	0.49	2.07	4.98	43000
-7	83000	1160	18	2.24		24300	13								1.14	1.0		1.07	87000	213.3	0.806		16600	39000	0.49	2.07	2.48	28000
-8	83000	1160	2.7	2.24		24300	13	5095.5							0.26	9.7		1.07	87000	213.3	0.806		16600	41000	1.47	1.94	2.48	28000
-9	41.0	376	2.7	1.03	618	16700	15	5095.5							0.26	9.7		0.81	22000	18.6	0.855		1550	41000	1.47	1.94	2.64	130
-10	41.0	376	230	1.03	2.59	16700	15	1743.2							0.60	1200	34.3	0.81	22000	18.6	0.855	1.79	1550	17000	2.32	1.99	2.64	130
-11	5.2	9890	230	1.48	11.5	1000	210	1743.2							0.60	1200	34.3	1.28	310	1.29	1.34	1.79	6.43	17000	2.32	1.99	3.03	4.8
-12	5.2	9890	0.62	1.48		1000	210	337.5						3.35	1.4	57	31.1	1.28	310	1.29	1.34	0.92	6.43	5500	1.39	1.99	3.03	4.8
-13	15	136	0.62	0.52		609	1.9	337.5	110					3.35	1.4	57	31.1	2.53	4.9		1.4	0.92	5.94	5500	1.39	1.99	1.71	27
-14	15	136	0.27	0.52		609	1.9	104.4	110	71				1.65	1.33	6.0	1.34	2.53	4.9		1.4	1.44	5.94	32	1.71	2.01	1.71	27
-15	5.6	788	0.27	44.6		6.9	26	104.4	3.7	71		2.2		1.65	1.33	6.0	1.34	0.89	8500		0.94	1.44	17.6	32	1.71	2.01	2.91	26
-16	5.6	788	11	44.6		6.9	26	25.2	3.7	1900		2.2	5.2	0.80	0.60	55	0.70	0.89	8500		0.94	1.44	17.6	2.0	1.79	2.8	2.91	26
-17		0.52	11	45.4		4.69	14	25.2	9.2	1900		1.1	5.2	0.80	0.60	55	0.70	1.09	84.0		1.76	1.44	5.28	2.0	1.79	2.8	2.35	10000
-18		0.52	3.2	45.4		4.69	14		9.2	1800	24200	1.1	1.2	0.78	0.62	0.60	1.07	1.09	84.0		1.76	1.28	5.28	3.2	2.08	2.24	2.35	10000
-19			3.2						0.81	1800	24200	14	1.2	0.78	0.62	0.60	1.07	1.42	5.2		1.15	1.28	369	3.2	2.08	2.24	2.48	11
-20									0.81	160	37600	14	1.8	3.76	0.96		1.16	1.42	5.2		1.15	1.79	369	1.9		0.69	2.48	11
-21									2.3	160	37600	4.8	1.8	3.76	0.96		1.16	0.92	1.9		2.2	1.79	32.7	1.9		0.69		7.2
-22									2.3	9600	3540	4.8	1.4	0.93			0.67	0.92	1.9		2.2	0.22	32.7			12.1		7.2
-23									0.58	9600	3540	3.9	1.4	0.93			0.67		13			0.22	6.52			12.1		
-24									0.58	3900	372	3.9	2.6	2.91			1.12		13			0.34	6.52					
-25									0.57	3900	372	0.49	2.6	2.91			1.12					0.34						
-26									0.57	680	7.6	0.49	0.77	4.44			5.49					0.35						
-27									0.51	680	7.6	0.46	0.77	4.44			5.49					0.35						
-28									0.51	11	2.93	0.46	1.4	0.46														
-29										11	2.93		1.4	0.46														
-30										0.16	15.9		0.29															
-31										0.16	15.9		0.29															
-32											1.59																	
-33											1.59																	
-34											1.5																	
-35											1.5																	
Calculated Excavation Elevation	-8.71	-17.38	-12.15	-12.80	-9.57											-12.67	-9.54	-4.90	-16.55	-9.22	-9.97	-9.70	-21.40	-14.22	-16.33	-5.70	-2.70	-18.93
Calculated Excavation Depth	10	18	12	12	11											10	0	0	10	8	3	0	14	10	14	0	0	14
Hydraulic Heave Elevation	-18.91	-20.90	-20.81	-20.73	-20.57	-20.69	-20.76	-16.29	-14.20	-14.52	-14.34	-13.33	-13.62	-14.00	-32.31	-31.69	-33.78	-13.58	-32.94	-25.98	-24.14	-24.78	-24.14	-23.25	-22.69	-22.39	-22.53	-23.45
Hydraulic Heave Depth	20.20	21.52	20.66	19.93	22.00	19.52	20.15	8.25	0.84	0.16	-4.05	-2.03	-2.02	1.60	28.02	29.62	24.24	8.68	26.39	24.76	16.74	15.08	16.74	19.03	20.49	16.69	19.83	18.52
						NW Corner	NW Corner	NW Corner	NW Corner	NW Corner	NW Corner	NW Corner	NW Corner	NW Corner	NW Corner													
(Area x Concentration)	12.96	0.05	0.13		0.46											8.88	4.60	0.09	11.55	3.92	0.05	0.01	2.43	4.31	0.33	0.14		3.18

Area-Based Average Concentration (Excluding the Northwest Corner)	23.31

Table 5-1

Area-Based Average Concentration Calculations
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Starting Elevation (Mud-line)	-1.53	-1.98	-2.07	-5.49	-2.12	-1.50	-5.94	-6.30	3.12	0.43	1.42	3.34	2.26	2.28	2.25	0.41	1.71	1.42	0.88	1.82	1.77	1.05	-2.26	-1.75	-2.39
Assigned Polygon Area (Acres)	0.25	Paired with SJSB093[2]	paired with SJSB038[2]	0.04	0.26	0.19	Paired with SJSB050-C1[2]	0.13	0.23	Paired with SJSB072[2]	0.25	0.29	0.15	Paired with SJSB036[2]	0.17	0.15	0.22	0.29	Paired with SJSB077[2]	0.17	0.26	0.30	0.26	0.23	0.15
Post-Excavation Surface Concentration	17.0			15.0	5.30	5.30	2.27		157.0	1.30		87.0	11.0	0.88		3.37	6.19	0.21		16.0	12.0	3.10	2.80	7.70	4.80
	SJSB093	SJSB038	SJGB016	SJSB104	SJSB088[1]	SJSB090	SJGB015	SJSB050-C1	SJSB033	SJGB012	SJSB072[1]	SJSB074	SJSB076	SJSB075	SJSB036	SJGB011	SJSB032	SJSB077	SJGB010	SJSB078[1]	SJSB080	SJSB079	SJSB081	SJSB082	SJSB046-C1
ELEVATION (feet NAVD88)																									
+5																									
+4																									
+3									95.6			7800													
+2									95.6			7800	3000	NA	NA		3410			33000	23000				
+1									1050		NA	70000	3000	NA	NA		3410	NA	4723.8	33000	23000	32000			
0									1050	4050.5	NA	70000	49000	NA	NA	12724.8	7660	NA	4723.8	47000	14000	32000			
-1									7120	4050.5	NA	30000	49000	NA	50500	12724.8	7660	NA	30873.4	47000	14000	52000			
-2	41000	NA	3517.8		39000	62000			7120	25065.3	NA	30000	63000	55000	NA	22222.8	3170	NA	30873.4	86000	9200	52000	2300	15000	1550
-3	41000	NA	3517.8		39000	62000			5740	25065.3	NA	87	63000	55000	NA	22222.8	3170	NA	6354	86000	9200	28000	2300	15000	1550
-4	42000	NA	75.3		43000	6600			5740	24424.6	NA	87	210	NA	276	9427.6	6.19	NA	6354	140	3200	28000	47000	670	3350
-5	42000	NA	75.3	15	43000	6600			1700	24424.6	NA	5.1	210	NA	276	9427.6	6.19	63000	194	140	3200	50000	47000	670	3350
-6	640	NA	0.46	15	50000	930	1.22	2.27	1700	17740	NA	5.1	11	NA	NA	14768.5	85.8	63000	194	100	1500	50000	47000	2000	2820
-7	640	NA	0.46	2.8	50000	930	1.22	2.27	157	17740	12	3.1	11	NA	NA	14768.5	85.8	77000		100	1500	50000	47000	2000	2820
-8	0.68	NA	2.33	2.8	71000	6.4	0.64	1.97	157		12	3.1	150	270	519	8707.4	26.5	77000		110	12	50000	5.3	7.7	11700
-9	0.68	NA	2.33	11	71000	6.4	0.64	1.97	24		340	0.37	150	270	19	8707.4	26.5	150		110	12	190	5.3	7.7	11700
-10	1900	96700	6.15	11	51000	260	1.48	2.22	24		340	0.37	21	0.88	189	3.37	15.9	150		16	1.5	190	19000	120	14900
-11	1900	364	6.15	2.6	51000	260	1.48	2.22	17.6		1.3	2.6	21	0.88		3.37	15.9	24		16	1.5	3.1	19000	120	14900
-12	1500	152		2.6	5.3	5.3	1.51	3.1	17.6		1.3	2.6	5.2	1.8			2.13	24		12	0.44	3.1	280	4.1	55.1
-13	1500	4.71		1.7	5.3	5.3	1.51	3.1	12.5		1.7	0.84	5.2	1.8			2.13	350		12	0.44	16	280	4.1	55.1
-14	430			1.7	0.68	9.1	0.85	1.31	12.5		1.7	0.84	3.7	6.7			12.7	350		140	13	16	2.8	1.1	2230
-15	430			1.8	0.68	9.1	0.85	1.31			34		3.7	6.7			12.7	0.21		140	13	0.64	2.8	1.1	2230
-16	17			1.8	1.3	4.1		1.54			34							0.21		2.7		0.64	1.7	3.7	205
-17	17			0.53	1.3	4.1		1.54			0.52									2.7			1.7	3.7	205
-18	4.4			0.53	1800	2.3		3.38			0.52									260			0.87	0.99	5690
-19	4.4			0.25	1800	2.3		3.38			120									260			0.87	0.99	5690
-20				0.25	2.5			2.88			120									0.42					
-21				0.20	2.5			2.88			0.81									0.42					
-22				0.20	2.2			1.33			0.81														
-23					2.2			1.33																	
-24					1.1																				
-25					1.1																				
-26																									
-27																									
-28																									
-29																									
-30																									
-31																									
-32																									
-33																									
-34																									
-35																									

Calculated Excavation Elevation	-15.53	-14.67	-13.91	-5.49	-12.12	-11.50	-6.30		-6.88	-11.57	-10.58	-2.66	-5.74	-10.72	-10.75	-9.59	-4.29	-14.58		-10.18	-8.23	-10.95	-14.26	-7.75	-20.39
Calculated Excavation Depth	14	13	12	0	10	10	0		10	12	12	6	8	13	13	10	6	16		12	10	12	12	6	16
Hydraulic Heave Elevation	**-18.58**	**-18.70**	**-18.70**	**-23.55**	**-18.51**	**-18.97**	**-23.00**	**-23.45**	**-20.43**	**-19.11**	**-18.93**	**-20.66**	**-19.03**	**-20.53**	**-21.38**	**-19.11**	**-20.64**	**-20.43**	**-20.62**	**-20.48**	**-22.77**	**-22.68**	**-22.29**	**-22.35**	**-22.43**
Hydraulic Heave Depth	**17.05**	**16.72**	**16.63**	**18.06**	**16.39**	**17.47**	**17.00**	**17.15**	**23.55**	**19.54**	**20.35**	**24.00**	**21.29**	**22.81**	**23.63**	**19.52**	**22.35**	**21.85**	**21.50**	**22.30**	**24.54**	**23.73**	**20.03**	**20.60**	**20.04**

(Area x Concentration)	4.30	0.59	1.38	1.03	0.29	35.62	0.00	24.94	1.61	0.15	0.50	1.36	0.06	2.74	3.09	0.94	0.73	1.78	

Area-Based Average Concentration (Excluding the Northwest Corner)	23.31

Table 5-1

Area-Based Average Concentration Calculations
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Starting Elevation (Mud-line)	-2.93	-2.05	4.48	-2.10	-1.30	-2.00	-3.86	-3.01	-1.85	-2.72	-4.00	-2.10	-5.67	-2.40	-4.00	-5.10	-2.88	-3.40	-4.36	-3.10	-3.58	2.68	4.33	5.12	6.99	6.64
Assigned Polygon Area (Acres)	Paired with SJSB046-C1[2]	0.10	0.16	0.10	0.13	0.11	0.17	0.24	0.20	0.19	0.16	0.11	0.16	0.06	0.13	0.12	0.22	0.06	0.18	0.24	0.12	0.16	0.34	0.16	0.34	0.38
Post-Excavation Surface Concentration		24.0	3.4	10.3	46.8	4.82	45.0	3.0	0.177	1.20	327	1.35	27.0	1.70	6.35	112	53.0	7.41	60.0	2.60	2.40	2.45	0.453	0.653	0.897	0.516
	SJSB083	SJSB102	SJSB028	SJSB045	SJSB045-C1	SJSB046	SJSB084	SJSB087	SJGB017	SJSB086	SJSB047-C1[1]	SJSB047	SJSB085	SJSB048	SJSB048-C1	SJSB049	SJSB089	SJSB050	SJSB105	SJSB106	SJSB091	SJSB029	SJSB030	SJSB031	SJSB034	SJSB035
ELEVATION (feet NAVD88)																										
+5																								2.46	1.17	0.59
+4			59.2																				5.54	2.46	1.17	0.59
+3			59.2																			14.90	5.54	0.77	3.04	1.00
+2			2.4																			14.9	1.9	0.77	3.04	1.00
+1			2.4																			2.95	1.9	0.67	0.99	0.90
0			35.9																			2.95	0.74	0.67	0.99	0.90
-1			35.9		286																	2.12	0.74	0.72	0.98	0.64
-2		1400	12.3	10.3	286	636			1.95			1.19		1.7								2.12	2.81	0.72	0.98	0.64
-3	46000	1400	12.3	10.3	190	636		4600	1.95	5.0		1.19		1.7			820	7.41		39		1.48	2.81	0.73	0.81	0.80
-4	46000	5.9	21.2	5.26	190	2660	12000	4600	1.46	5.0	7470	1.35		1.02	623		820	7.41	36000	39	16	1.48	0.44	0.73	0.81	0.80
-5	2200	5.9	21.2	5.26	286	2660	12000	25000	1.46	2.3	7470	1.35		1.02	623	23600	53	3.13	36000	3.6	16	1.35	0.44	0.97	0.59	1.26
-6	2200	340	3.35	5.58	286	8610	3200	25000	0.91	2.3	6310	1.53	42000	1.72	55.1	23600	53	3.13	48000	3.6	6.7	1.35	0.82	0.97	0.59	1.26
-7	9.8	340	3.35	5.58	46.8	8610	3200	2300	0.91	1.3	6310	1.53	42000	1.72	55.1	6640	18	1.33	48000	9.4	6.7	2.45	0.82	0.33	1.5	0.96
-8	9.8	24	2.59	4.88	46.8	28500	45	2300	0.85	1.3	139	2.73	720	2.46	592	6640	18	1.33	240	9.4	5.2	2.45	0.45	0.33	1.5	0.96
-9	14	24	2.59	4.88	54.6	28500	45	10	0.85	1.2	139	2.73	720	2.46	592	2350	3.5	1.48	240	2.9	5.2	1.36	0.45	0.65	0.90	0.52
-10	14	5.6	2.39	3.25	54.6	6930	23	10	0.18	1.2	29.4	2.03	27	2.52	4.95	2350	3.5	1.48	29	2.9	2.7	1.36	0.59	0.65	0.90	0.52
-11	15000	5.6	2.39	3.25	50.4	6930	23	570	0.18	2.2	29.4	2.03	27	2.52	4.95	110	52	3.38	29	3.4	2.7	0.77	0.59	0.36		
-12	15000	2.5	1.19	0.72	50.4	111	6.1	570		2.2	769	1.41	44	1.77	323	110	52	3.38	13	3.4	2.1	0.77	0.98	0.36		
-13	200	2.5	1.19	0.72	3.79	111	6.1	3.5		2.3	769	1.41	44	1.77	323	251	34	2.71	13	2.6	2.1	9.13	0.98			
-14	200	34		1.52	3.79	3420	7.8	3.5		2.3	685	1.69	25	2.03	6.35	251	34	2.71	17	2.6	2.4	9.13				
-15	24	34		1.52	22.4	3420	7.8	110		3.2	685	1.69	25	2.03	6.35	112	2.00	1.81	17	2.6	2.4					
-16	24	1.4		2.36	22.4	1710	6.1	110		3.2	821	1.98	4.3	1.66	147	112	2.00	1.81	1400	2.6	2.4					
-17	9.0	1.4		2.36	5.81	1710	6.1	1500		2.9	821	1.98	4.3	1.66	147	117	2.30	1.77	1400	1.6	2.4					
-18	9.0	110		4.96	5.81	3400	3.7	1500		2.9	327	1.67	7.0	2.56	143	117	2.30	1.77	60	1.6	2.2					
-19	0.72	110		4.96		3400	3.7	3.0		1.6	327	1.67	7.0	2.56	143	28.1	0.40	0.351	60	3.4	2.2					
-20	0.72	8.9				4.82	3.9	3.0		1.6	7.35		11		219	28.1	0.40	0.351	7.7	3.4	2.7					
-21	4.8	8.9				4.82	3.9				7.35		11		219	5.87			7.7		2.7					
-22	4.8	3.9											7.8		11.8	5.87										
-23		3.9											7.8		11.8											
-24		4.0													1.07											
-25		4.0													1.07											
-26																										
-27																										
-28																										
-29																										
-30																										
-31																										
-32																										
-33																										
-34																										
-35																										

Calculated Excavation Elevation	-20.93	-8.05	-7.30	-2.10	-7.30	-20.00	-7.86	-19.01	-11.21	-9.16	-18.00	-4.29	-9.67	-2.40	-14.00	-15.10	-4.88	-3.40	-16.36	-13.74	-16.51	-8.62	-8.26	-8.88	-9.27	-11.65
Calculated Excavation Depth	18	6	12	0	5	18	4	16	9	6	14	2	4	0	10	10	2	0	14	11	13	11	13	14	16	16
Hydraulic Heave Elevation	**-22.58**	**-22.34**	**-21.48**	**-22.35**	**-22.13**	**-22.32**	**-22.50**	**-22.20**	**-21.90**	**-22.52**	**-19.29**	**-19.59**	**-25.27**	**-25.02**	**-25.17**	**-25.04**	**-19.35**	**-23.35**	**-25.12**	**-25.21**	**-21.42**	**-21.03**	**-22.27**	**-22.07**	**-18.51**	**-18.51**
Hydraulic Heave Depth	**19.65**	**20.29**	**25.96**	**20.25**	**20.83**	**20.32**	**18.64**	**19.19**	**20.05**	**19.80**	**15.29**	**17.49**	**19.60**	**22.62**	**21.17**	**19.94**	**16.47**	**19.95**	**20.76**	**22.11**	**17.84**	**23.71**	**26.60**	**27.19**	**25.50**	**25.15**

																										Area-Based Average
(Area x Concentration)	0.00	2.35	0.53	1.04	5.99	0.53	7.61	0.73	0.04	0.22	50.92	0.15	4.37	0.10	0.81	13.50	11.90	0.45	10.57	0.63	0.28	0.39	0.15	0.11	0.31	0.20	23.31

Notes:

1) Bold font indicates dioxins results >30 ng/kg TEQ.
2) Yellow shading indicates material >30 ng/kg TEQ being removed.
3) Green shading indicates material <30 ng/kg TEQ being removed.
4) Red line indicates the elevation in each boring at which there is risk of hydraulic heave (Factor of Safety <1.25).
5) Green line indicates the target excavation elevation for each boring.
6) Grey shading indicates soil borings in the northwest corner that are excluded from the calculations shown herein.
7) The excavation elevations were calculated such that the resulting post-excavation surface average concentration is <30 ng/kg TEQ. These concentrations will be verified through confirmation sampling. The target elevations were determined utilizing three guiding principles: 1) No material removed below the elevation at risk of hydraulic heave; 2) Remove all material above 300 ng/kg (representative of the principle threat waste [PTW] concentration identified in the ROD); and 3) The resulting area-weighted average will be <30 ng/kg TEQ. Target excavation elevations were adjusted to account for the grading between surrounding boring locations.

[1] Excavation to the deepest elevation of dioxins concentrations >30 ng/kg TEQ would be at risk of hydraulic heave (or within a foot).

[2] The data from collocated borings was consolidated, taking the higher of the two values into consideration.

Table 5-2

Rationale for Excavation Elevations
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Soil Boring Location	Excavation Elevation Rationale
SJGB010	Excavation elevation based upon removal of all material above 30 ng/kg TEQ
SJGB011	
SJGB012	
SJGB014	
SJGB015	
SJGB016	
SJGB017	
SJSB028	
SJSB029	
SJSB030	
SJSB031	
SJSB034	
SJSB035	
SJSB036	
SJSB037	
SJSB038	
SJSB045	
SJSB046	
SJSB046-C1	
SJSB047	
SJSB048	
SJSB050	
SJSB050-C1	
SJSB051	
SJSB052	
SJSB052-C1	
SJSB053	
SJSB053-C1	
SJSB055	
SJSB058	
SJSB075	
SJSB077	
SJSB079	
SJSB080	
SJSB081	
SJSB083	
SJSB086	
SJSB087	
SJSB090	
SJSB091	
SJSB092	
SJSB093	
SJSB101	
SJSB104	
SJSB106	

Rationale for Excavation Elevations
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Soil Boring Location	Excavation Elevation Rationale
SJSB047-C1	Further excavation would put the area at risk of Hydraulic Heave
SJSB072	
SJSB078*	
4	
SJSB032	Excavation elevation based upon removal of all material > 300 ng/kg TEQ; resulting area-weighted average <30 ng/kg (23.31 ng/kg)
SJSB033	
SJSB045-C1	
SJSB048-C1	
SJSB049	
SJSB054	
SJSB055-C1	
SJSB071	
SJSB073	
SJSB074	
SJSB076	
SJSB082	
SJSB084	
SJSB085	
SJSB089	
SJSB094	
SJSB095	
SJSB096	
SJSB102	
SJSB105	
SJGB013	Northwest Corner (excluded from dataset)
SJSB056	
SJSB056-C1	
SJSB057	
SJSB070	
SJSB097	
SJSB098	
SJSB099	
SJSB100	
SJSB103	

Notes:
1) Target excavation elevations identified in Table 5-1 will be verified using post-excavation confirmation sampling.
* All material >300 ng/kg also removed at these borings.

Table 5-3

Water Treatment Basis of Sizing
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Equipment/Process Description	Sizing/Selection Criteria Assumptions	Design Value	Notes
Remediation Cell Dewatering Pump	Dewater BMP area after largest expected rain event within 4 days *after* rain event stops.	Dewatering flowrate of up to 1000 gpm.	Dewatering times for rainfall events as follows (from start of rainfall): 24-Hour Rainfall (in) — Dewatering Time (days) 3 — 1.1 4 — 1.5 5 — 3.3 6 — 4.6
Influent Tanks	Working volume to hold 3.4-inch, 24-hour rain event in BMP area, containment area, truck wash, excavated materials storage, and dewatering area.	1.72 million-gallons (~860,000 gallons working volume/tank).	Lake Tank B-24 portable storage tank was used for design. Assumes 8 inches of freeboard and minimum water level of 24 inches to keep liner in place.
Containment Area Sump Pump(s)	Contractor shall select pump to dewater Containment Area after a rain event to allow work to resume. Preliminary flowrate provided on project drawings.	TBD by contractor. Preliminary flowrate provided on project drawings.	Largest 24-hour rain event for the construction period (November to April) for the years 1930-2019 was ~6.2."
WTS Dewatering Sump	Contractor shall select pump to ensure the contact water draining from the Dewatering Boxes and any rain water is-delivered to the Influent Tank without backing up in the sump. Preliminary flowrate provided on project drawings.	TBD by contractor. Preliminary flowrate provided on project drawings.	
Treatment Feed Pump	300 gpm base treatment flow.	300 gpm to accommodate return streams.	Pump will operate on VFD to adjust treatment rate, as required. Pump will shutdown on high level in Inclined Plate Clarifier.
Rapid Mix Tank	Minimum retention time: 7 minutes.	Minimum working volume of 2,100 gallon capacity.	Provide mixing at high enough velocity to fully mix coagulant, organosulfides, acid and/or caustic, and polymer. Overflow of tank shall be set above the operating level of the Inclined Plate Clarifier to allow for gravity flow.
Flocculation Tank	Minimum retention time: 7 minutes.	Minimum working volume of 2,100 gallon capacity.	Tank will include baffles to prevent vertexing. Tank will be mixed by top entry mixer(s) with paddle-type blades to prevent shearing solids. Mixer shall be variable speed. Overflow of tank shall be set above the operating level of the Inclined Plate Clarifier to allow for gravity flow.
Inclined Plate Clarifier	Maximum Hydraulic Loading rate: 0.25 gpm/ft2.	3,200 ft^2 of inclined plate separation area.	Clarifier shall include integral sludge hopper to allow for sludge withdrawal. Overflow shall be set above the operating level of the Filter Feed Tank to allow for gravity flow.
Filter Feed Tank	Nominal retention time: 20 minutes.	Minimum working volume of 6,000 gallon capacity.	Overflow of tank shall be set above the operating level of the Inclined Plate Clarifier.
Filter Feed Pump	300 gpm base treatment flow.	Up to 400 gpm.	Pump will operate on VFD and controlled by level in Filter Feed Tank.
Multimedia Filters	5-15 gpm/ft2 Hydraulic Loading.	Minimum of 60 ft^2 of active media filter area.	Minimum of three vessels, forward-feed automated backwash.
10-um Bag Filtration System (2 in parallel)	10 micron with 95% minimum removal efficiency.	25 gpm/cartridge elements with total system capacity of 400 gpm.	Rosedale Filter Cartridge Model PL-POMF-R1-10-P2.
1-um Bag Filtration System (2 in parallel)	1 micron with 95% minimum removal efficiency.	25 gpm/cartridge elements with total system capacity of 400 gpm.	Rosedale Filter Cartridge Model PL-POMF-R1-1-P2.
Granular Activated Carbon	10 minute Empty Bed Contact Time (min) per stage. 5 gpm/ft2 Hydraulic Loading.	400 ft^3 Bed Volume; 60 ft^2 of active bed area.	GAC vessels will be configured in a lead-lag configuration providing a total contact time up to 20 minutes (total).
Sludge Wasting/Recycle Pump	75 gpm (~25% of Influent Feed Pump).	50 gpm to 150 gpm.	Sludge Wasting/Recycle pump will be positive displacement pump (e.g., air diaphragm). Flowrate will depend on solids accumulation rate and will be adjusted during start-up and operations.
Sludge Dewater Boxes	Allow for dewatering of sludge from Inclined Plate Clarifier. Filter fabric over a false bottom to trap solids and allow contact water to drain into sump.	25-CY filter box.	25-CY Filter Boxes are available.
Coagulant Feed Pumps	Flow paced at dosage of 50 ppm coagulant solution - treatability study used 100 ppm.	Up to 2 GPH.	Chemical metering pumps. (e.g., diaphragm, peristaltic).
Organosulfide Feed Pumps (if needed)	Flow paced at dose of 50 ppm organosulfide solution.	Up to 2 GPH.	Chemical metering pumps. (e.g., diaphragm, peristaltic).
Acid/Caustic Feed Pumps (if needed)	Flow paced based on measured pH of contact water in Rapid Mixing Tank.	Up to 2 GPH.	Chemical metering pumps. (e.g., diaphragm, peristaltic).
Polymer Feed Pumps	Flow paced at dose of 25 ppm (neat polymer).	Up to 15 GPH (dilute polymer solution).	Chemical metering pumps. (e.g., diaphragm, peristaltic), polymer activation/aging equipment will be provided, as needed.

Notes:
The 90% process flow diagram (drawing P-01) and piping and instrumentation diagrams (drawings P-02 through P-05) illustrate the major water treatment system equipment and components.
gpm - Gallons per minute
VFD - Variable frequency drive
ft^2 - Square feet
ft^3 - Cubic feet
ppm - Parts per million
GPH - Gallons per hour
CY - Cubic yard

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (0-1) 12/7/2019 (0-1) ft bgs	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (0-2.5 CM) 12/7/2019 (0-2.5) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (1-2) 12/7/2019 (1-2) ft bgs	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (2-4) 12/7/2019 (2-4) ft bgs	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (4-6) 12/7/2019 (4-6) ft bgs	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (7.5-10 CM) 12/7/2019 (7.5-10) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (15-17.5 CM) 12/7/2019 (15-17.5) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	48	--	23	4.5 U	35	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2400	--	1100	330	1100	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	6.6 J	--	2.5 J	0.86 J	3.9 J	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	62	--	41	16	45	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.0 J	--	0.19 U	0.14 U	0.65 J	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.8 J	--	0.79 J	0.25 J	1.7 J	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.0 J	--	0.65 J	0.54 J	0.81 J	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.91 J	--	0.39 J	0.096 U	0.74 J	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.5 J	--	0.96 U	0.62 U	1.3 J	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.15 U	--	0.41 J	0.20 J	0.12 U	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.2 J	--	2.4 J	1.5 J	2.5 J	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.1 J	--	0.74 J	0.44 J	1.2 J	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.48 J	--	0.32 U	0.29 U	0.29 U	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.55 J	--	0.20 J	0.095 U	0.14 U	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.75 J	--	0.14 U	0.12 U	0.17 U	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	27	--	21	15	38	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8.6	--	7.0	3.4	12	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	17 J	--	7.4 J	2.7 J	11 J	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	210 J	--	170 J	63 J	160 J	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	7.4 J	--	3.5 J	0.45 J	5.5 J	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	49 J	--	41 J	27 J	46 J	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	4.0 J	--	1.5 J	0.44 J	3.3 J	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.6 J	--	5.3 J	6.6 J	10 J	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	38 J	--	31 J	15 J	53 J	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	14 J	--	11 J	11 J	17 J	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	14.4	--	10.4	5.43	17.4	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	14.4	--	10.6	5.63	17.6	--	--
Radiochemistry								
Cesium-137	pCi/g	--	0.1323 U+/-0.08434	--	--	--	0.1896 U+/-0.1132	0.1845 U+/-0.09896
Lead-210	pCi/g	--	0.713 +/-0.0564	--	--	--	0.694 +/-0.0588	0.5 +/-0.0513
General Chemistry								
Percent solids	%	45.2	--	57.4	53.6	57.2	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (22.5-25 CM) 12/7/2019 (22.5-25) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (30-32.5 CM) 12/7/2019 (30-32.5) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (37.5-40 CM) 12/7/2019 (37.5-40) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (45-47.5 CM) 12/7/2019 (45-47.5) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (52.5-55 CM) 12/7/2019 (52.5-55) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (60-62.5 CM) 12/7/2019 (60-62.5) cm	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (70-72.5 CM) 12/7/2019 (70-72.5) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.1497 U+/-0.08256	0.1376 U+/-0.08681	0.1214 U+/-0.07948	0.09617 U+/-0.07003	0.09826 U+/-0.06292	0.1139 U+/-0.07255	0.1443 U+/-0.07964
Lead-210	pCi/g	0.635 +/-0.0545	0.682 +/-0.0577	0.513 +/-0.059	0.538 +/-0.0583	0.599 +/-0.0532	0.465 +/-0.0503	0.456 +/-0.0478
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA01 11187072-120719-SS-SJSSA01 (80-82.5 CM) 12/7/2019 (80-82.5) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (0-2.5 CM) 12/7/2019 (0-2.5) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02(0-1) 12/7/2019 (0-1) ft bgs	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02(1-2) 12/7/2019 (1-2) ft bgs	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02(2-4) 12/7/2019 (2-4) ft bgs	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02(4-6) 12/7/2019 (4-6) ft bgs	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (7.5-10 CM) 12/7/2019 (7.5-10) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (15-17.5 CM) 12/7/2019 (15-17.5) cm
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	3.8 U	4.3 U	25	5.3 U	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	400	510	1000	450	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	0.67 U	2.6 J	4.2 J	0.90 U	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	14 J	21	44	22	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	0.083 U	0.52 U	0.77 U	0.062 U	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.094 U	1.1 J	2.3 J	0.42 J	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.14 U	0.33 J	0.39 J	0.39 J	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.092 U	0.35 J	0.73 J	0.23 J	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.32 J	0.42 J	1.1 J	0.54 J	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.13 U	0.12 U	0.20 U	0.11 U	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.80 J	1.4 J	2.3 J	1.0 J	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	0.095 U	0.063 U	1.3 J	0.10 U	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	0.062 U	0.17 J	0.42 J	0.080 U	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.097 U	0.084 U	0.25 J	0.081 U	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	0.092 U	0.061 U	1.2 J	0.26 J	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	3.6 J	3.2	18	2.0	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	1.1 J	1.1 J	6.8	0.62 J	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	1.5 J	4.8 J	11 J	2.3 J	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	48 J	77 J	150 J	70 J	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.85 J	3.1 J	8.7 J	2.2 J	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	18 J	34 J	51 J	26 J	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	0.095 U	1.1 J	6.1 J	0.88 J	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	4.3 J	8.8 J	11 J	4.6 J	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	7.7 J	6.8 J	49 J	5.0 J	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	7.0 J	11 J	20 J	5.2 J	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	1.83	2.34	10.9	1.51	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	1.91	2.36	10.9	1.57	--	--
Radiochemistry									
Cesium-137	pCi/g	0.1333 U+/-0.08375	0.1145 U+/-0.07314	--	--	--	--	0.114 U+/-0.06986	0.08665 U+/-0.05227
Lead-210	pCi/g	0.399 U+/-0.0504	0.657 +/-0.0547	--	--	--	--	0.552 +/-0.0573	0.346 +/-0.0448
General Chemistry									
Percent solids	%	--	--	71.2	75.2	76.0	79.7	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (22.5-25 CM) 12/7/2019 (22.5-25) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (30-32.5 CM) 12/7/2019 (30-32.5) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (37.5-40 CM) 12/7/2019 (37.5-40) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (45-47.5 CM) 12/7/2019 (45-47.5) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (52.5-55 CM) 12/7/2019 (52.5-55) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (60-62.5 CM) 12/7/2019 (60-62.5) cm	Sand Separation Area SJSSA02 11187072-120719-SS-SJSSA02 (70-72.5 CM) 12/7/2019 (70-72.5) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.04357 U+/-0.02621	0.03245 U+/-0.02093	0.08767 U+/-0.0544	0.06205 U+/-0.04939	0.07463 U+/-0.046	0.0845 U+/-0.0547	0.06443 U+/-0.03829
Lead-210	pCi/g	0.28 +/-0.0495	0.226 +/-0.0474	0.245 +/-0.0566	0.342 +/-0.0461	0.326 +/-0.0472	0.331 +/-0.0483	0.38 +/-0.0497
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area		Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area
Sample Location:		SJSSA02	SJSSA03	SJSSA03	SJSSA03	SJSSA03	SJSSA03	SJSSA03	SJSSA03
Sample Identification:	Units	11187072-120719-SS-SJSSA02 (80-82.5 CM)	11187072-120619-SS-SJSSA03 (0-2.5 CM)	11187072-120619-SS-SJSSA03(0-1)	11187072-120619-SS-SJSSA03(1-2)	11187072-120619-SS-SJSSA03(2-4)	11187072-120619-SS-SJSSA03(4-6)	11187072-120619-SS-SJSSA03 (7.5-10 CM)	11187072-120619-SS-SJSSA03 (15-17.5 CM)
Sample Date:		12/7/2019	12/6/2019	12/6/2019	12/6/2019	12/6/2019	12/6/2019	12/6/2019	12/6/2019
Sample Depth:		(80-82.5) cm	(0-2.5) cm	(0-1) ft bgs	(1-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs	(7.5-10) cm	(15-17.5) cm
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	10 U	5.5 U	1.6 U	120	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	980	810	700	2300	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	2.2 J	1.1 U	0.42 U	11	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	41	34	30	90	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	0.35 U	0.23 U	0.082 U	1.5 J	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	4.1 J	0.66 J	0.084 U	2.6 J	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.56 J	0.48 J	0.40 J	0.95 J	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	1.2 J	0.095 U	0.081 U	1.5 J	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.79 J	0.87 J	0.56 J	2.7 J	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.096 U	0.14 U	0.11 U	0.21 U	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	2.7 J	2.3 J	2.2 J	3.9 J	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	4.6 J	0.32 J	0.091 U	1.1 J	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	0.40 J	0.32 J	0.20 J	0.62 J	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.37 J	0.10 U	0.090 U	0.34 J	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	4.9 J	0.26 J	0.083 U	0.89 J	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	34	12	0.92 J	24	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	8.4	3.8	0.20 J	8.5	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	5.0 J	2.8 J	0.98 J	27 J	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	160 J	130 J	110 J	270 J	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	8.8 J	2.3 J	0.52 J	24 J	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	53 J	53 J	32 J	61 J	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	19 J	2.1 J	0.78 J	16 J	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	12 J	11 J	6.1 J	9.3 J	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	82 J	28 J	2.8 J	58 J	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	20 J	17 J	4.9 J	15 J	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	15.5	6.42	1.32	14.8	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	15.5	6.45	1.35	14.8	--	--
Radiochemistry									
Cesium-137	pCi/g	0.03835 U+/-0.02381	0.09548 U+/-0.05456	--	--	--	--	0.1187 U+/-0.07539	0.09875 U+/-0.06434
Lead-210	pCi/g	0.266 +/-0.0437	0.487 +/-0.0502	--	--	--	--	0.516 +/-0.0512	0.278 +/-0.0511
General Chemistry									
Percent solids	%	--	--	62.3	71.8	76.6	67.8	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (22.5-25 CM) 12/6/2019 (22.5-25) cm	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (30-32.5 CM) 12/6/2019 (30-32.5) cm	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (37.5-40 CM) 12/6/2019 (37.5-40) cm	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (45-47.5 CM) 12/6/2019 (45-47.5) cm	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (52.5-55 CM) 12/6/2019 (52.5-55) cm	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (60-62.5 CM) 12/6/2019 (60-62.5) cm	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (70-72.5 CM) 12/6/2019 (70-72.5) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.07308 U+/-0.04441	0.06646 U+/-0.043	0.08151 U+/-0.04759	0.0821 U+/-0.05179	0.094 U+/-0.05404	0.06385 U+/-0.0392	0.05209 U+/-0.0324
Lead-210	pCi/g	0.302 +/-0.0498	0.447 +/-0.0471	0.261 +/-0.0447	0.452 +/-0.0469	0.286 +/-0.0498	0.0695 U+/-0.0435	0.402 +/-0.0489
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA03 11187072-120619-SS-SJSSA03 (80-82.5 CM) 12/6/2019 (80-82.5) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (0-2.5 CM) 12/9/2019 (0-2.5) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04(0-1) 12/9/2019 (0-1) ft bgs	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04(1-2) 12/9/2019 (1-2) ft bgs	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04(2-4) 12/9/2019 (2-4) ft bgs	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04(4-6) 12/9/2019 (4-6) ft bgs	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (7.5-10 CM) 12/9/2019 (7.5-10) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (15-17.5 CM) 12/9/2019 (15-17.5) cm
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	12 U	35 U	9.2 U	190	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	720	2100	750	4700	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	1.7 U	4.2 J	1.0 U	20	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	31	57	31	180	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	0.32 U	0.56 U	0.36 U	2.2 U	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	1.2 J	1.8 J	0.78 J	5.6 J	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.63 J	0.98 J	0.63 J	1.9 J	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.41 J	1.2 J	0.33 J	2.6 J	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	0.88 J	1.5 J	0.99 J	4.4 J	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.61 J	0.31 U	0.16 U	0.39 J	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	2.4 J	2.3 J	2.5 J	5.7 J	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	1.1 J	1.6 J	0.70 J	3.9 J	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	0.40 U	0.71 U	0.40 U	0.88 J	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	0.16 U	0.31 U	0.16 U	0.92 J	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	0.77 J	1.0 J	0.60 J	2.1 J	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	43	50	29	110	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	11	13	7.7	31	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	4.9 J	12 J	2.5 J	65 J	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	130 J	220 J	120 J	610 J	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	4.1 J	6.4 J	1.1 J	29 J	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	41 J	40 J	39 J	96 J	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	2.7 J	5.4 J	2.1 J	16 J	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	8.9 J	5.3 J	7.7 J	13 J	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	72 J	89 J	52 J	180 J	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	21 J	19 J	16 J	39 J	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	16.7	20.4	11.9	49.2	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	16.9	20.8	12.1	49.3	--	--
Radiochemistry									
Cesium-137	pCi/g	0.06432 U+/-0.04086	0.1421 U+/-0.08159	--	--	--	--	0.0665 U+/-0.03796	0.04764 U+/-0.02799
Lead-210	pCi/g	0.476 +/-0.055	1.11 +/-0.0613	--	--	--	--	1 +/-0.0639	0.93 +/-0.0592
General Chemistry									
Percent solids	%	--	--	41.6	50.8	46.1	42.6	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00242

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (22.5-25 CM) 12/9/2019 (22.5-25) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (30-32.5 CM) 12/9/2019 (30-32.5) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (37.5-40 CM) 12/9/2019 (37.5-40) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (45-47.5 CM) 12/9/2019 (45-47.5) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (52.5-55 CM) 12/9/2019 (52.5-55) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (60-62.5 CM) 12/9/2019 (60-62.5) cm	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (70-72.5 CM) 12/9/2019 (70-72.5) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.1216 U+/-0.0706	0.1144 U+/-0.0658	0.09033 U+/-0.06255	0.128 U+/-0.07696	0.1268 U+/-0.07849	0.1293 U+/-0.07496	0.1496 U+/-0.08865
Lead-210	pCi/g	0.889 +/-0.0681	1.05 +/-0.0586	0.638 +/-0.0505	0.607 +/-0.0531	0.832 +/-0.0595	0.881 +/-0.0591	0.84 +/-0.052
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA04 11187072-120919-BN-SJSSA04 (80-82.5 CM) 12/9/2019 (80-82.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (0-1) 12/8/2019 (0-1) ft bgs	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (0-2.5 CM) 12/8/2019 (0-2.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (1-2) 12/8/2019 (1-2) ft bgs	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (2-4) 12/8/2019 (2-4) ft bgs	Sand Separation Area SJSSA05 11187072-120819-BN-DUP2 12/8/2019 (4-6) ft bgs	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (4-6) 12/8/2019 (4-6) ft bgs	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (7.5-10 CM) 12/8/2019 (7.5-10) cm
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	10 J	--	3.4 U	4.3 U	4.4 U	2.4 U	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	550	--	190	140	380	160	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	1.5 J	--	0.49 J	0.63 J	0.77 J	0.43 J	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	18	--	8.0	7.2	15	6.6 J	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	0.27 J	--	0.23 J	0.39 J	0.066 U	0.071 U	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	2.1 J	--	0.26 J	0.21 J	0.28 J	0.13 U	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	0.37 J	--	0.36 J	0.31 J	0.45 J	0.29 J	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	0.49 J	--	0.090 U	0.12 U	0.12 U	0.14 U	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	0.56 U	--	0.29 U	0.41 U	0.38 U	0.31 U	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	0.10 U	--	0.31 J	0.20 J	0.17 J	0.18 J	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	1.4 J	--	0.71 J	0.76 J	1.1 J	0.54 J	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	1.8 J	--	0.33 J	0.24 J	0.38 J	0.27 J	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	0.18 U	--	0.15 U	0.13 U	0.16 U	0.20 U	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	0.11 U	--	0.071 U	0.094 U	0.088 U	0.11 U	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	1.0 J	--	0.094 U	0.10 U	0.086 U	0.13 U	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	78	--	6.0	2.9 J	9.9 J	4.5	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	18	--	1.5	0.76 J	2.7	1.3 J	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	3.7 J	--	1.4 J	1.9 J	1.8 J	1.0 J	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	70 J	--	29 J	25 J	65 J	24 J	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	3.5 J	--	0.57 J	0.41 J	0.45 J	0.18 J	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	20 J	--	11 J	12 J	28 J	10 J	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	4.5 J	--	0.33 J	0.24 J	0.85 J	0.27 J	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	3.3 J	--	2.4 J	3.3 J	7.6 J	3.0 J	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	130 J	--	9.1 J	4.1 J	16 J	6.4 J	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	22 J	--	4.0 J	4.1 J	14 J	4.5 J	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	27.0	--	2.42	1.33	4.17	1.98	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	27.1	--	2.53	1.44	4.30	2.13	--
Radiochemistry									
Cesium-137	pCi/g	0.1537 U+/-0.08935	--	0.1064 U+/-0.06604	--	--	--	--	0.1099 U+/-0.06103
Lead-210	pCi/g	0.749 +/-0.055	--	0.212 +/-0.052	--	--	--	--	0.259 +/-0.0486
General Chemistry									
Percent solids	%	--	64.1	--	71.3	75.8	76.5	68.5	--

Notes:
pg/g - picogram per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00244

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (15-17.5 CM) 12/8/2019 (15-17.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (22.5-25 CM) 12/8/2019 (22.5-25) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (30-32.5 CM) 12/8/2019 (30-32.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (37.5-40 CM) 12/8/2019 (37.5-40) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (45-47.5 CM) 12/8/2019 (45-47.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (52.5-55 CM) 12/8/2019 (52.5-55) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (60-62.5 CM) 12/8/2019 (60-62.5) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.1084 U+/-0.06582	0.07979 U+/-0.04556	0.09782 U+/-0.05617	0.07139 U+/-0.05011	0.06645 U+/-0.04037	0.09536 U+/-0.05946	0.08828 U+/-0.04935
Lead-210	pCi/g	0.35 +/-0.0423	0.119 +/-0.0422	0.181 +/-0.079	0.073 +/-0.0455	0.0704 U+/-0.0418	0.317 +/-0.0542	0.352 +/-0.0526
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA05 11187072-120819-BN-DUP1 12/8/2019 (60-62.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (70-72.5 CM) 12/8/2019 (70-72.5) cm	Sand Separation Area SJSSA05 11187072-120819-BN-SJSSA05 (80-82.5 CM) 12/8/2019 (80-82.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (0-2.5 CM) 12/6/2019 (0-2.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06(0-1) 12/6/2019 (0-1) ft bgs	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06(1-2) 12/6/2019 (1-2) ft bgs	Sand Separation Area SJSSA06 11187072-120619-SS-DUP1 12/6/2019 (1-2) ft bgs	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06(2-4) 12/6/2019 (2-4) ft bgs	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06(4-6) 12/6/2019 (4-6) ft bgs
Dioxins/Furans										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	10 J	4.8 U	9.0 U	3.4 U	46 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	380	210	230	200	1300 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	3.1 J	2.7 J	19 J	2.8 J	100 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	16	9.9	12	9.3	75 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	0.79 U	1.0 U	9.3	0.93 U	41 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	9.6	9.2 J	120 J	9.7	420 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	0.20 J	0.20 J	0.71 J	0.16 J	0.65 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	2.3 J	2.4 J	31 J	2.3 J	110 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	0.45 J	0.24 J	0.91 J	0.42 J	0.64 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.24 J	0.17 J	2.8 J	0.15 J	7.3 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	0.87 J	0.72 J	1.2 J	0.58 J	4.0 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	6.6	6.2 J	160 J	6.2	250 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	0.69 J	0.70 J	7.7 J	0.68 J	25 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.35 J	0.32 J	9.5	0.37 J	11 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	4.7 J	5.1 J	190 J	5.4 J	170 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	270	300 J	1900 J	290	3900
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	74	83 J	360 J	82	2800
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	6.1 J	5.3 J	34 J	4.3 J	180 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	55 J	38 J	42 J	35 J	250 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	16 J	15 J	190 J	15 J	630 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	14 J	11 J	18 J	11 J	62 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	19 J	20 J	530 J	20 J	700 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	2.7 J	2.2 J	11 J	2.2 J	28 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	600 J	650 J	4500 J	640 J	17000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	84 J	94 J	420 J	94 J	3100 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	105	117	637	115	3330
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	105	117	637	115	3330
Radiochemistry										
Cesium-137	pCi/g	0.1223 U+/-0.06922	0.1146 U+/-0.06916	0.06587 U+/-0.04211	0.06482 U+/-0.03688	--	--	--	--	--
Lead-210	pCi/g	0.333 +/-0.0544	0.442 +/-0.0572	0.365 +/-0.0568	0.221 +/-0.057	--	--	--	--	--
General Chemistry										
Percent solids	%	--	--	--	--	83.6	89.6	55.0	82.5	60.9

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00246

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (7.5-10 CM) 12/6/2019 (7.5-10) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (15-17.5 CM) 12/6/2019 (15-17.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (22.5-25 CM) 12/6/2019 (22.5-25) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (30-32.5 CM) 12/6/2019 (30-32.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (37.5-40 CM) 12/6/2019 (37.5-40) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (45-47.5 CM) 12/6/2019 (45-47.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (52.5-55 CM) 12/6/2019 (52.5-55) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.05367 U+/-0.03063	0.03911 U+/-0.02794	0.06255 U+/-0.03486	0.1076 U+/-0.06432	0.0544 U+/-0.0336	0.07865 U+/-0.04602	0.0497 U+/-0.03368
Lead-210	pCi/g	0.161 +/-0.0493	0.0939 +/-0.0491	0.215 +/-0.0476	0.113 +/-0.0522	0.0852 +/-0.0513	0.166 +/-0.0478	0.0697 U+/-0.0434
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (60-62.5 CM) 12/6/2019 (60-62.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (70-72.5 CM) 12/6/2019 (70-72.5) cm	Sand Separation Area SJSSA06 11187072-120619-SS-SJSSA06 (80-82.5 CM) 12/6/2019 (80-82.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (0-2.5 CM) 12/9/2019 (0-2.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07(0-1) 12/9/2019 (0-1) ft bgs	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07(1-2) 12/9/2019 (1-2) ft bgs	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07(2-4) 12/9/2019 (2-4) ft bgs	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07(4-6) 12/9/2019 (4-6) ft bgs
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	44	5.4 U	0.17 U	27 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	2400	430	36	890
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	4.8 J	0.64 U	0.15 U	0.52 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	61	16	1.4 U	39
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	1.3 U	0.21 U	0.17 U	0.70 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	1.3 J	0.12 U	0.092 U	0.33 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	1.1 J	0.40 J	0.19 J	0.51 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	1.1 J	0.15 J	0.088 U	0.31 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	1.9 J	0.59 J	0.11 U	0.54 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.78 J	0.097 U	0.071 U	0.26 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	2.7 J	1.3 J	0.096 U	2.6 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	1.1 J	0.16 U	0.11 U	0.39 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	0.51 U	0.28 U	0.15 U	0.66 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.60 J	0.093 U	0.070 U	0.24 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	0.74 J	0.16 U	0.12 U	0.41 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	28	2.7	0.073 U	0.25 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	8.6	1.1 J	0.10 U	0.34 U
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	15 J	1.5 J	0.17 U	5.6 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	220 J	75 J	5.7 J	130 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	8.8 J	0.15 J	0.092 U	0.33 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	38 J	20 J	1.9 J	28 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	4.8 J	0.17 U	0.12 U	0.43 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	3.7 J	4.2 J	0.28 J	5.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	47 J	3.1 J	0.073 U	0.25 U
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	11 J	3.8 J	0.40 J	0.57 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	14.0	1.90	0.030	0.917
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	14.3	2.09	0.213	1.62
Radiochemistry									
Cesium-137	pCi/g	0.03504 U+/-0.02395	0.05251 U+/-0.03429	0.04477 U+/-0.02713	0.112 U+/-0.06301	--	--	--	--
Lead-210	pCi/g	0.113 +/-0.0485	0.188 +/-0.054	0.0941 +/-0.0531	0.905 +/-0.062	--	--	--	--
General Chemistry									
Percent solids	%	--	--	--	--	43.4	64.4	81.7	56.0

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00248

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (7.5-10 CM) 12/9/2019 (7.5-10) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (15-17.5 CM) 12/9/2019 (15-17.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (22.5-25 CM) 12/9/2019 (22.5-25) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (30-32.5 CM) 12/9/2019 (30-32.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (37.5-40 CM) 12/9/2019 (37.5-40) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (45-47.5 CM) 12/9/2019 (45-47.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (52.5-55 CM) 12/9/2019 (52.5-55) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.05777 U+/-0.03325	0.1033 U+/-0.0658	0.0679 U+/-0.03908	0.1 U+/-0.05852	0.06529 U+/-0.04338	0.0502 U+/-0.03476	0.07514 U+/-0.04497
Lead-210	pCi/g	0.853 +/-0.0707	0.912 +/-0.0704	1.05 +/-0.0803	0.655 +/-0.0602	0.156 +/-0.0533	0.0682 U+/-0.0423	0.0808 U+/-0.0502
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (60-62.5 CM) 12/9/2019 (60-62.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (70-72.5 CM) 12/9/2019 (70-72.5) cm	Sand Separation Area SJSSA07 11187072-120919-BN-SJSSA07 (80-82.5 CM) 12/9/2019 (80-82.5) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (0-2.5 CM) 12/4/2019 (0-2.5) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08(0-1) 12/4/2019 (0-1) ft bgs	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08(1-2) 12/4/2019 (1-2) ft bgs	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08(2-4) 12/4/2019 (2-4) ft bgs	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08(4-6) 12/4/2019 (4-6) ft bgs
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	20	53	93	8.6 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	930	2600	3600	830
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	3.1 J	6.6 J	13	2.3 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	28	73	110	35
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	0.53 U	1.0 U	2.2 J	0.41 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.84 J	2.5 J	10	4.0 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	0.31 J	0.98 J	1.4 J	0.35 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.37 J	1.1 J	3.2 J	0.99 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	0.57 J	1.7 J	2.6 J	0.90 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.16 U	0.16 U	0.34 J	0.21 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	1.3 J	3.0 J	4.8 J	2.3 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	0.49 J	1.2 J	6.9 J	2.7 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	0.20 J	0.49 J	1.5 J	0.52 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	0.12 U	0.25 J	0.59 J	0.16 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	0.29 J	0.86 J	5.2 J	2.6 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	11	32	260	120
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	4.1	10	75	35
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	7.1 J	16 J	29 J	4.6 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	89 J	240 J	370 J	130 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	4.4 J	12 J	29 J	6.5 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	18 J	50 J	80 J	40 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	3.6 J	7.3 J	27 J	8.7 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	2.4 J	6.4 J	11 J	8.2 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	26 J	68 J	540 J	260 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	6.4 J	17 J	92 J	47 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	6.44	16.5	109	49.9
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	6.45	16.5	109	49.9
Radiochemistry									
Cesium-137	pCi/g	0.09191 U+/-0.05208	0.08917 U+/-0.05545	0.08095 U+/-0.04787	0.07898 U+/-0.0474	--	--	--	--
Lead-210	pCi/g	0.0815 +/-0.0467	0.0969 U+/-0.0587	0.198 +/-0.0468	0.076 U+/-0.0475	--	--	--	--
General Chemistry									
Percent solids	%	--	--	--	--	76.3	67.5	57.7	70.1

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00250

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (7.5-10 CM) 12/4/2019 (7.5-10) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (15-17.5 CM) 12/4/2019 (15-17.5) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (22.5-25 CM) 12/4/2019 (22.5-25) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (30-32.5 CM) 12/4/2019 (30-32.5) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (37.5-40 CM) 12/4/2019 (37.5-40) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (45-47.5 CM) 12/4/2019 (45-47.5) cm	Sand Separation Area SJSSA08 11187072-120419-SS-SJSSA08 (52.5-55 CM) 12/4/2019 (52.5-55) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.0429 U+/-0.02742	0.06693 U+/-0.04252	0.09049 U+/-0.04816	0.04994 U+/-0.02875	0.1452 U+/-0.07804	0.1771 U+/-0.1092	0.1565 U+/-0.08324
Lead-210	pCi/g	0.0758 U+/-0.045	0.0683 U+/-0.0422	0.083 U+/-0.0493	0.0681 U+/-0.0405	0.611 +/-0.0567	0.833 +/-0.0641	0.54 +/-0.0671
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area		Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area	Sand Separation Area
Sample Location:		SJSSA08	SJSSA08	SJSSA08	SJSSA09	SJSSA09	SJSSA09	SJSSA09	SJSSA09
Sample Identification:	Units	11187072-120419-SS-SJSSA08 (60-62.5 CM)	11187072-120419-SS-SJSSA08 (70-72.5 CM)	11187072-120419-SS-SJSSA08 (80-82.5 CM)	11187072-120819-BN-SJSSA09 (0-1)	11187072-120819-BN-SJSSA09 (0-2.5 CM)	11187072-120819-BN-SJSSA09 (1-2)	11187072-120819-BN-SJSSA09 (2-4)	11187072-120819-BN-SJSSA09 (4-6)
Sample Date:		12/4/2019	12/4/2019	12/4/2019	12/8/2019	12/8/2019	12/8/2019	12/8/2019	12/8/2019
Sample Depth:		(60-62.5) cm	(70-72.5) cm	(80-82.5) cm	(0-1) ft bgs	(0-2.5) cm	(1-2) ft bgs	(2-4) ft bgs	(4-6) ft bgs
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	4.4 U	--	3.6 U	4.1 U	7.3 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	300	--	180	180	130
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	0.83 J	--	1.2 J	1.1 J	1.1 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	7.4	--	6.2 J	6.1 J	5.5 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	0.087 U	--	0.35 J	0.56 J	0.32 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	0.33 J	--	0.78 J	3.3 J	0.64 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	0.087 U	--	0.096 U	0.24 J	0.27 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	0.073 U	--	0.32 J	0.82 J	0.28 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	0.31 U	--	0.50 U	0.21 U	0.19 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	0.13 J	--	0.28 J	0.46 J	0.23 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	0.34 J	--	0.58 J	0.44 J	0.36 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	0.35 J	--	0.64 J	1.2 J	0.40 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	0.14 U	--	0.15 U	0.18 U	0.12 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	0.070 U	--	0.073 U	0.10 U	0.094 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	0.092 U	--	0.079 U	0.61 J	0.092 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	13	--	20	44	14
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	3.0	--	4.4	9.7	3.0
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	2.3 J	--	4.0 J	2.5 J	3.0 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	27 J	--	18 J	22 J	16 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	0.83 J	--	3.3 J	4.6 J	1.2 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	3.3 J	--	4.3 J	5.0 J	3.3 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	0.76 J	--	0.74 J	2.7 J	0.40 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	0.14 U	--	0.15 U	0.18 U	0.14 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	19 J	--	29 J	68 J	20 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	3.0 J	--	4.4 J	11 J	3.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	4.56	--	6.75	15.0	4.70
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	4.67	--	6.87	15.1	4.79
Radiochemistry									
Cesium-137	pCi/g	0.1584 U+/-0.0959	0.1831 U+/-0.09753	0.183 U+/-0.1084	--	0.08415 U+/-0.05819	--	--	--
Lead-210	pCi/g	0.294 U+/-0.0491	0.596 +/-0.0531	0.524 +/-0.0536	--	0.095 +/-0.0428	--	--	--
General Chemistry									
Percent solids	%	--	--	--	71.0	--	75.2	78.4	75.4

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (7.5-10 CM) 12/8/2019 (7.5-10) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (15-17.5 CM) 12/8/2019 (15-17.5) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (22.5-25 CM) 12/8/2019 (22.5-25) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (30-32.5 CM) 12/8/2019 (30-32.5) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (37.5-40 CM) 12/8/2019 (37.5-40) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (45-47.5 CM) 12/8/2019 (45-47.5) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (52.5-55 CM) 12/8/2019 (52.5-55) cm
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--	--	--	--	--
Radiochemistry								
Cesium-137	pCi/g	0.09609 U+/-0.05366	0.08249 U+/-0.05073	0.1153 U+/-0.06196	0.09361 U+/-0.0574	0.0758 U+/-0.04698	0.06056 U+/-0.03959	0.08343 U+/-0.05239
Lead-210	pCi/g	0.0718 U+/-0.0451	0.0967 +/-0.0467	0.0732 U+/-0.0459	0.0755 +/-0.0432	0.0714 U+/-0.0446	0.12 +/-0.0473	0.08 U+/-0.0481
General Chemistry								
Percent solids	%	--	--	--	--	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00253

Table 6-1

Sand Separation Area Analytical Results - Northern Impoundment
Pre-Final 90% Remedial Design - Northern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Area Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (60-62.5 CM) 12/8/2019 (60-62.5) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (70-72.5 CM) 12/8/2019 (70-72.5) cm	Sand Separation Area SJSSA09 11187072-120819-BN-SJSSA09 (80-82.5 CM) 12/8/2019 (80-82.5) cm
Dioxins/Furans				
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/g	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/g	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/g	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/g	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	--	--	--
Radiochemistry				
Cesium-137	pCi/g	0.09455 U+/-0.06032	0.1217 U+/-0.06699	0.05701 U+/-0.03507
Lead-210	pCi/g	0.0744 U+/-0.0461	0.0816 +/-0.0451	0.105 +/-0.0417
General Chemistry				
Percent solids	%	--	--	--

Notes:
pg/g - picogram per gram
pCi/g - picocuries per gram
DUP - indicates the result from a duplicate sample
U - Not detected at the associated reporting limit.
J - Estimated concentration.
-- - Not analyzed

ED_014247_00001351-00254

Paper Size ANSI B

0 160 320 480 640

Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

VICINITY MAP

Project No.	**11215702**
Revision No.	**-**
Date	**May 11, 2022**

FIGURE 1-1

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS001-1.mxd

Data source: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community.

Paper Size ANSI B

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT AND SAND SEPARATION AREA

Project No. 11215702
Revision No. -
Date May 11, 2022

FIGURE 1-2

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS001-2.mxd

Data source: Google Earth Imagery

Notes:
PDI-1 = First Phase Pre-Design Investigation
RI = Remedial Investigation
TCRA = Time Critical Removal Action
Transducers were placed in monitoring wells.

Paper Size ANSI B
0 40 80 120 160
Feet
N

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

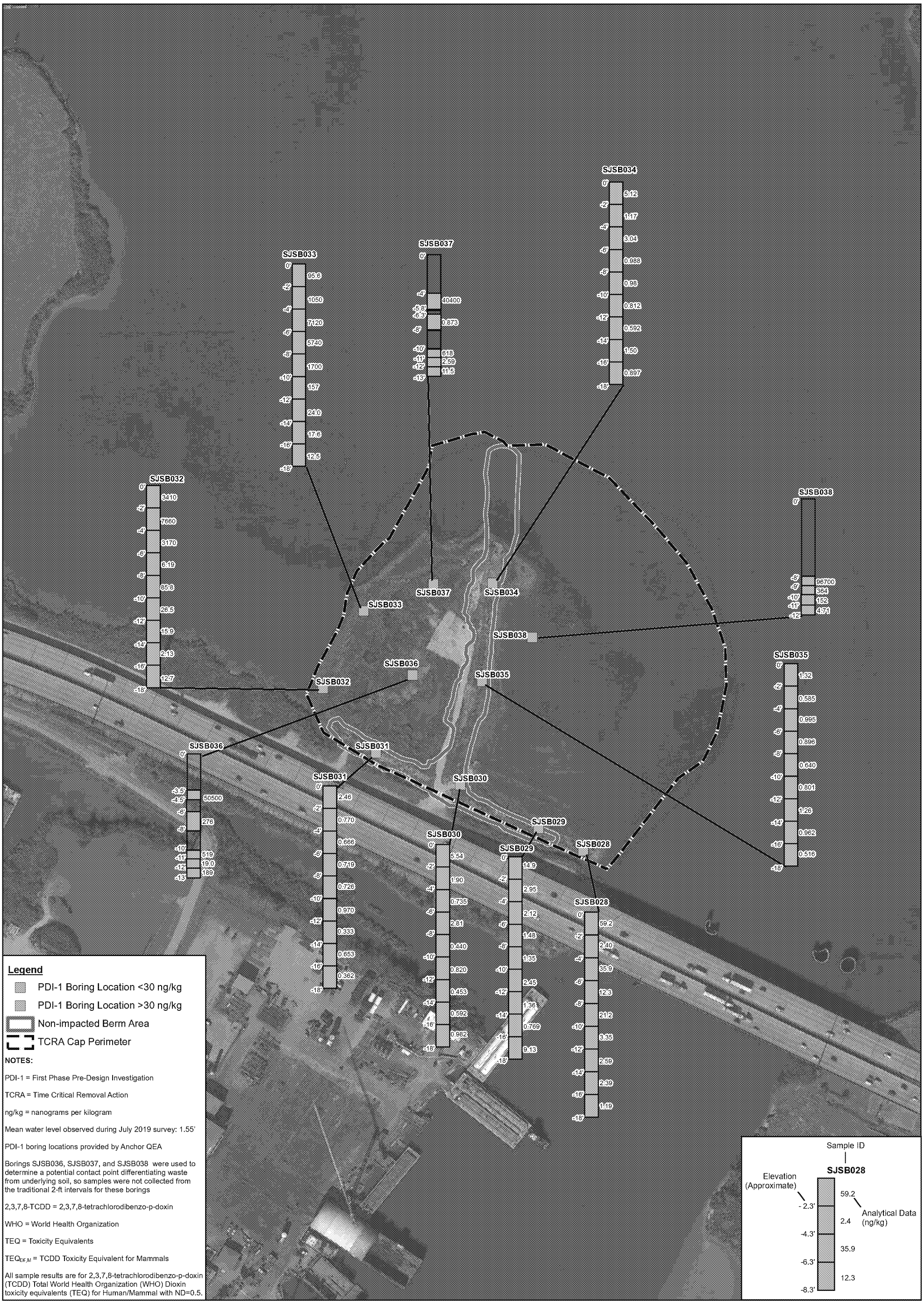
FIRST PHASE PRE-DESIGN INVESTIGATION BORING LOCATIONS

Project No. **11215702**
Revision No. **-**
Date **May 11, 2022**

FIGURE 2-1

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS002-1.mxd

Data source: Google Earth Imagery



Paper Size ANSI B

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

FIRST PHASE PRE-DESIGN INVESTIGATION RESULTS

Project No. 11215702
Revision No. -
Date Jun 27, 2022

FIGURE 2-2

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS002-2.mxd

Data source: Google Earth Imagery

Notes:
PDI-2 = Second Phase Pre-Design Investigation
TCRA = Time Critical Removal Action
Transducer was manually driven into the river on the staff gauge.
Articulated Concrete Block Mat (ACBM) was installed to provide slope protection in the northwest corner in June 2019.

SJSB057
SJSB056
SJSB055
SJSB057-C1
SJSB056-C1
SJSB055-C1
SJSB070
SJSB055-C2
SJSB053
SJSB053-1
SJSB054
SJSB071
SJSB058
SJSB051
SJSB052
SJTW016
SJSB052-C1
SJGB027
SJSB050-C1
SJSB050
SJSB049-C1
SJSB049
SJSB048
SJSB048-C1
SJGB026
SJSB047-C1
SJGB025
SJSB047
SJSB046-C1
SJSB046
SJSB045-C1
SJSB045
SJGB024
Interstate 10

Legend

- Staff Gauge and Transducer Location (Approximate)
- PDI-2 Analytical Boring Location
- PDI-2 Geotechnical Boring Location
- PDI-2 Analytical and Geotechnical Boring Location
- PDI-2 Analytical Contingent Boring Not Completed
- Transducer Location
- Non-impacted Berm Area
- TCRA Cap Perimeter
- Articulated Concrete Block Mat (ACBM)

Paper Size ANSI B

0 40 80 120 160

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

Project No. 11215702
Revision No. -
Date Jun 10, 2022

SECOND PHASE PRE-DESIGN INVESTIGATION BORING LOCATIONS

FIGURE 2-3

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS002-3.mxd

Data source: Google Earth Imagery

Notes:
PDI-2 = Second Phase Pre-Design Investigation
TCRA = Time Critical Removal Action

Sand Separation Area

SJSSA01
SJSSA02
SJSSA03
SJSSA04
SJSSA05
SJSSA06
SJSSA07
SJSSA08
SJSSA09

Northern Impoundment

Interstate-10

Legend

- PDI-2 Sand Separation Area Locations
- Half-Acre Grid
- TCRA Cap Perimeter
- Sand Separation Area

Paper Size ANSI B

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

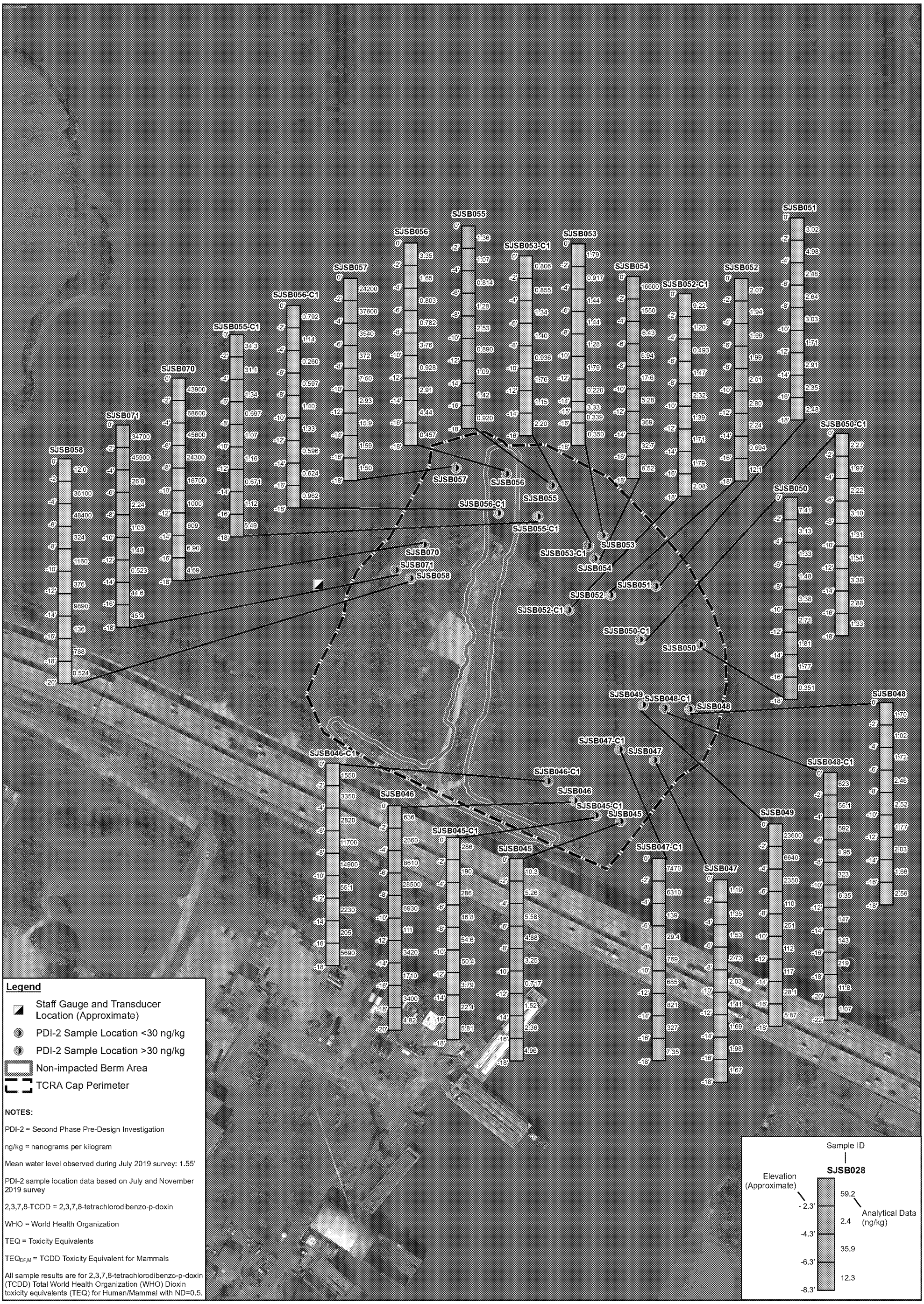
SAND SEPARATION AREA SAMPLE LOCATIONS

Project No. **11215702**
Revision No. **-**
Date **May 11, 2022**

FIGURE 2-4

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_222105_RPT005_GIS002-4.mxd

Data source: Google Earth Imagery



Paper Size ANSI B

0 60 120 180 240

Feet

N

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

SECOND PHASE PRE-DESIGN INVESTIGATION RESULTS

Project No. 11215702
Revision No. -
Date Jun 27, 2022

FIGURE 2-5

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS002-5.mxd

Data source: Google Earth Imagery

SJCPT-004
SJCPT-005
SJSB103
SJCPT-003
SJCPT-006
SJSB097
SJSB100
SJCPT-002A
SJCPT-006A
SJSB098
SJCPT-002
SJSB095
SJSB096
SJSB099
SJCPT-007
SJSB101
SJCPT-001
SJSB094
SJSB072
SJSB092
SJSB104
SJSB073
SJMW-014
SJSB093
SJCPT-011
SJMW-015
SJSB074
SJMW-016
SJSB076
SJSB090
SJCPT-008
SJSB075
SJSB088
SJSB091
SJSB105
SJSB106
SJSB078
SJSB089
SJSB077
SJSB079
SJSB085
SJCPT-009
SJSB080
SJSB087
SJSB086
SJSB081
SJSB083
SJSB084
SJSB082
SJSB102
SJMW-017
SJCPT-010

Legend

- Supplemental Design Boring
- SDI CPT Boring Location
- CPT Calibration Boring
- SDI Shallow Piezometer Location
- SDI Intermediate Piezometer Location
- SDI Deep Piezometer Location
- SDI Deep Piezometer with SPT and Shelby Tubes Location
- Non-impacted Berm Area
- TCRA Cap Perimeter
- Extent of ACBM

Paper Size ANSI B

0 30 60 90 120

Feet

N

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

SUPPLEMENTAL DESIGN INVESTIGATION BORING LOCATIONS

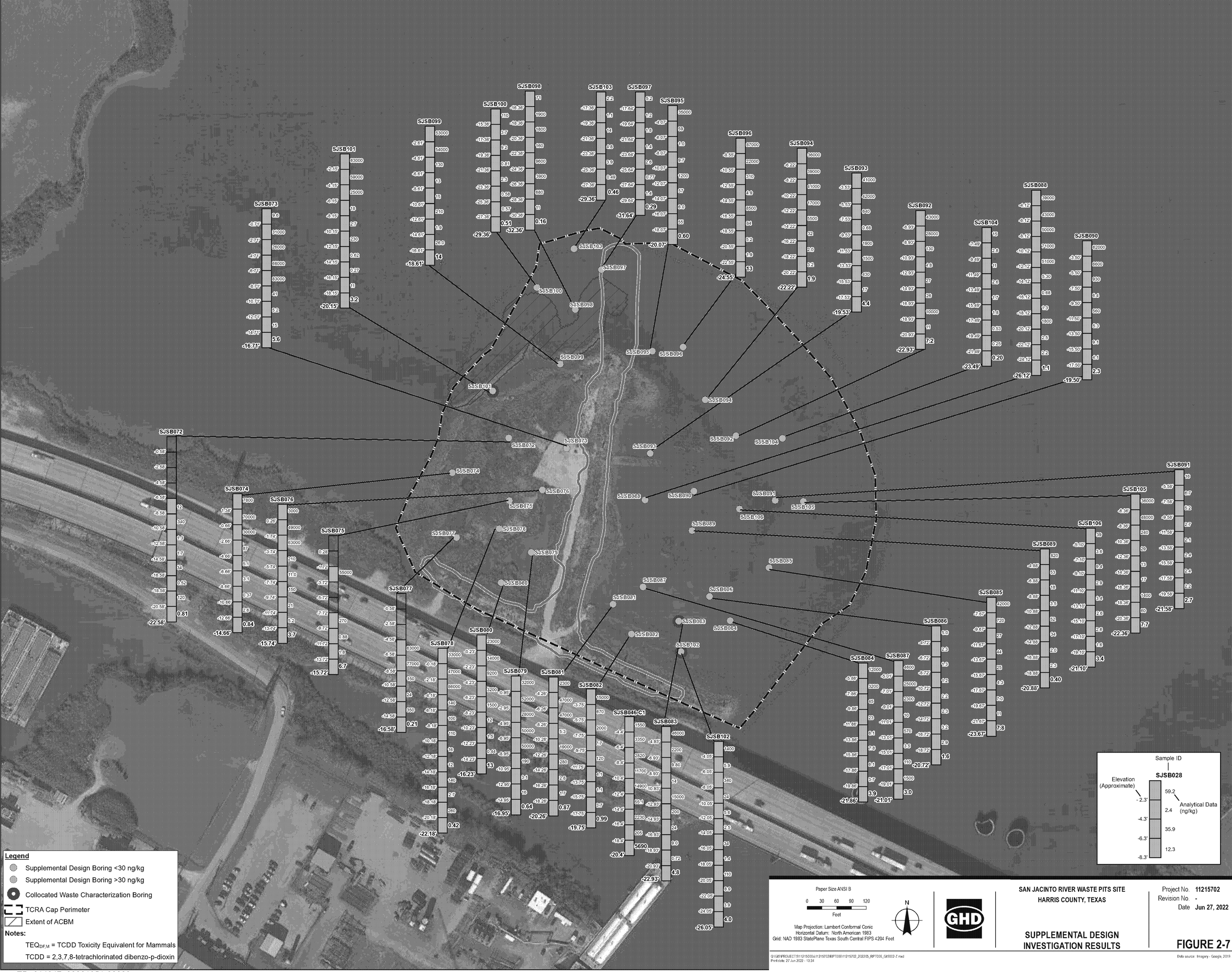
Project No. 11215702
Revision No. -
Date May 11, 2022

FIGURE 2-6

G:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_022205_RPT006_GIS002-6.mxd
Print date: 11 May 2022 - 12:18

Data source: Imagery - Google, 2019

ED_014247_00001351-00262



ED_014247_00001351-00263

Paper Size ANSI B

0 100 200 300 400

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

VELOCITY MONITORS AND AMBIENT TURBIDITY MEASUREMENT LOCATIONS

Project No. **11215702**
Revision No. **-**
Date **May 11, 2022**

FIGURE 2-8

G:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS002-8.mxd
Print date: 11 May 2022 - 12:29

Data source: Imagery - Google, 2019

ED_014247_00001351-00265

Interstate-10

Legend

- Composite Sample 2
- Composite Sample 3
- Composite Sample 4
- Approximate Location of Excavation for Contact Water Sample
- TCRA Cap Perimeter

1. Approximately 30 gallons of material from 4 separate portions of the Northern Impoundment were composited into 4 treatability samples.
2. Material from the first 20 feet of the PDI-2 geotechnical borings in the northwest, northeast, and southeast quadrants was used as Composite Samples 2-4. Material from the pilot test excavation was used as Composite Sample 1 for the southwest quadrant.

PDI-2 Second Phase Pre-Design Investigation
TCRA Time Critical Removal Action

Paper Size ANSI B

0 40 80 120 160

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

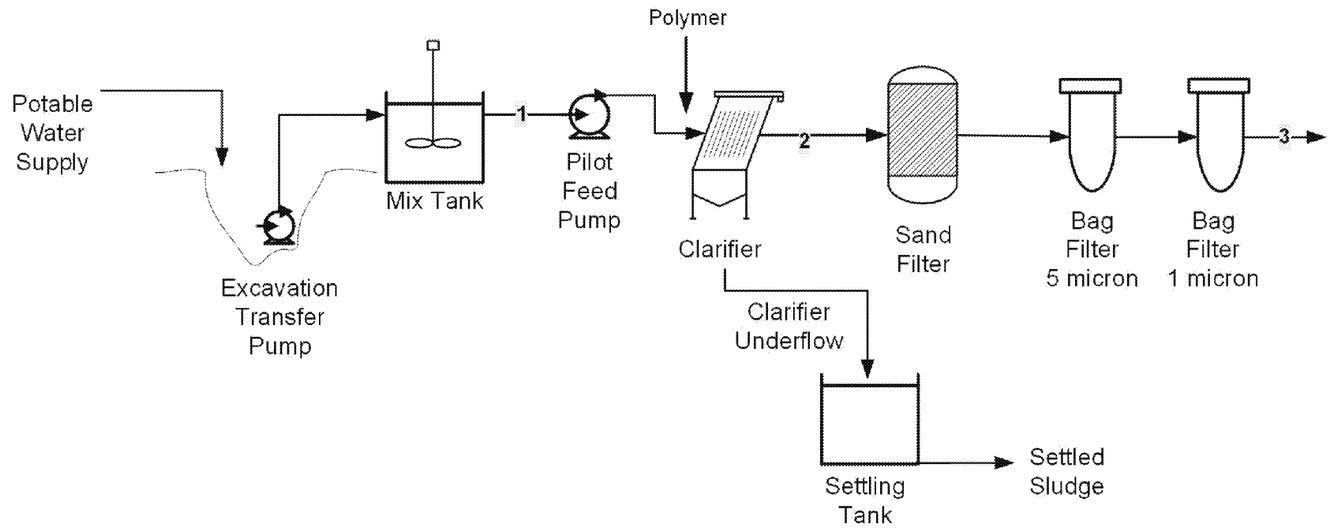
2019 TREATABILITY WASTE MATERIAL SAMPLE LOCATIONS

Project No. **11215702**
Revision No. **-**
Date **May 11, 2022**

FIGURE 3-1

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS003-1.mxd

Data source: Google Earth Imagery



Parameter		Sample Point		
		1	2	3
		Contact Water (average)[2]	Clarifier Effluent[2]	Filter Effluent[2]
2,3,7,8 TCDD[1]	pg/L	16,500	13	<10
Copper	mg/L	0.10	0.0081 U	0.0081 U
Lead	mg/L	0.11	0.0022 U	0.0022 U
Zinc	mg/L	0.38	0.045	0.036
TSS	mg/L	4,050	11	2

Notes:
pg/L = picogram per liter
mg/L = milligram per liter
2,3,7,8 TCDD =Tetrachlorodibenzodioxin
TSS = total suspended solids
U = not detected at the associated reporting limit

1) The Minimum Level (ML) of EPA approved method 1613B is 10 pg/L.
2) Full analytical data set included in Table 3-2. Lab reports included in Appendix D.

Paper Size ANSI B

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

2019 PILOT TEST
PROCESS FLOW DIAGRAM

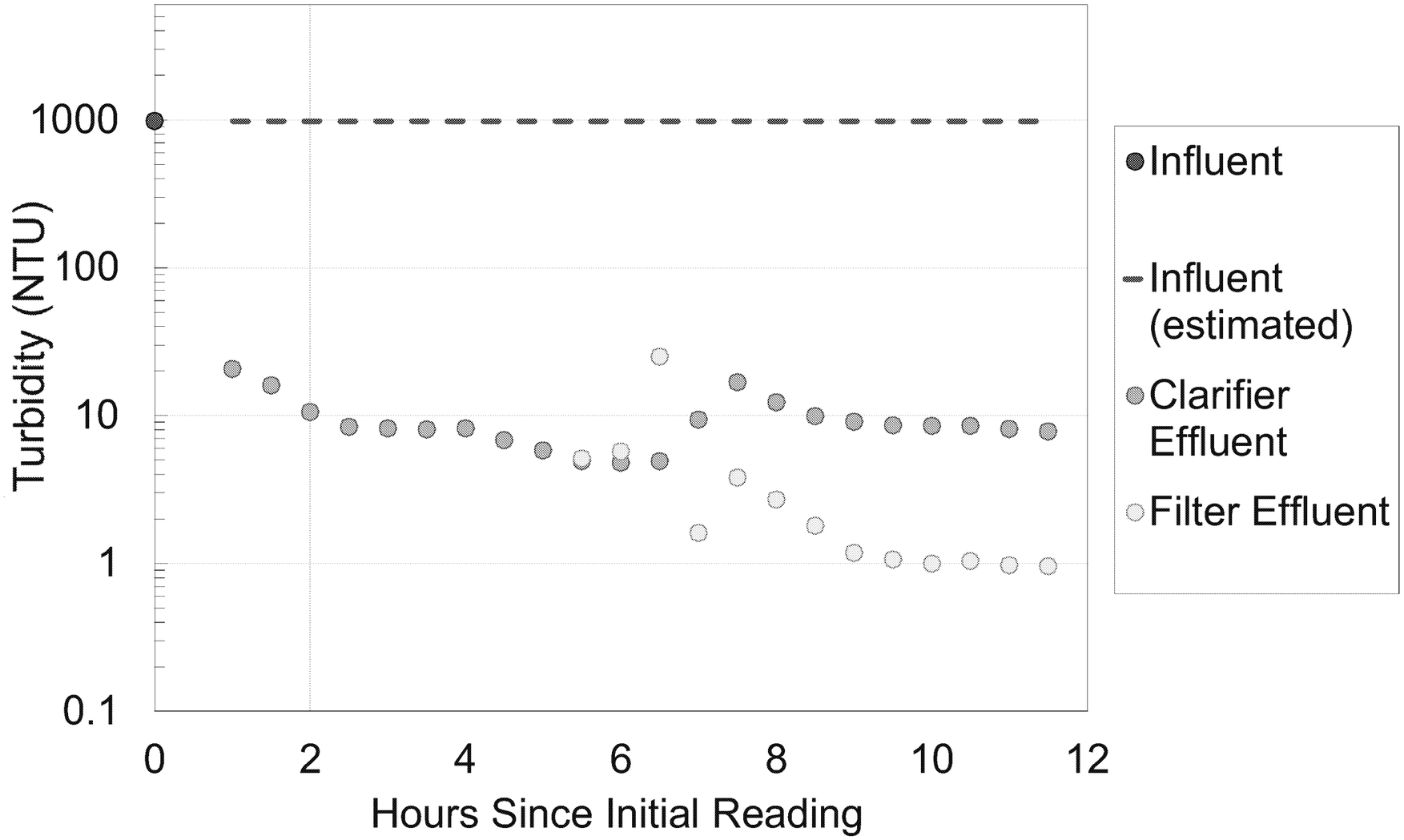
Project No. 11215702
Revision No. -
Date May 6, 2022

FIGURE 3-2

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS003-2.mxd

Notes:
NTU = Nephelometric Turbidity Unit

Turbidity was measured during the on-site water treatment pilot test. Real-time turbidity readings were taken for the influent, the post-clarification effluent, and the post-filtration effluent.



Paper Size ANSI B

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

2019 PILOT TEST
EFFLUENT TURBIDITY

Project No. 11215702
Revision No. -
Date May 6, 2022

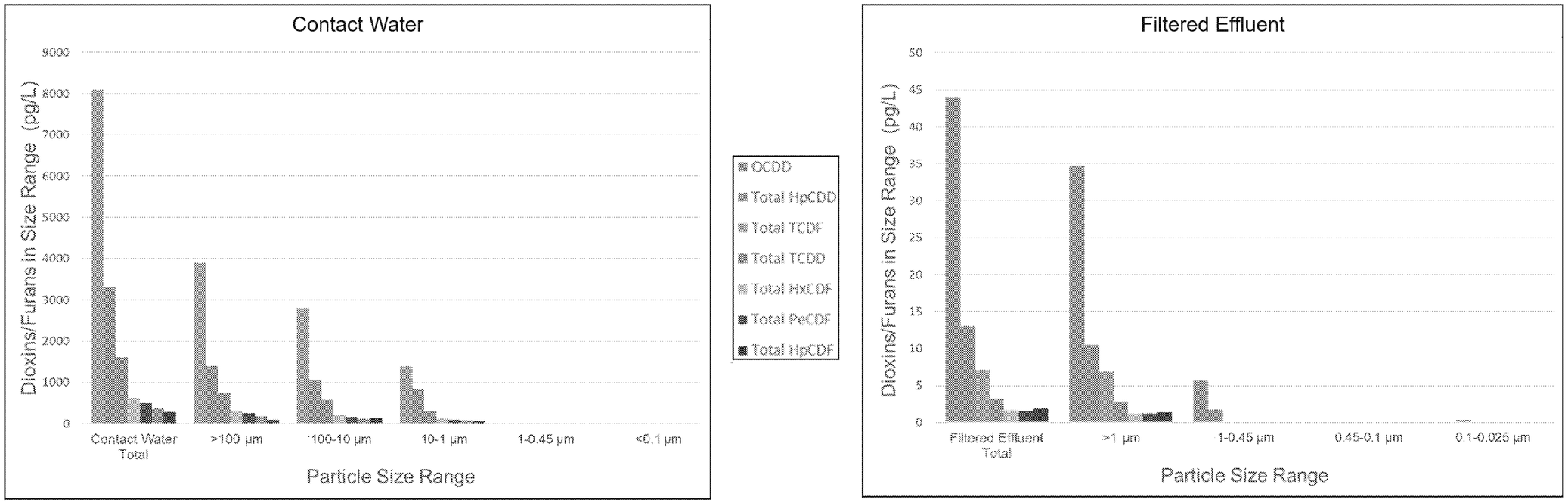
FIGURE 3-3

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_222205_RPT005_GIS003-3.mxd

Notes:
pg/L = picogram per liter
µm = micron
TCDF =Tetrachlorodibenzofuran
OCDD = Octachlorodibenzodioxin
TCDD = Tetrachlorodibenzodioxin
HxCDF = Hexachlorodibenzofuran
PeCDF = Pentachlorodibenzofuran
HpCDD = Heptachlorodibenzodioxin
HpCDF = Heptachlorodibenzofuran

The graph on the left shows dioxin/furan results after the raw contact water was filtered through 100 µm, 10 µm, 1 µm, 0.45 µm, and 0.1 µm filters.

The graph on the right shows dioxin/furan results after the clarified and filtered effluent from the on-site pilot test was then filtered through 1 µm, 0.45 µm, 0.1 µm, 0.05 µm, and 0.025 µm filters.



Paper Size ANSI B

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

Project No. 11215702
Revision No. -
Date May 6, 2022

2019 FILTRATION TESTING RESULTS

FIGURE 3-4

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS003-4.mxd

Notes:
1. Sample locations approximate.
2. Composite samples were collected from representative locations distributed across each area.
TCRA = Time Critical Removal Action

Legend

- Approximate Armored Cap Material Sample Locations
- Western Composite
- Berm Composite
- Eastern Composite
- Non-impacted Berm Area
- Approximate Area for Armored Cap Reuse
- TCRA Cap Perimeter

Paper Size ANSI B

0 40 80 120 160

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

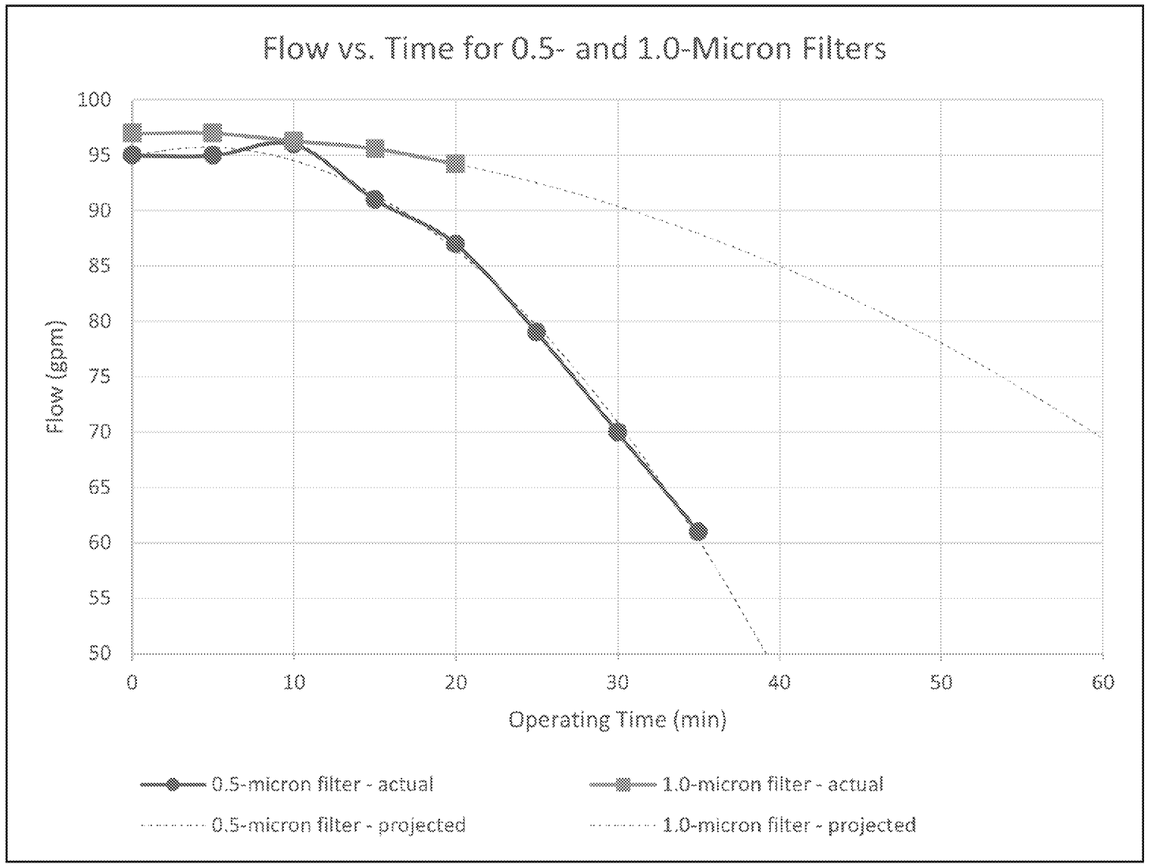
2019 ARMORED CAP MATERIAL SAMPLE LOCATIONS

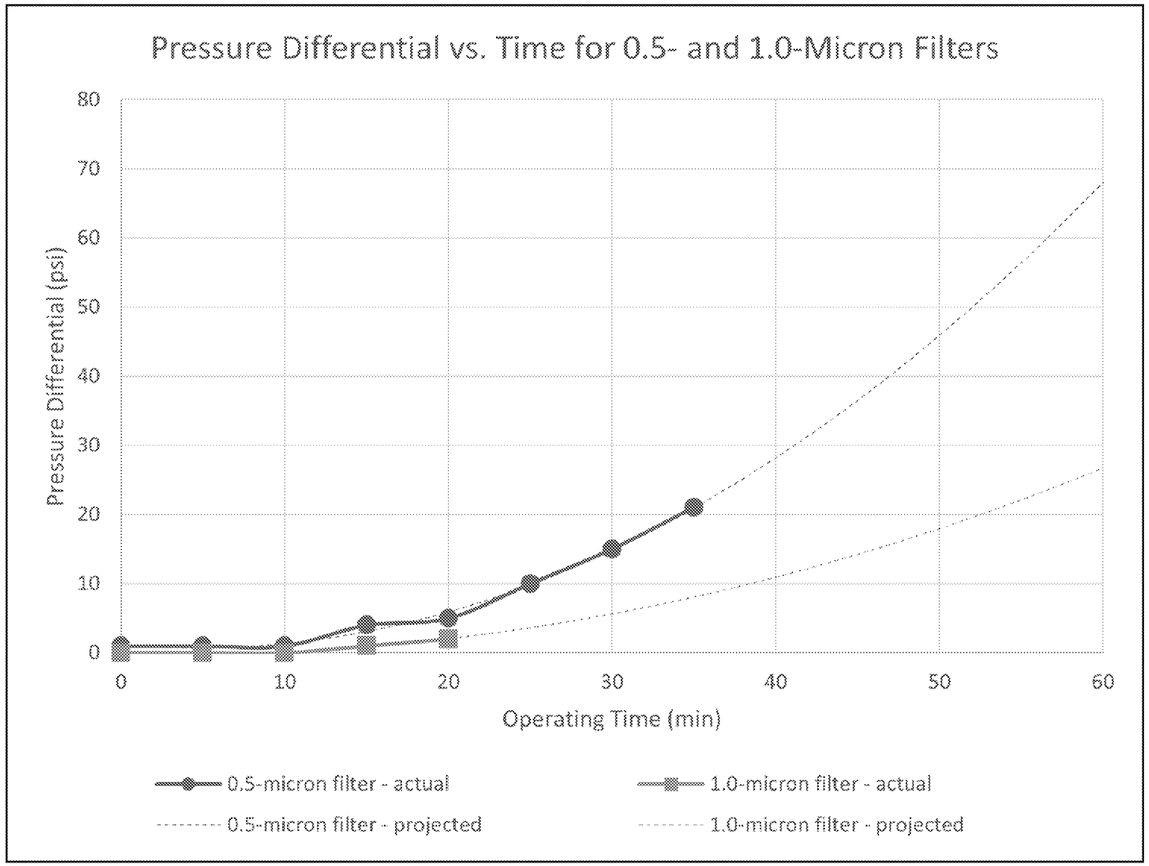
Project No. **11215702**
Revision No. **-**
Date **May 11, 2022**

FIGURE 3-5

Q:\GIS\PROJECTS\11215000s\11215702\RPT006\11215702_202205_RPT006_GIS003-5.mxd

Data source: Google Earth Imagery





Notes:
- gpm = gallons per minute
- min = minutes
- psi = pounds per square inch

Paper Size ANSI B

GHD

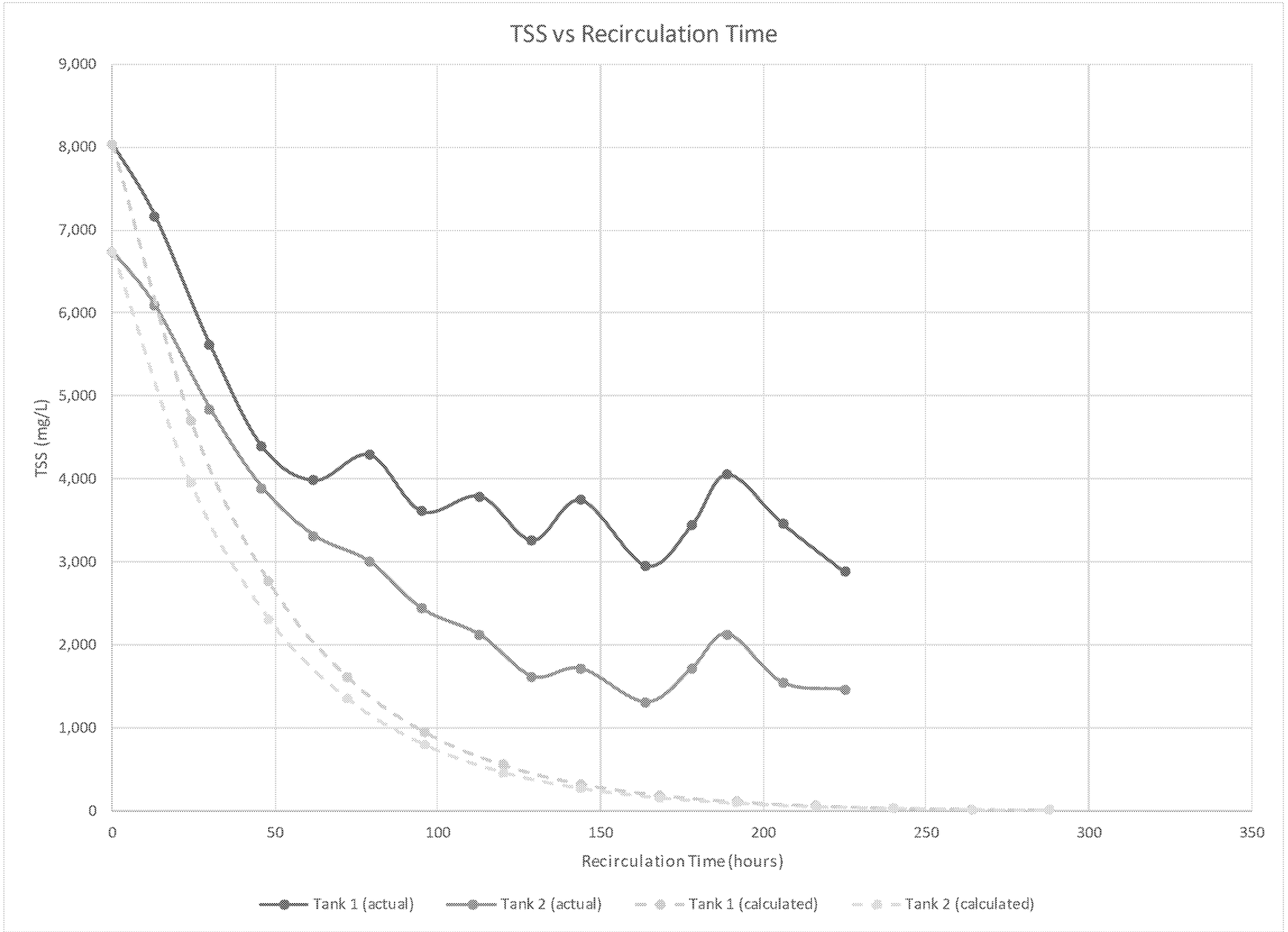
SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

FLOW AND DIFFERENTIAL PRESSURE OVER TIME - FIELD FILTRATION TESTING

Project No. 11215702
Revision No. -
Date May 19, 2022

FIGURE 3-6

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS003-6.mxd



Notes:

- TSS = total suspended solids
- mg/L = milligrams per liter
- This graph shows the TSS values after recirculation. Expected TSS values for filtrate from Tank 1 and Tank 2 were calculated based on particle size distributions prior to recirculation versus filter pore sizes used during recirculation.

Paper Size ANSI B

GHD

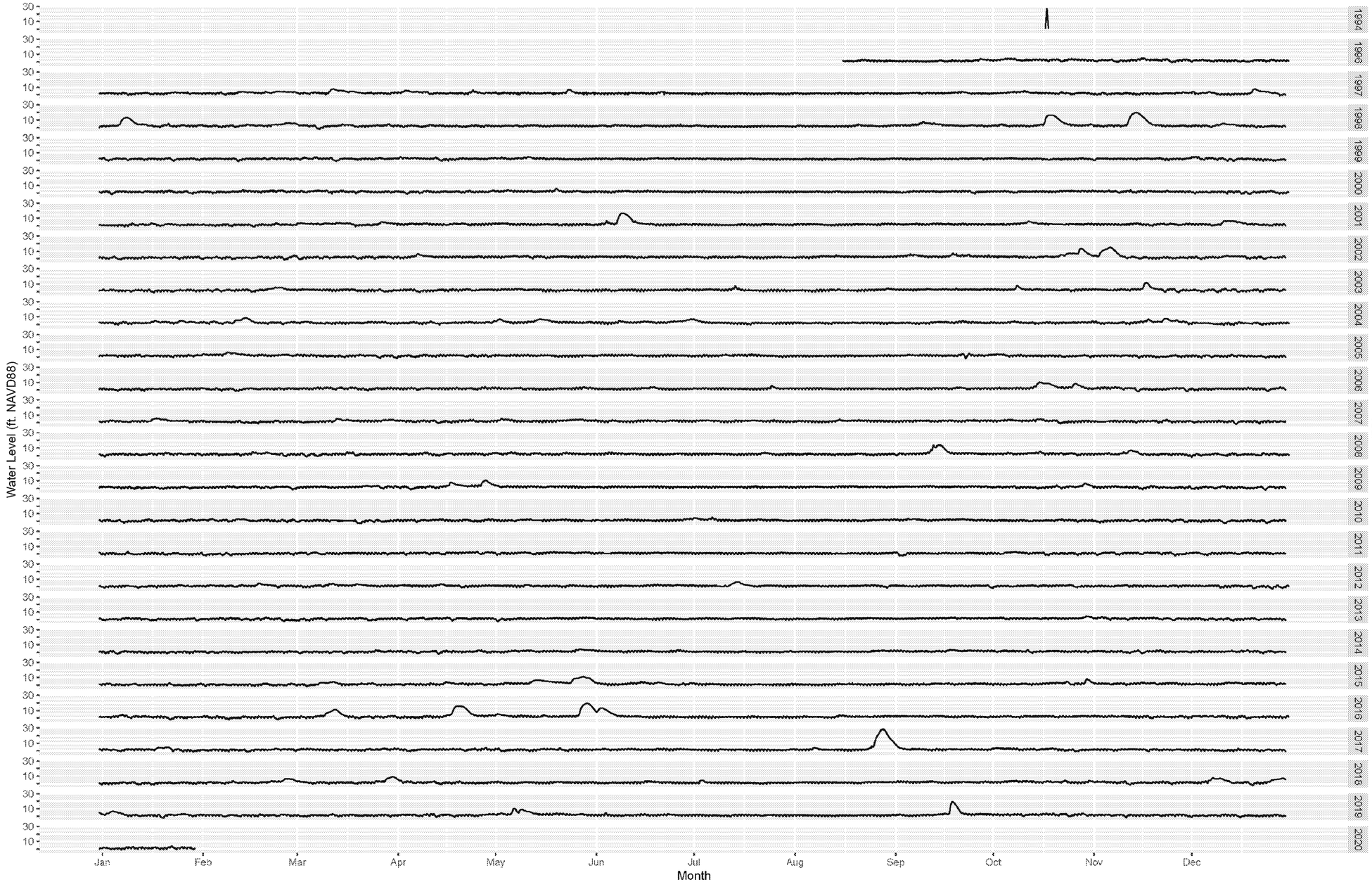
SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

ACTUAL VERSUS EXPECTED (CALCULATED) TSS VALUES - APPROACH B FILTRATION TESTING

Project No. **11215702**
Revision No. **-**
Date **May 19, 2022**

FIGURE 3-7

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS003-7.mxd



Legend

Water Surface Elevation (Feet NAVD88)

Notes:
San Jacinto River water surface elevations measured at the Sheldon Gage (USGS #08072050)

NAVD88 = North American Vertical Datum of 1988

Paper Size ANSI B

GHD

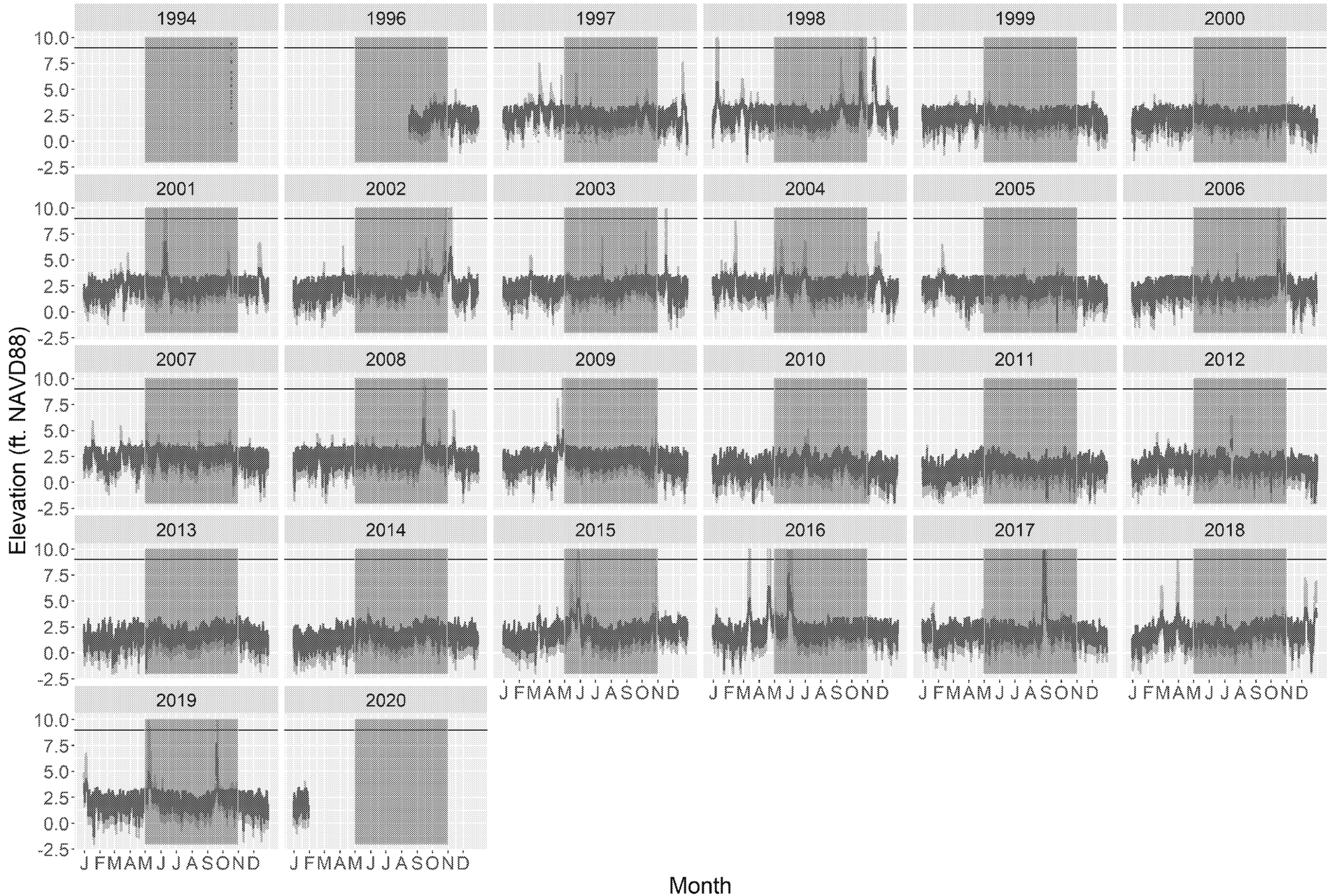
SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

HISTORICAL RIVER ELEVATIONS - SHELDON GAGE

Project No. 11215702
Revision No. -
Date May 6, 2022

FIGURE 5-1

G:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS005-1.mxd



Legend

- Top of BMP
- Northern Impoundment Water Surface (Hindcasted)
- Sheldon Gage Water Surface (Measured)
- Non-Excavation Season (November through April)

Notes:
San Jacinto River water surface elevations measured at the Sheldon Gage (USGS #08072050)

NAVD88 = North American Vertical Datum of 1988

San Jacinto River water surface data at the Northern Impoundment based upon data obtained from a transducer installed in the river on the west side of the Northern Impoundment in July, 2019

BMP = Best Management Practice (ie: cofferdam or sheetpile wall)"

Paper Size ANSI B

GHD

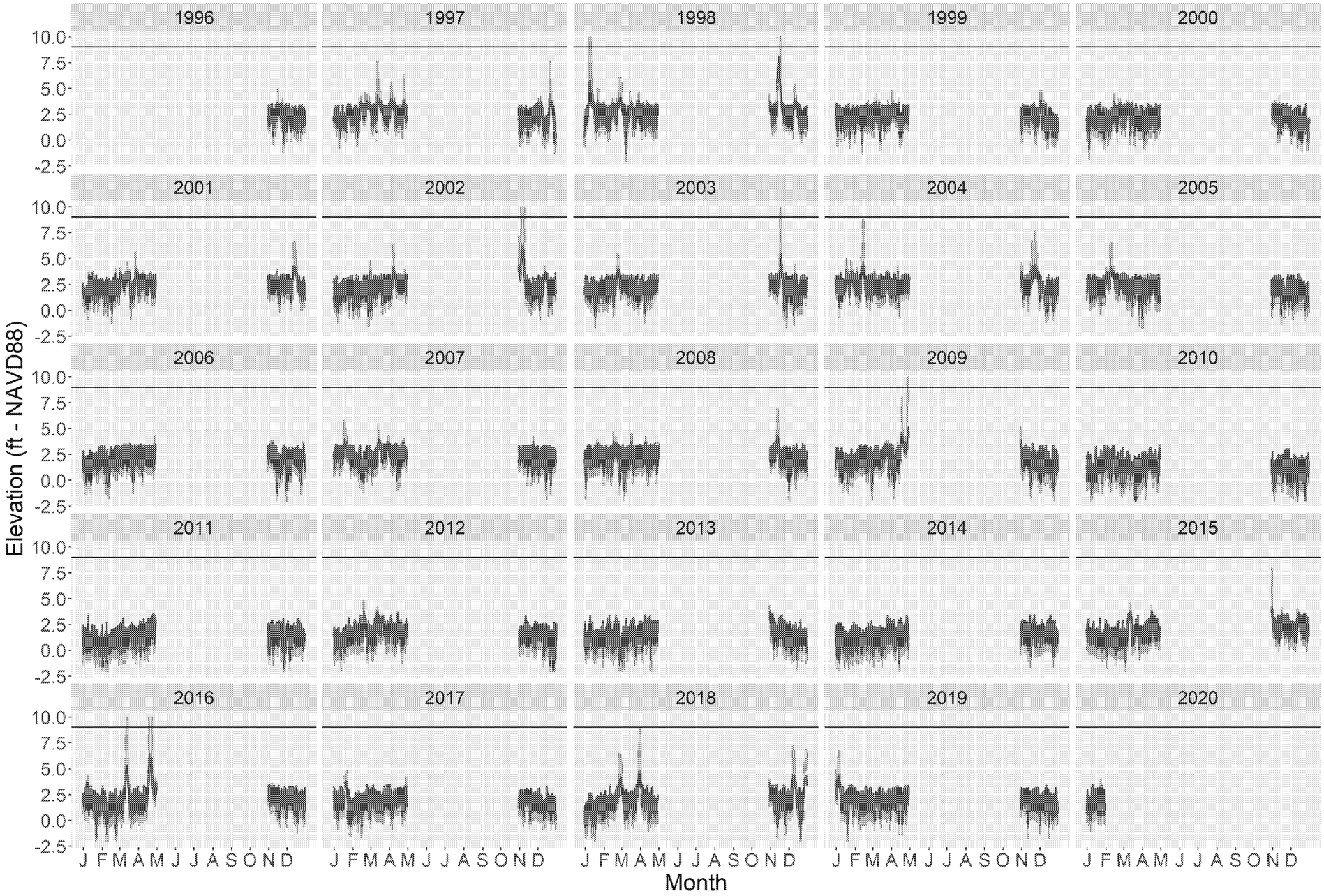
SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

HINDCASTED WATER SURFACE ELEVATIONS - YEAR ROUND

Project No. **11215702**
Revision No. **-**
Date **May 6, 2022**

FIGURE 5-2

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS005-2.mxd



Legend

- Top of BMP
- Northern Impoundment Water Surface (Hindcasted)
- Sheldon Gage Water Surface (Measured)

Notes:
San Jacinto River water surface elevations measured at the Sheldon Gage (USGS #08072050)

NAVD88 = North American Vertical Datum of 1988

San Jacinto River water surface data at the Northern Impoundment based upon data obtained from a transducer installed in the river on the west side of the Northern Impoundment in July, 2019

BMP = Best Management Practice (ie: cofferdam or sheetpile wall)"

Paper Size ANSI B

GHD

SAN JACINTO RIVER WASTE PITS SITE
HARRIS COUNTY, TEXAS

HINDCASTED WATER SURFACE ELEVATIONS - NOVEMBER TO APRIL

Project No. **11215702**
Revision No. **-**
Date **May 6, 2022**

FIGURE 5-3

Q:\GIS\PROJECTS\11215000s\11215702\RPT005\11215702_202205_RPT005_GIS005-3.mxd

June 21, 2022

BY E-MAIL

Lisa Price
Acting Superfund Division Director
United States Environmental Protection Agency, Region 6
1201 Elm Street
Dallas, Texas 75270

John Meyer
Interim Superfund Division Deputy Director
United States Environmental Protection Agency, Region 6
1201 Elm Street
Dallas, Texas 75270

Re: Northern Impoundment, San Jacinto River Waste Pits Superfund Site, Harris County, Texas ("Site") – Extension Request for Northwest Corner Component

Administrative Settlement Agreement and Order on Consent for Remedial Design, United States Environmental Protection Agency Region 6, CERCLA Docket No. 06 02 18 ("AOC")

Dear Ms. Price and Mr. Meyer:

This letter is submitted by International Paper Company and McGinnes Industrial Maintenance Corporation (collectively, "Respondents"), with respect to the remedial design ("RD") for the Northern Impoundment of the Site and in follow-up to Respondents' letter to the United States Environmental Protection Agency ("USEPA") dated March 24, 2022, requesting a re-evaluation of the response action for the Northern Impoundment ("Respondents' Request to Alter Response Action"). The Respondents are in receipt of USEPA's letter dated April 15, 2022 in response to that request ("USEPA Response Letter"), as well as email correspondence from Ashley Howard, USEPA's Remedial Project Manager for the Site, dated June 9, 2022, offering clarification on the same ("USEPA Clarification Email").

Respondents write to address points raised in the USEPA Response Letter and confirm that Respondents will submit the pre-final 90% RD for the Northern

Impoundment ("90% RD") on Monday, June 27, 2022.[1] Additionally, Respondents write to submit an extension request herein with respect to the Northwest Corner component of the 90% RD, in accordance with the USEPA Clarification Email.

Respondents' Request to Alter Response Action presented significant new information developed since the record of decision ("ROD") was issued on October 11, 2017 to the USEPA's attention.[2] Respondents sought to pause the RD schedule to allow the USEPA, Respondents and relevant stakeholders time to evaluate the new information and its impact on the implementability of the remedy selected in the ROD. Citing concerns that the overall RD schedule not be unduly delayed, in the USEPA Response Letter, the USEPA declined to pause the RD and asked that Respondents continue with the 90% RD as scheduled, but acknowledged that the 90% RD will need to be evaluated in light of uncertainties identified by Respondents and new information about the Northern Impoundment that may require a re-design of elements of the RD. Respondents agree with the USEPA that the 90% RD will need to be evaluated along with the significant new information and uncertainties raised concerning its implementability, and we look forward to engaging with the USEPA on a path forward to design a remedy that is implementable in light of the information now known about conditions in the Northern Impoundment.

As has been discussed in Technical Working Group meetings with the USEPA, some of the new information presented in Respondents' Request to Alter Response Action has rendered completion of the design in the Northwest Corner for the remedy selected in the ROD unimplementable unless modifications are made. The USEPA Clarification Email acknowledges that in light of the new information, the forthcoming 90% RD will not include a design for the Northwest Corner and that an extension would be necessary with respect to that component of the 90% RD. After noting its position in approving the current RD deliverable schedule that continuing technical challenges associated with the design for the Northwest Corner may necessitate an extension for this component of the 90% RD, the USEPA noted in the USEPA Clarification Email that Respondents should submit such a request.

---

[1] The current RD deliverable schedule would result in the 90% RD being due on June 26, 2022, which is a Sunday. Because the deadline would fall on a Sunday, pursuant to Article III, Paragraph 8 of the AOC, the resulting deadline is Monday, June 27, 2022.

[2] Extensive post-ROD investigations conducted by Respondents have yielded ten times more analytical data and three times more geotechnical data about the subsurface conditions of the Northern Impoundment than was available at the time the ROD was issued. Resulting analyses have established that the maximum depth of excavation would have to increase to at least -28.40 feet NAVD88 in the Northwest Corner. As a result, excavation in accordance with the ROD directives is not implementable, given the risk of catastrophic failure of the excavation bottom in multiple areas due to hydraulic heave and the potential for undermining the structural integrity of the required BMP wall. Design of the BMP wall itself also becomes problematic when accounting for the increased depth due to alignment needs in the river and along the Texas Department of Transportation right-of-way.

Accordingly, Respondents will submit the 90% RD as scheduled and as requested in the USEPA Response Letter, Respondents will note as part of that submission the uncertainties and information impacting implementability of the selected remedy, including with respect to the Northwest Corner. Furthermore, Respondents respectfully request an extension with respect to the Northwest Corner component of the 90% RD. Respondents and the USEPA will need additional discussion on the design elements' compatibility with the ROD in order to develop a framework and deliverable schedule for the Northwest Corner component of the 90% RD, but Respondents believe this can be done without adversely impacting the overall RD schedule. Respondents are committed to working with the USEPA to design a remedy that is implementable and meets the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan Contingency Plan, 40 CFR § 300.1 *et seq.* ("NCP").

As noted in the USEPA Response Letter, information in the 90% RD will aid USEPA in evaluating whether a remedy modification is warranted pursuant to the NCP's requirements under 40 CFR § 300.825. Therefore, Respondents respectfully request a meeting with USEPA after USEPA has had an opportunity to review Respondents' forthcoming 90% RD to discuss a path forward on an implementable remedy for the Northern Impoundment.

Sincerely,

INTERNATIONAL PAPER COMPANY

By:

Chris F. Kotara
Director, Global Environment Services & Remediation

MCGINNES INDUSTRIAL MAINTENANCE CORPORATION

By:

Steve Joyce
Senior Director,
Environmental Legacy Management Group

cc: Earthea Nance, Ph.D., Regional Administrator, Region 6 (Nance.Earthea@epa.gov)
Larry E. Douchand, Director, Office of Superfund Remediation & Technology (douchand.larry@epa.gov)
Chris Villarreal, Interim Superfund Branch Chief, Region 6 (villarreal.chris@epa.gov)
Anne Foster, Regional Counsel, Region 6 (foster.anne@epa.gov)
Blake Atkins, Section Chief, Region 6 (Atkins.Blake@epa.gov)
Ashley Howard, Remedial Project Manager, Region 6 (howard.ashley@epa.gov)
Lauren Poulos, Remedial Project Manager, Region 6 (poulos.lauren@epa.gov)
Robert Appelt, Remedial Project Manager, Region 6 (appelt.robert@epa.gov)
Karl Gustavson, Contaminated Sediments Lead, EPA Office of Superfund Remediation and Technology Innovation (gustavson.karl@epa.gov)
Toby Baker, Executive Director, Texas Commission on Environmental Quality (toby.baker@tceq.texas.gov)
Kristian Livingston, Team Leader Superfund Division, Texas Commission on Environmental Quality (kristian.livingston@tceq.texas.gov)
Katie Delbecq, Project Manager, Texas Commission on Environmental Quality (katie.delbecq@tceq.texas.gov)

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 11/1/2021 3:21:39 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Charles Munce [charles.munce@ghd.com]
Subject: SJRWP Southern Impoundment RAWP Discussion Follow Up

Flag: Follow up

Good morning Lauren,

We wanted to follow up regarding our call last week regarding potential TCEQ comments to the work plan as our team has had time to review further.

- Three TCLP D/F samples were collected from the Southern Impoundment in 2019 as part of the Treatability Study and Waste Characterization activities detailed in Section 3.3.1 and Table 6 of the 100% Remedial Design. Sample locations were selected based upon data collected during the RI and PDI-1 indicating that those locations had dioxin and furan concentrations greater than 240 ng/kg $TEQ_{DF,M}$ DWA.

- As detailed in Section 2.3.3 of the RAWP, prior to the RA excavation the Respondent will coordinate with the receiving off-site disposal facility to ensure that the waste profile is developed for the waste being transported to the disposal facility. Prior to initiating the RA construction, some volume-based frequency of waste characterization sampling will be agreed upon between the Respondent and the facility to verify that different truckloads of waste will be consistent with those profiles.

If it would helpful, we could participate in a call with the EPA and TCEQ to further discuss TCEQ comments to ensure they are expeditiously addressed to maintain the project schedule.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/5/2021 9:17:18 PM
To: Charles Munce [charles.munce@ghd.com]
CC: Meagan Willis [Meagan.Willis@ghd.com]; Philip J Slowiak [Philip.Slowiak@ipaper.com]; Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
Subject: EPA Approval with Modifications to San Jacinto Southern Impoundment RA Work Plan
Attachments: 2021 11 05 EPA SJRWP SI RAWP Signed Approval with Modifications.pdf

Hi Charles,

Attached is EPA's signed approval with modifications to the San Jacinto River Waste Pits Southern Impoundment Remedial Action Work Plan. Let me know if you have any questions, and thanks for coordinating.

Have a great weekend,

Lauren Poulos
Remedial Project Manager
Arkansas/Texas Section (SEDRA)
Superfund Division
U.S. EPA Region 6
214-665-8371

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 4/15/2022 9:03:37 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Philip J Slowiak [Philip.Slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Charles Munce [charles.munce@ghd.com]
Subject: San Jacinto River Waste Pits Site Southern Impoundment RA - March Monthly Progress Report No. 07
Attachments: 11215131-LTR-Poulos-8 - Complete - Monthly Progress Report No. 07 - March 2022.pdf

Flag: Follow up

Good afternoon Lauren,

On behalf of International Paper Company (IPC), GHD Services Inc. (GHD) submits the March 2022 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order* for *Remedial Action of the Southern Impoundment*, U.S. EPA Region 6, CERCLA Docket No. 06-05-21 (Order). This Monthly Progress Report No. 07 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of March 2022 or are projected to take place during the six-week period following the reporting period.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

11451 Katy Freeway, Suite 400
Houston, Texas 77079
United States
www.GHD.com

Our Ref.: 11215131-Poulos-8

April 15, 2022

Ms. Lauren Poulos
Remedial Project Manager
United States Environmental Protection Agency - 6SF RA
1201 Elm Street, Suite 500
Dallas, Texas 75202-2102

San Jacinto River Waste Pits Superfund Site
Southern Impoundment, Harris County, Texas
Monthly Progress Report No. 07 - March 2022
Unilateral Administrative Order for Remedial Action of the Southern Impoundment, USEPA Region 6, CERCLA Docket No. 06-05-21

Dear Ms. Poulos:

On behalf of International Paper Company (Respondent), GHD Services Inc. (GHD) submits the March 2022 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order (UAO)* for *Remedial Action of the Southern Impoundment*, USEPA Region 6, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. 06-05-21 (Order). This Monthly Progress Report No. 07 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of March 2022 or are projected to take place during the six-week period following the reporting period.

Consistent with the requirements in Section 4, Subsection 4.1 of the Statement of Work (SOW) attached to the Order, this progress report is organized into the following subject areas:

- Actions taken during the reporting period toward achieving compliance with the Order.
- A cumulative summary of sampling, tests, and all other data results received or generated pursuant to the Order and a summary of validated results generated during the reporting period.
- UAO deliverables Respondent submitted to the EPA during the reporting period.
- Activities scheduled relating to the RA Construction for the six weeks following the reporting period.
- An updated RA Construction Schedule detailing percentage complete, potential schedule delays, and efforts to mitigate the anticipated delays.
- Modifications to approved work plans or schedules that have been proposed or approved by EPA during the reporting period.
- Community Involvement Plan activities conducted during the reporting period and to be undertaken during the six weeks following the reporting period.

1. Actions Taken During Reporting Period

- Pursuant to Section 3, Subsection 3.2.b of the Order SOW, weekly conference calls were held between Respondent's Project Coordinator (PC) and the EPA.

- For the north central excavation (the only area which had not previously been reported to have been laterally delineated), the remaining sidewall analytical results from the fourth round of step outs from the northwest corner were reported by the analytical laboratory, SGS Analytical Inc. (SGS), on March 9, 2022. All sidewall unvalidated analytical results were below 240 nanograms per kilogram (ng/kg) $TEQ_{DF,M}$, demonstrating that the proposed north central excavation area had been laterally delineated and no further soils borings were warranted.
- The Respondent continued to receive and validate analytical data from the Pre-Construction Field Sampling event (PC-FSE) and continued work on updating of the design drawings and specifications and other aspects of the 100% RD.
- The Respondent, GHD, and the EPA met with representatives from the Texas Commission on Environmental Quality (TCEQ) via video conference on March 21, 2022, to discuss the Southern Impoundment RA substantive requirements for contact water treatment and discharge to the San Jacinto River.
- The Respondent continued its efforts, related to its December 30, 2021, submission pursuant to Section XI, Paragraph 67.b, to obtain additional information related to the location of utilities and the identification of other property rights associated with properties identified in the December 2021 submission as an "Affected Property" under the Order. On March 30, 2022, the Respondent made a further submission to the EPA regarding such matters, which it intends to further supplement as it continues such efforts.
- The Respondent continued efforts to obtain access rights related to performing the RA.

2. Sampling, Testing, and Data Results

- The validation of the analytical data from the PC-FSE fieldwork is currently on-going and anticipated to be completed in April 2022. The validated soil confirmation data, rinsate blank samples, discrete waste characterization, composite investigation derived waste (IDW) samples, and water samples from the PC-FSE fieldwork received through March are included in Tables 1 through 5 attached to this report. A full validation memorandum will be provided following the receipt and validation of all data from the PC-FSE sampling activities.

3. UAO Deliverables Submitted to the EPA During the Reporting Period

- The Respondent made a supplemental submission to the EPA pursuant to Section XI, Paragraph 67.b on March 30, 2022.

4. Activities Scheduled for the Next Six Weeks

- Pursuant to Section 3, Subsection 3.2.b of the Order SOW, weekly conference calls will be held between Respondent's PC and the EPA.
- The Respondent will complete the remaining PC-FSE activities including plugging and abandoning of two wells and IDW management.
- The Respondent will continue efforts to obtain property access rights related to performing the Southern Impoundment RA Construction and to address proprietary controls related to Affected Properties.

- The Respondent will remain in contact with the Texas Department of Transportation (TxDOT) to obtain and track information regarding plans for the dolphin and fender repair project and Interstate-10 (I-10) bridge replacement project.
- The Respondent will finish evaluating and validating data from the PC-FSE and continue work on updating of the design drawings and specifications and other aspects of the 100% RD including the supporting deliverables.

5. Updated RA Schedule

- Based on the RA Construction Schedule included within the Revised Remedial Action Work Plan (RAWP), the RA is approximately 16 percent complete. It should be noted that this reflects progress as it relates to the completion of the deliverables and tasks included in Table 6.1 of the Revised RAWP. Following selection of the Remedial Contractor, an updated RA Construction schedule will be submitted to the EPA.

6. Modifications to Approved Work Plans or Schedules

- No modifications to approved work plans or schedules occurred during this period. The time necessary to complete the PC-FSE field work extended well beyond the 50 days that was estimated for purposes of the Revised RAWP and will have a direct impact on subsequent deadlines in the schedule in Table 6.1 of the Revised RAWP.

7. Community Involvement Plan Activities

- To the Respondent's knowledge, no community involvement activities took place during the reporting period or are projected to take place during the six week period following the reporting period.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (713) 734-3090.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(225) 773-5770
Charles.Munce@GHD.com

CWM/jlf/8

Encl.: Table 1 - PC-FSE Soil Analytical Results Summary
Table 2 - PC-FSE Rinsate Blank Analytical Results Summary
Table 3 - PC-FSE Discrete Waste Characterization Analytical Results Summary
Table 4 - PC-FSE Composite IDW Analytical Results Summary
Table 5 - PC-FSE Water Analytical Results Summary

Copy to: Katie Delbecq, TCEQ
Phil Slowiak, IPC
Brent Sasser, IPC

Table 1

PC-FSE – Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-A1, NC-A2, NC-A3, NC-A4	NC-B1, NC-B2, NC-B3, NC-C1, NC-C2, NC-C3	NC-I1, NC-I2, NC-J1, NC-J2, NC-J3, NC-K1	NC-L1, NC-L2, NC-L3, NC-M1, NC-M2, NC-M3	NC-O1, NC-02, NC-P1, NC-P2, NC-P3, NC-Q1	NC-W1, NC-W2, NC-W3, NC-Y1, NC-Y2, NC-X1	NC-AC1, NC-AC2, NC-AC3	NC-AC1, NC-AC2, NC-AC3	NC-AG1, NC-AG2	NC-AA1, NC-AA2, NC-AA3, NC-AB1, NC-AB2,
Sample Identification:	Units	11215131-121021-S-SS-NC-B-1	11215131-121021-S-JC-NC-B-2	11215131-120921-S-JC-NC-B-3	11215131-120921-S-SS-NC-B-4	11215131-121421-S-BN-NC-B-5	11215131-121321-S-SS-NC-B-6	11215131-011022-S-BN-DUP-12	11215131-011022-S-BN-NC-B-7	11215131-010822-S-BN-NC-B-8	11215131-011122-S-BN-NC-B-9
Sample Date:		12/10/2021	12/10/2021	12/09/2021	12/09/2021	12/14/2021	12/13/2021	01/10/2022	01/10/2022	01/08/2022	01/11/2022
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Duplicate	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	6990 J	4300 J	227 J	4960 J	4560	1510	4680	3660	462	4470
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	10700 J	7070 J	1140 J	10300 J	10700 J	2160	10000 J	6330	1680	7480
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	594	310	71.1	320	417	127 J	411	276	68.1	275
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	772	485	77.7	773	750	113 J	825	482 J+	120	536
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	179	82.8	23.3	102	115	13.1	115	73.7	14	48.7
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1330	660	190	651	951	81.3 J	924	593	111	310
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.73	3.78	0.695 J	5.27	4.2	1.39 J	3.89	2.14 J	1.04 J	2.85
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	323	168	46.8	160	227	21.9	215	144 J+	28	79
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	29.2	18.1	2.49	25.5	21.2	4.79	19.8	14.5	3.49	16
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.19 U	0.726 U	0.334 U	1.06 U	2.01 U	0.381 U	0.713 U	0.682 U	0.894 U	1.07 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	13	8.47	1.91 J	11.5	10.5	3.1	8.48	6.15	2.63	7.63
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	675	455	107	429	635	54.1	630	433	71.8	202
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	45.4	42.7	9.23	34.5	45.4	6.84	55.9	36.5	5.96	18.4
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	67.2	38.9	8.9	38.5	55.8	5.67	50.3	34.2	6.19	21.4
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	458 J+	356 J+	82.4 J+	307 J+	483	45.5 J+	501	352 J+	55.2	167
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	13300 J	12500 J	2770 J	9250 J	16000 J	1520 J	19500 J	12800 J	1940 J	5690 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4710 J	4250 J	958	3560 J	4140 J	589	5010 J	3310 J	512	1630 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1170 J	596 J	122 J	724 J	801 J	186 J	821 J	546 J	123 J	573 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1600 J	965 J	184 J	1630 J	1520 J	271 J	2080 J	1020 J	306 J	1240 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2130 J	1090 J	293 J	1110 J	1520 J	153 J	1510 J	987 J	187 J	604 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	257 J	156 J	58.4 J	268 J	222	71.7	224 J	134 J	49.6 J	163 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1840 J	1320 J	301 J	1210 J	1800 J	174 J	1840 J	1280 J	205 J	662 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	96.4 J	80.2 J	20.5 J	81 J	86.3 J	20.9 J	96 J	65.1 J	9.52 J	49.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	25300 J	24000 J	5510 J	17800 J	30500 J	2940 J	39100 J	25800 J	3680 J	11100 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5280 J	4770 J	1080 J	3980 J	4550 J	667 J	5580 J	3680 J	579 J	1820 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**6440 J**	**5770 J**	**1300 J**	**4730 J**	**6090 J**	**779 J**	**7330 J**	**4840 J**	**749 J**	**2330 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**6440 J**	**5770 J**	**1300 J**	**4730 J**	**6090 J**	**779 J**	**7330 J**	**4840 J**	**749 J**	**2330 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-AC4, NC-AC5, NC-AC6	NC-AC4, NC-AC5, NC-AC6	NC-AG3, NC-AG4	NC-AA4, NC-AA5, NC-AB4, NC-AB5	NC-AC7, NC-AC8, NC-AC9	NC-AA6, NC-AA7, NC-AA8	NC-A1, NC-A2, NC-A3, NC-A4	NC-B1, NC-B2, NC-B3	NC-C1, NC-C2, NC-C3	NC-D1, NC-D2	NC-E1, NC-E2
Sample Identification:	Units	11215131-012222-S-BN-DUP-14	11215131-012222-S-BN-NC-B-10	11215131-012122-S-BN-NC-B-11	11215131-012222-S-BN-NC-B-12	11215131-020222-S-SB-NC-B-13	11215131-020222-S-SB-NC-B-14	11215131-121021-S-SS-NC-O-1	11215131-121021-S-JC-NC-O-2	11215131-121021-S-JC-NC-O-3	11215131-121321-S-SS-NC-O-4	11215131-121321-S-SS-NC-O-5
Sample Date:		01/22/2022	01/22/2022	01/21/2022	01/22/2022	02/02/2022	02/02/2022	12/10/2021	12/10/2021	12/10/2021	12/13/2021	12/13/2021
Sample Type:		Duplicate	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3690	3120	287	944	4460	792	84.6 J	85 J	389 J	48.5	153
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2730	2450	2500	2690	4760	1210	1440 J	1460 J	5150 J	23900 J	3360
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	111	108	151	91.2	161	49.9	19.9	20.3	89.2	15.5	51.7
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	178	156	188	180	294	65.9	99.4	101	435	193	209
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	11.5	11	57	20.8	23	3.4	2.12 J	2.88	12.3	3.07 J	14.6
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	41.1	25.5	468	174	100	4.1	5.97	7.28	33.1	26.9	99.3
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.12 J	1.68 J	0.804 J	1.1 J	3.19	1.04 J	1.54 J	1.11 J	4.09	0.984 J	1.26 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	11.1	6.94	119	45.1	27.1	1.32 J	1.51 J	1.93 J	7.71	6.26	23.6
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.4	7.33	4.94	5.65	12.6	2.75	4.92	4.02	16.7	2.44 J	4.29
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.402 U	0.413 U	0.26 U	0.29 U	0.392 U	0.202 U	0.215 U	0.259 U	0.482 U	0.801 U	0.94 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.25	5.12	2.68	2.97	7.04	2.51	3.04 J	2.5	8.52	1.47 J	2.6
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	36.2	13.9	284	116	66	2.66	2.27 J	5.4	19.8	16.4	56.3
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.41	3.39	24.8	12.7	9.25	0.992 J	0.863 J	1.1 J	3.11	1.55 J	6.42
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.27	3.3	26.2	10.2	9.53	1.05 J	1.2 J	1.44 J	5.54	1.65 J	5.92
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	28.4	15.1	217	92.1	59.7 J+	3.09 J+	2.29 J+	3.86 J+	13 J+	13.3	48.2
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	699	556	6890 J	3340 J	2110 J	105	37.5	85.2	306	484	2170 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	229	185	2480 J	1240 J	748	34.2	12	33.3	123	131	558
Total heptachlorodibenzofuran (HpCDF)	pg/g	213 J	198 J	268 J	182 J	324 J	78.2 J	52.5 J	64.4 J	296 J	31.5 J	111 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	444 J	392 J	392 J	387 J	661 J	197 J	247 J	246 J	979 J	487 J	654 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	123 J	89.2 J	727 J	286 J	239 J	21.5 J	28.3 J	33.1 J	144 J	46.6 J	162 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	143 J	135 J	74.2 J	66.7 J	127 J	11.8 J	52.6 J	39.6 J	134 J	46.8	64.7
Total pentachlorodibenzofuran (PeCDF)	pg/g	146 J	83.7 J	794 J	332 J	254 J	17.9 J	16.2 J	23.3 J	80.3 J	47.5 J	171 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	35.8 J	31.4 J	43 J	26.7 J	35.3 J	28.7 J	6.09 J	5.22 J	17.2 J	4.81 J	8.77 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	1360 J	1050 J	13400 J	6540 J	4190 J	170 J	74.2 J	160 J	565 J	971 J	4250 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	282 J	230 J	2720 J	1370 J	858 J	54.6 J	15.5 J	40.6 J	150 J	144 J	618 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**324 J**	**258 J**	**3330 J**	**1650 J**	**1010 J**	49.8 J	20.9 J	47.8 J	176 J	199 J	**815 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**324 J**	**258 J**	**3330 J**	**1650 J**	**1010 J**	49.8 J	20.9 J	47.8 J	176 J	199 J	**815 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE – Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-F1, NC-F2, NC-F3	NC-G1, NC-G2	NC-H1, NC-H2	NC-I1, NC-I2	NC-J1, NC-J2, NC-J3	NC-K1, NC-K2, NC-K3	NC-L1, NC-L2, NC-L3	NC-M1, NC-M2, NC-M3	NC-N1, NC-N2, NC-N3	NC-O1, NC-02	NC-P1, NC-P2, NC-P3
Sample Identification:	Units	11215131-120721-S-JC-NC-O-6	11215131-120721-S-SS-NC-O-7	11215131-120721-S-SS-NC-O-8	11215131-120921-S-JC-NC-O-9	11215131-120921-S-JC-NC-O-10	11215131-120921-S-JC-NC-O-11	11215131-120921-S-SS-NC-O-12	11215131-120921-S-SS-NC-O-13	11215131-120921-S-SS-NC-O-14	11215131-121421-S-BN-NC-O-15	11215131-121421-S-BN-NC-O-16
Sample Date:		12/07/2021	12/07/2021	12/07/2021	12/09/2021	12/09/2021	12/09/2021	12/09/2021	12/09/2021	12/09/2021	12/14/2021	12/14/2021
Sample Type:		Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	397	82.1	238	257	203 J	241 J	154	87 J	220 J	135	40.6 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2790	7830	36500 J	2320 J	3210 J	3010 J	2780 J	1870 J	3340 J	2430	936
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	87.7	38.6	123	85.7	62.5	57	43.3	24.5	55.6	27.9	11
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	198	219	925	170	240	250	234	144	259	190	118
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	24.2	10.1	42.2	28.2	14	7.72	8.72	2.88	7.34	3.77	0.939 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	173	82.4	321	220	95.7	22.2	22.1	7.54	17.8	10.4	2.3 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.6	1.49 J	5.34	1.93 J	2.31 J	2.3 J	3.35	1.59 J	2.99	1.31 J	1.25 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	45.2	20.5	81.1	54.8	24.5	5.79	5.84	2.69	4.96	2.8 J	0.536 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.35	5.04	13.4	6.18	8.85	9.73	10.4	5.65	9.45	4.88 J	2.42 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.25 U	0.159 U	0.256 U	0.443 U	0.34 U	0.292 U	0.379 U	0.293 U	0.334 U	0.804 U	0.613 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.57	3.33	9.99	3.9	5.35	5.61	7.75	3.75	6.28	3.41	2.23 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	117	60.3	183	135	56.9	12.4	11.1	4.76	8.44	5.24	1.64 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	11.4	6.12	20.3	9.37	5.42	1.95 J	2.45 J	1.26 J	1.88 J	0.762 U	0.682 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	10.8	5.22	17.3	12.4	6.85	3.68	3.41	1.85 J	3.84	1.83 J	0.566 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	87.3 J+	50.3 J+	138 J+	88.1 J+	41.6 J+	9.07 J+	9.92 J+	4.1 J+	7.21 J+	4.02	1.58 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2930 J	1640 J	5310 J	2530 J	1230 J	166	241	62.4	181	87.7	35.9
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1020 J	538	1830 J	922	442	52.7	89.8	22.8	65.5	23.4	8.47
Total heptachlorodibenzofuran (HpCDF)	pg/g	203 J	89.8 J	262 J	184 J	166 J	174 J	120 J	78.2 J	168 J	83 J	32.8 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	439 J	524 J	2060 J	423 J	717 J	552 J	544 J	336 J	611 J	533 J	491 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	301 J	143 J	522 J	365 J	191 J	92.8 J	78.4 J	41.8 J	81.9 J	40.3 J	13.6 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	68.4 J	63.1 J	169 J	77.2 J	108 J	83.3 J	110 J	54.8 J	100 J	69	57.4
Total pentachlorodibenzofuran (PeCDF)	pg/g	335 J	179 J	511 J	351 J	167 J	51.9 J	54 J	25.8 J	43 J	21.6 J	8.19 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	22.3 J	14.8 J	38.1 J	20.4 J	18.5 J	10.3 J	17.6 J	7.52 J	14.5 J	3.84 J	3.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	5730 J	3270 J	10400 J	4890 J	2390 J	273 J	474 J	120 J	296 J	151 J	64.4 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1140 J	607 J	2050 J	1030 J	502 J	63 J	106 J	30.2 J	78.7 J	26.9 J	10.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**1380 J**	**742 J**	**2500 J**	**1250 J**	**603 J**	83.4 J	129 J	36.3 J	96.7 J	39.0 J	15.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**1380 J**	**742 J**	**2500 J**	**1250 J**	**603 J**	83.4 J	129 J	36.3 J	96.7 J	39.4 J	15.5 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-Q1, NC-Q2	NC-R1, NC-R2	NC-S1, NC-S2	NC-T1, NC-T2	NC-T1, NC-T2	NC-U1, NC-U2	NC-V1, NC-V2	NC-W1, NC-W2, NC-W3	NC-X1, NC-X2	NC-Y1, NC-Y2	NC-Y1, NC-Y2
Sample Identification:	Units	11215131-121421-S-BN-NC-O-17	11215131-121321-S-BN-NC-O-18	11215131-121321-S-BN-NC-O-19	11215131-121321-S-BN-DUP-8	11215131-121321-S-BN-NC-O-20	11215131-121321-S-BN-NC-O-21	11215131-121321-S-BN-NC-O-22	11215131-121321-S-SS-NC-O-23	11215131-121321-S-SS-NC-O-24	11215131-121321-S-SS-DUP-7	11215131-121321-S-SS-NC-O-25
Sample Date:		12/14/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021
Sample Type:		Overburden	Overburden	Overburden	Duplicate	Overburden	Overburden	Overburden	Overburden	Overburden	Duplicate	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	123	244	155	131	115	117	104	739	87.3	86.2	62
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2260	3390	2520	2450	2330	2090	1980	6960	2320	1880	1550
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	30.6	66.9	36.1	31.5	30.1	34.4	26.4	113	23.2	22.6	16.7
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	212	300	201	167	179	147	152	564	130	129	111
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	3.91	4.88	2.68 U	3.82	3.46	3.02	2.94	14.5	2.91	3.01	1.87 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	15	8.14	8.51	10.9	9.77	7.29	6.48	63	7.1	8.31	4.78
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.92 J	1.91 J	1.9 J	2.04 J	1.93 J	1.89 J	1.86 J	4.91	1.49 J	1.8 J	2.37 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.67	3.08	2.45 J	3.12	2.48	2.43 J	2.1 J	16.2	1.92 J	2.4 J	1.44 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.16	15	6.43	7.93	5.75	6.73	5.75	16	4.44	4.45	4.06
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.905 U	1.14 U	0.947 U	0.309 U	0.245 U	0.262 U	0.218 U	0.522 U	0.271 U	0.211 U	0.193 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.05	7.35	3.59	4.72	3.97	4.64	4.2	8.79	2.93	3.77	4.12
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	10.4	4.09	4.43	5.59	4.88	3.86	2.96	37.6	3.31	4.22	2.81
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.4 J	1.53 J	1.07 J	1.55 J	1.28 J	1.74 J	1.25 J	4.8	0.734 J	1.23 J	1.28 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.41 J	3.75	2.2 J	2.72	1.89 J	1.89 J	1.55 J	6.87	1.44 J	1.58 J	1.07 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	8	4.49	4.07	4.44 J+	3.81 J+	3.17 J+	2.62 J+	30.1 J+	2.74 J+	3.45 J+	2.4 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	140	73.7	94.5	90.9	81.1	60.9	50	783	48.6	69.1	54.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	33.7	18.3	28.5	41.5	33.9	27.7	21.7	328	18.1	29.8	22.2
Total heptachlorodibenzofuran (HpCDF)	pg/g	94.9 J	210 J	101 J	96.6 J	85.8 J	95.6 J	69.9 J	288 J	60 J	63.6 J	43.6 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	538 J	610 J	500 J	420 J	427 J	374 J	369 J	2510 J	362 J	302 J	273 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	53.5 J	68.2 J	46.3 J	51.8 J	42.6 J	42.2 J	32.7 J	169 J	31.2 J	32.6 J	21.8 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	80.9	112	74	80.8	73.9	78.6	74.6	241	59.3	63.2	60
Total pentachlorodibenzofuran (PeCDF)	pg/g	40.2 J	29.2 J	26.7 J	29.7 J	24.4 J	21.4 J	17.3 J	134 J	16.1 J	19.6 J	13.1 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	11.7 J	11.9 J	9.27 J	13.3 J	12.6 J	16.8 J	12.6 J	26.4 J	7.65 J	11.7 J	11 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	247 J	138 J	177 J	178 J	157 J	114 J	90.3 J	1490 J	91.3 J	134 J	106 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	42.1 J	20.5 J	35.3 J	55.7 J	45.9 J	42.2 J	30 J	378 J	24.1 J	38.3 J	29.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	58.4 J	37.4 J	46.1 J	59.6 J	50.0 J	41.6 J	33.5 J	**442 J**	28.8 J	43.5 J	33.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	58.5 J	37.5 J	46.1 J	59.6 J	50.0 J	41.6 J	33.5 J	**442 J**	28.8 J	43.5 J	33.3 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE – Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-AC1, NC-AC2, NC-AC3	NC-AD1, NC-AD2, NC-AD3	NC-AE1, NC-AE2, NC-AE3	NC-AF1, NC-AF2	NC-AB1, NC-AB2, NC-AB3	NC-AG1, NC-AG2	NC-AA1, NC-AA2, NC-AA3	NC-AH1, NC-AH2	NC-AI1, NC-AI2	NC-AC4, NC-AC5, NC-AC6	NC-AE4, NC-AE5, NC-AE6
Sample Identification:	Units	11215131-011022-S-BN-NC-O-26	11215131-011022-S-BN-NC-O-27	11215131-011122-S-BN-NC-O-28	11215131-011022-S-BN-NC-O-29	11215131-011122-S-BN-NC-O-30	11215131-010822-S-BN-NC-O-31	11215131-011122-S-BN-NC-O-32	11215131-010822-S-BN-NC-O-33	11215131-010822-S-BN-NC-O-34	11215131-012222-S-BN-NC-O-35	11215131-012222-S-BN-NC-O-36
Sample Date:		01/10/2022	01/10/2022	01/11/2022	01/10/2022	01/11/2022	01/08/2022	01/11/2022	01/08/2022	01/08/2022	01/22/2022	01/22/2022
Sample Type:		Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	209	195	540	93.2	98.6	132	230	226	1260	92	31.2
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	3020	2780	11700 J	18400 J	1590	2070	2800	3110	5810	1380	3730
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	48.6	48.3	139	123	22.7	28.9	41.5	43	272	33.2	19.5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	228	213	250	270	118	151	178	249	455	99.9	82.7
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	5.69	6.61	47.3	42.9	2.92	3.54	5.23	4.12	24.8	8.32	5.53
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	14.1	20.8	423	382	12.2	9.93	26.9	13.4	179	62.3	44.3
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.77 J	1.09 U	1.44 J	1.33 J	1.33 J	1.34 J	1.36 J	1.84 J	2.63	1.14 J	0.938 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.03	6	105	89.2	3.15	2.84	6.74	3.99	45.2	15	13.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.76	8.04	7.16	5.33	3.9	5.21	5.88	7.6	12.6	3.9	2.45 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.651 U	0.89 U	0.871 U	0.747 U	0.776 U	0.713 U	0.738 U	0.794 U	1.11 U	0.151 U	0.229 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.01	3.82	3.47	2.6 J	2.53	3.24	3.75	4.03	5.8 J	2.61	1.98 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.86	13.2	245	227	7.38	6.33	17.2	7.56	114	40.3	29.5
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.71 J	1.89 J	17.8	16.6	1.09 J	1.15 J	1.82 J	1.39 J	11.5	4.5	2.41 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.93	3.02	23	17.9	1.28 J	1.85 J	2.98	2.18 J	14.3	3.76	3.16
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.05	9.33	179	167	5.08 J+	4.59 J+	13.3 J+	6.07 J+	90	31 J+	20.5 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	154	191	6260 J	5340 J	164	104	340	155	3240 J	1020 J	606
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	46.3	54.2	1710 J	1550 J	43.5	31	100	42.7	932	366	219
Total heptachlorodibenzofuran (HpCDF)	pg/g	149 J	137 J	290 J	233 J	65.6 J	87.5 J	104 J	114 J	620 J	76.8 J	44.2 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	555 J	517 J	584 J	621 J	353 J	366 J	481 J	799 J	1030 J	242 J	192 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	74.3 J	81.3 J	688 J	591 J	39 J	48.7 J	75.7 J	67.1 J	412 J	109 J	81.8 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	69.1 J	60.4 J	64.1 J	88.7 J	48.5 J	48.9 J	67.5 J	112 J	145 J	48.7 J	28.2 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	38.7 J	57.7 J	677 J	612 J	23.3 J	27.8 J	60.1 J	35.5 J	351 J	116 J	84.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.13 J	5.85 J	32.8 J	30.4 J	3.4 J	4.48 J	7.97 J	9.98 J	29.7 J	13.7 J	7.04 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	278 J	340 J	12300 J	10800 J	275 J	180 J	635 J	281 J	6430 J	2010 J	1210 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	53.7 J	60.4 J	1920 J	1750 J	48.5 J	36.3 J	115 J	52 J	1050 J	416 J	247 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	72.7 J	86.1 J	**2480 J**	**2220 J**	67.1 J	49.1 J	148 J	68.9 J	**1330 J**	**494 J**	**298 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	72.7 J	86.2 J	**2480 J**	**2220 J**	67.2 J	49.1 J	148 J	68.9 J	**1330 J**	**494 J**	**298 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold

Sidewall sample concentrations exceed 240 pg/g

Bold

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-AF3, NC-AF4	NC-AF5, NC-AF6	NC-AB4, NC-AB5	NC-AG3, NC-AG4	NC-AA4, NC-AA5	NC-AH3, NC-AH4	NC-AI3, NC-AI4	NC-AC7, NC-AC8, NC-AC9	NC-AF7	NC-AA6, NC-AA7, NC-AA8	NC-AH5, NC-AH6
Sample Identification:	Units	11215131-012122-S-BN-NC-O-37	11215131-012122-S-BN-NC-O-38	11215131-012222-S-BN-NC-O-39	11215131-012122-S-BN-NC-O-40	11215131-012222-S-BN-NC-O-41	11215131-012122-S-BN-NC-O-42	11215131-012122-S-BN-NC-O-43	11215131-020222-S-SB-NC-O-44	11215131-020222-S-SB-NC-O-45	11215131-020222-S-SB-NC-O-46	11215131-020222-S-SB-NC-O-47
Sample Date:		01/21/2022	01/21/2022	01/22/2022	01/21/2022	01/22/2022	01/21/2022	01/21/2022	02/02/2022	02/02/2022	02/02/2022	02/02/2022
Sample Type:		Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	253	88.1	206	100	1090	533	1180	387	163	161	115
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	13900 J	4050	5680	2420	4830	2350	2520	2860	4290	2500	2400
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	141	81.7	52.4	27.8	138	55.3	81.8	71.1	228	49.2	31.4
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	625	163	277	155	368	209	184	192	193	215	180
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	29.3	34.1	7.74	3.65	34.6	9.52	10.2	11.5	91.3	9.32	2.96
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	198	300	27.3	6.23	260	41.8	58.3	62.9	736	53	6.12
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.51	1.09 J	2.86	1.65 J	3.2	1.91 J	1.69 J	2.11 J	1.64 J	2.51	2.32 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	55.9	75.2	6.78	2.65	70.8	11.2	16.8	16.3	178	13.2	3.26
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	20.9	4.41	9.6	5.37	13.6	6.56	6.07	6.96	5.59	7.77	7.55
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.268 U	0.245 U	0.288 U	0.256 U	0.436 U	0.469 U	0.256 U	0.278 U	0.81 U	0.506 U	0.373 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.37	2.26 J	5.9	3.55	7.01	3.23	3.96	4.52	2.98 J	4.8	4.85
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	117	178	20.8	3.37	212	23.8	38.8	39.4	391	32.5	2.53
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	13.5	17.6	3.48	1.23 J	14.5	3.25	4.72	5.42	23.8	3.75	1.29 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	14.5	15.3	4.35	2.3 J	18.6	3.87	5.09	5.24	36.5	4.66	3.21
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	87.7	137	12.5 J+	3.39	153	20.6 J+	32.7 J+	32.4 J+	248	23.7 J+	4 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	2910 J	4770 J	229	41.1	3610 J	644	1110 J	1140 J	6300 J	744	23.5
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1060 J	1740 J	78.9	15.7	1330 J	239	395	437	2430 J	290	8.57
Total heptachlorodibenzofuran (HpCDF)	pg/g	367 J	166 J	169 J	76.2 J	325 J	119 J	150 J	161 J	399 J	134 J	84 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1270 J	357 J	797 J	376 J	862 J	431 J	422 J	436 J	424 J	510 J	425 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	411 J	468 J	99.1 J	42.1 J	470 J	92.5 J	125 J	132 J	1110 J	118 J	51.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	169 J	62 J	112 J	65.7 J	134 J	77.7 J	81.1 J	75.1 J	68.7 J	88.5 J	96 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	380 J	499 J	80.7 J	28.2 J	606 J	87.5 J	129 J	126 J	989 J	99.8 J	44.4 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	38 J	32.5 J	20.4 J	14.4 J	36.3 J	20.9 J	19.9 J	17.4 J	40.7 J	15.8 J	28.8 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	5720 J	9170 J	411 J	85.2 J	7030 J	1310 J	2240 J	2240 J	12400 J	1460 J	81.1 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1190 J	1930 J	96.4 J	25.6 J	1480 J	279 J	449 J	495 J	2710 J	331 J	31.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**1440 J**	**2320 J**	120 J	27.0 J	**1800 J**	**324 J**	**535 J**	**581 J**	**3270 J**	**388 J**	19.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**1440 J**	**2320 J**	120 J	27.0 J	**1800 J**	**324 J**	**535 J**	**581 J**	**3270 J**	**388 J**	19.1 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

	Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-AI5, NC-AI6	NC-A1	NC-A2	NC-A3	NC-B1	NC-C1	NC-F1	NC-F2	NC-G1	NC-H1	NC-J1	NC-K1
Sample Identification:	Units	11215131-020222-S-SB-NC-O-48	11215131-121021-S-SS-NC-S-1	11215131-121021-S-SS-NC-S-2	11215131-121021-S-SS-NC-S-3	11215131-121021-S-JC-NC-S-4	11215131-121021-S-JC-NC-S-5	11215131-120721-S-JC-NC-S-6	11215131-120721-S-JC-NC-S-7	11215131-120721-S-SS-NC-S-8	11215131-120721-S-SS-NC-S-9	11215131-120921-S-JC-NC-S-10	11215131-120921-S-JC-NC-S-11
Sample Date:		02/02/2022	12/10/2021	12/10/2021	12/10/2021	12/10/2021	12/10/2021	12/07/2021	12/07/2021	12/07/2021	12/07/2021	12/09/2021	12/09/2021
Sample Type:		Overburden	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans													
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4370	660 J	634 J	682 J	2510 J	2170 J	50.4	772	404 J	126 J	565 J	532 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	8420	3630 J	5930 J	6070 J	6680 J	6170 J	1160	3110	12200 J	41500 J	5350 J	1860 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	180	169	169	149	258	146	13.5	195	198	93.1	173	80.5
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	496	258	354	334	470	477	85.5	247	502	453	381	131
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	26.6	50.5	54.5	43.2	70.1	21.2	1.8	64.4	63.4	33.8	57.9	17.2
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	118	413	455	324	521	128	4.38	545	530	246	522	132
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.4	1.82 J	2.75	2.4 J	3.88	3.45	1.11 J	2.41	2.32	2.05	2.74	1.68 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	31.2	103	111	78.6	131	32.7	1.29 J	136	128	59.2	122	33.5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	19.6	7.83	12.2	11	16.9	13.9	2.84	8.96	10.9	4.86	10.7	4.4 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.588 U	0.321 U	0.193 U	0.248 U	0.4 U	0.324 U	0.126 U	0.113 U	0.222 U	0.147 U	0.202 U	0.212 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	9.03	3.88	5.77	5.27	7.76	6.49	2.63	5.06	4.6	4.13	5.54	3.31
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	67.7	244	250	158	292	76.7	2.59	295	331	103	269	77.2
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.73	30.6	23.9	17.2	36	9.65	0.771 J	23.6	33.3	9.9	26	7.62
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	12.3	22.8	25.5	19.2	31	10.4	1.09 J	29.2	29.6	11.8	29.1	8.56
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	56.9	207 J+	180 J+	129 J+	229 J+	62.7 J+	2.03 J+	189	266 J+	71.1 J+	201 J+	56.9 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1890 J	8110 J	6150 J	4610 J	9370 J	2440 J	44	5530 J	9470 J	2220 J	7040 J	1870 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	711	2900 J	2150 J	1560 J	3250 J	816	16.7	2020 J	3140 J	829 J	2480 J	655
Total heptachlorodibenzofuran (HpCDF)	pg/g	389 J	312	395	348	548	340	38.7 J	370 J	412 J	167 J	359	143
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1170 J	521	769	717	1010	1870	229 J	532 J	1670 J	1010 J	1180	344
Total hexachlorodibenzofuran (HxCDF)	pg/g	290 J	653	738	542	874	275	20.2 J	854 J	835 J	373 J	822	223
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	217 J	72.4	97.8	89.2	150	179	55.7 J	82.5 J	147 J	77.8 J	128	71.5
Total pentachlorodibenzofuran (PeCDF)	pg/g	246 J	703	683	473	848	252	14 J	751 J	941 J	272 J	744	215
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	48.2 J	47.6	40.3	32.5	65.9	27.9	9.7 J	40.6 J	54.3 J	19.7 J	44	19.3
Total tetrachlorodibenzofuran (TCDF)	pg/g	3770 J	15800	11700	9050	18100	4700	88.2 J	10700 J	18300 J	4260 J	13600	3640
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	812 J	3120	2340	1720	3540	900	33.6 J	2200 J	3480 J	910 J	2710	727
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**959 J**	**3870 J**	**2920 J**	**2130 J**	**4380 J**	**1120 J**	25.3 J	**2740 J**	**4290 J**	**1140 J**	**3360 J**	**890 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**959 J**	**3870 J**	**2920 J**	**2130 J**	**4380 J**	**1120 J**	25.3 J	**2740 J**	**4290 J**	**1140 J**	**3360 J**	**890 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-L1	NC-M1	NC-N1	NC-P3	NC-T1	NC-U1	NC-V1	NC-W1	NC-AD1	NC-AE1	NC-AE2
Sample Identification:	Units	11215131-120921-S-SS-NC-S-12	11215131-120921-S-SS-NC-S-13	11215131-120921-S-SS-NC-S-14	11215131-121421-S-BN-NC-S-15	11215131-121321-S-BN-NC-S-16	11215131-121321-S-BN-NC-S-17	11215131-121321-S-BN-NC-S-18	11215131-121321-S-SS-NC-S-19	11215131-011022-S-BN-NC-S-20	11215131-011122-S-BN-NC-S-21	11215131-011122-S-BN-NC-S-22
Sample Date:		12/09/2021	12/09/2021	12/09/2021	12/14/2021	12/13/2021	12/13/2021	12/13/2021	12/13/2021	01/10/2022	01/11/2022	01/11/2022
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	80.1	111	1320	1050	355	1110	3310	1900	82.3	99.4	2550
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1340 J	1650 J	5170 J	8830 J	3530	5010	4460	5950	1240	1680	31900 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	23.7	25.2	413	118	62.4	131	126	114	21.2	96.3	499
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	105	119	388	970	236	371	311	485	96.5	109	666
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	4.58	2.56	165	20.2	13.6	12.5	14.9	20.3	2.74	37.8	174
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	19.5	7.5	855	125	97.7	54.2	47.7	101	10.8	348	1470
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.1 J	1.11 J	3.29	4.9	2.16 J	2.89	4.14	5.12	1.29 J	1.38 J	3.91 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.48	2.39 J	179	31.4	25.7	15.7	13.3	26.6	2.37 J	88.5	352
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.96	3.65	13.3	18.6	8.48	16.8	13.5	17	3.62	4.09	20.6
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.149 U	0.103 U	0.199 U	0.713 U	0.406 U	0.254 U	0.466 U	0.365 U	0.44 U	0.61 U	1.22 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.19 J	2.48	7.15	8.06	4.1	10.3	7.71	8.67	2.28 J	2.66	8.47
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	8.2	4.19	166	73.6	62.2	37.5	28.7	64.1	7.14	209	791
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.41 J	0.839 J	13.7	5.04 J	6.13	6.64	5.84	7.03	0.907 J	16.2	60.6
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.04 J	1.32 J	27.4	9.34	7.37	6.92	6.75	9.62	1.46 J	19.8	72.5
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.43 J+	3.17 J+	99.9 J+	52.2	44.7 J+	30.7 J+	28 J+	53.5 J+	3.8 J+	146 J+	577 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	177	73.1	3170 J	1650 J	1390 J	911	904	1530 J	87.7	4830 J	18700 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	66.3	27	1190 J	414	516	339	297	542	33.2	1600 J	6700 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	65.4	70.1	797	318	157	378	273	276	55.9 J	173 J	1000 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	266	326	868	3780	566	831	772	1560	254 J	231 J	1580 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	47.4	30.7	1230	264	183	179	151	226	32.7 J	543 J	2280 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	60	46.5	130	324	84	154	149	267	60.5 J	48.1 J	177 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	28.3	18.4	426	230	176	131	128	216	21.5 J	571 J	2160 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.61	7.07	34.3	25.6	18.5	33.4	32.1	37.5	10 J	35.9 J	100 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	336	145	6110	3160	2770	1770	1770	2930	162 J	9190 J	35700 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	80.7	34.3	1300	466	574	391	342	609	52.2 J	1780 J	7410 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	92.7 J	40.1 J	**1680 J**	**636 J**	**695 J**	**465 J**	**419 J**	**745 J**	48.0 J	**2200 J**	**9040 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	92.7 J	40.1 J	**1680 J**	**636 J**	**695 J**	**465 J**	**419 J**	**745 J**	48.0 J	**2200 J**	**9040 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-AF1	NC-AB1	NC-AB2	NC-AG1	NC-AA2	NC-AH1	NC-AI1	NC-AA1	NC-AC2	NC-AD3	NC-AC4
Sample Identification:	Units	11215131-011022-S-BN-NC-S-23	11215131-011122-S-BN-NC-S-24	11215131-011122-S-BN-NC-S-25	11215131-010822-S-BN-NC-S-26	11215131-011122-S-BN-NC-S-27	11215131-010822-S-BN-NC-S-28	11215131-010822-S-BN-NC-S-29	11215131-011122-S-BN-NC-S-30	11215131-011022-S-BN-NC-S-31	11215131-011022-S-BN-NC-S-32	11215131-012222-S-BN-NC-S-33
Sample Date:		01/10/2022	01/11/2022	01/11/2022	01/08/2022	01/11/2022	01/08/2022	01/08/2022	01/11/2022	01/10/2022	01/10/2022	01/22/2022
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	111	293	60.2	423	630	953	1290	329	1560	71.6	905
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	6690	2000	1000	4300	2740	4840	3010	1970	5950	1250	6020
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	155	58.4	48.4	91.3	70.7	104	89.1	45.4	181	15.5	257
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	169	145	66.7	274	190	336	198	116	416	89.6	452
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	69.3	11.8	17	21.5	12.7	19.4	16.8	7.68	40.8	1.75 J	84.3
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	638	87.6	141	155	78.2	116	111	48.9	344	5	733
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.58 J	1.84 J	1 J	2.06 J	1.84 J	2.91	2.45	2.53	2.95	0.983 J	2.21
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	158	22.7	38	40.5	23.6	33.6	29.7	13	87.6	1.45 J	191
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.85	6.24	2.36 J	9.36	6.87	13.4	8.79	4.22	14.7	3.58 J	13.2
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.04 U	0.482 U	0.743 U	0.71 U	0.514 U	0.823 U	0.611 U	0.574 U	0.714 U	0.482 U	0.384 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.42	3.68	1.43 J	5.51	3.66	7.39	5.41	3.64	6.94	2.28 J	5.43
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	390	58.4	93.1	96.2	52.6	74.6	71.2	31.4	241	2.57 J	483
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	19.8	6.66	11	8.94	5.05	7.5	7.23	3.01	19.5	0.825 J	53.9
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	31.5	5.91	7.14	9.22	7.16	8.88	7.92	3.52	20.7	1.09 J	43.9
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	226 J+	48.1 J+	76.9 J+	72.3 J+	40.3 J+	55.9 J+	51.8 J+	24.2 J+	190 J+	2.54 J	401
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	5500 J	1760 J	2970 J	2450 J	1420 J	1960 J	1680 J	647	5650 J	51.2	15400 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1930 J	654	1080 J	852	461	670	608	242	2040 J	18.2	5570 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	291 J	128 J	88.2 J	214 J	153 J	239 J	176 J	82.8 J	372 J	41 J	501 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	368 J	347 J	159 J	630 J	432 J	765 J	464 J	305 J	880 J	258 J	873 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	965 J	163 J	222 J	274 J	165 J	246 J	213 J	89.8 J	590 J	23.3 J	1170 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	70.3 J	72.9 J	40.7 J	96.1 J	68.5 J	159 J	100 J	66.8 J	128 J	50 J	121 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	930 J	178 J	268 J	279 J	159 J	230 J	214 J	92.9 J	708 J	14.8 J	1400 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	36.2 J	17 J	21.6 J	22.6 J	16.7 J	31.3 J	24.3 J	13.2 J	43.9 J	9.57 J	86.7 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	10400 J	3400 J	5730 J	4700 J	2730 J	3870 J	3290 J	1270 J	11100 J	98.1 J	29700 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2110 J	739 J	1210 J	958 J	524 J	764 J	682 J	273 J	2250 J	22.8 J	6260 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	2670 J	868 J	1430 J	1160 J	638 J	917 J	822 J	328 J	2750 J	27.9 J	7410 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	2670 J	869 J	1430 J	1160 J	638 J	917 J	822 J	328 J	2750 J	27.9 J	7410 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

	Overburden and excavation bottoms sample exceed
Bold	240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central	North Central
Sample Location:		NC-AE4	NC-AE5	NC-AF3	NC-AB4	NC-AG3	NC-AH3	NC-AA4	NC-AC5	NC-AC7	NC-AC8	NC-AF7
Sample Identification:	Units	11215131-012222-S-BN-NC-S-34	11215131-012222-S-BN-NC-S-35	11215131-012122-S-BN-NC-S-36	11215131-012222-S-BN-NC-S-37	11215131-012122-S-BN-NC-S-38	11215131-012122-S-BN-NC-S-39	11215131-012222-S-BN-NC-S-40	11215131-012222-S-BN-NC-S-41	11215131-020222-S-SB-NC-S-42	11215131-020222-S-SB-NC-S-43	11215131-020222-S-SB-NC-S-44
Sample Date:		01/22/2022	01/22/2022	01/21/2022	01/22/2022	01/21/2022	01/21/2022	01/22/2022	01/22/2022	02/02/2022	02/02/2022	02/02/2022
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	102	13.5	450	2360	303	1500	500	137	309	4740	118
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2930	949	9320 J	4520	4710	3530	4350	2110	2010	7280	1900
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	24.1	4.42	94	205	112	137	122	63.3	43.6	454	120
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	160	46.3	324	295	349	232	288	138	149	490	116
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	4.07	0.478 U	17.6	37.1	24.4	19.5	25.5	6.36	8.62	129	48
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.76	0.769 J	112	247	160	136	195	43.5	44.9	782	406
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.7 J	0.926 J	3.06	2.79	3.45	2.06 J	2.57	1.53 J	2 J	4.82	0.841 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.29	0.304 U	34.3	69.3	45.3	38	51.8	10.4	10.6	187	88.8
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.81	1.55 J	10.4	10.2	15.3	7.64	8.79	5.78	4.95	18.4	3.48
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.364 U	0.417 U	0.386 U	0.518 U	0.389 U	0.508 U	0.526 U	0.507 U	0.289 U	0.655 U	0.867 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.19	1.7 J	5.63	5.53	7.62	3.9	4.97	3.61 J	3.97	9.1	1.81 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.07 J	0.68 U	73.1	143	90.5	77	119	22.9	29.7	230	201
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.514 J	0.455 U	5.94	15.5	9.89	8.1	10.6	2.57	3.68	23.1	9.29
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.45 J	0.351 U	9.86	15.8	13.5	9.66	14.4	4.15	3.8	29.3	18.8
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.42 J	0.69 U	54.8 J+	119	70.5	61.5	96.5	18.2	21.7	170	109 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	9.63	3.7	1490 J	3980 J	2060 J	1980 J	3110 J	470	695	5800 J	2540 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2.61	1.35	535	1390 J	739 J	709	1020 J	176	261	2110 J	743
Total heptachlorodibenzofuran (HpCDF)	pg/g	75.5 J	7.51 J	221 J	379 J	258 J	236 J	266 J	136 J	109 J	811 J	223 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	574 J	144 J	730 J	817 J	814 J	550 J	720 J	354 J	351 J	1080 J	276 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	34.2 J	3.2 J	252 J	444 J	326 J	253 J	355 J	102 J	92 J	1220 J	599 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	72.5 J	35.8 J	110 J	120 J	155 J	102 J	92.6 J	97 J	63.9 J	183 J	33.1 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	14.1 J	0.81 J	231 J	436 J	293 J	240 J	353 J	71.2 J	88.5 J	685 J	469 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.46 J	4.81 J	19.3 J	38.3 J	44.5 J	27.1 J	25.7 J	19.4 J	13.9 J	61.1 J	11.1 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	22.1 J	12 J	2890 J	7630 J	4080 J	3910 J	6110 J	911 J	1330 J	11400 J	4950 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.23 J	5.34 J	605 J	1570 J	843 J	808 J	1160 J	203 J	296 J	2360 J	824 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	8.96 J	3.01 J	**733 J**	**1890 J**	**1010 J**	**961 J**	**1410 J**	**241 J**	**351 J**	**2890 J**	**1100 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	8.97 J	3.41 J	**733 J**	**1890 J**	**1010 J**	**961 J**	**1410 J**	**241 J**	**351 J**	**2890 J**	**1100 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold (shaded) — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE – Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		North Central	North Central	North Central	North Central	North Central	North Central	Northeast	Northeast	Northeast	Northeast
Sample Location:		NC-AH5	NC-AI5	NC-AA6	NC-AC13	NC-AF8	NC-AI7	NE-F1, NE-F2, NE-F3, NE-G1, NE-G2, NE-G3	NE-F1, NE-F2, NE-F3, NE-G1, NE-G2, NE-G3	NE-H1, NE-H2, NE-H3, NE-H4, NE-I1, NE-I2	NE-K1, NE-K2
Sample Identification:	Units	11215131-020222-S-SB-NC-S-45	11215131-020222-S-SB-NC-S-46	11215131-020222-S-SB-NC-S-47	11215131-021822-S-SB-NC-S-48	11215131-021722-S-SB-NC-S-49	11215131-021922-S-SB-NC-S-50	11215131-120121-S-JC-NE-B-1	11215131-120121-S-JC-NE-B-1H	11215131-120121-S-SPS-NE-B-2	11215131-121621-S-BN-NE-B-3
Sample Date:		02/02/2022	02/02/2022	02/02/2022	02/18/2022	02/17/2022	02/19/2022	12/01/2021	12/01/2021	12/01/2021	12/16/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	170	1230	814	841	989	5.71	1410	14.7	1750	7540
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	3390	2000	4600	3410	42100 J	592	1440	2100	6550	6250
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	40.7	51.1	141	154	137	2.8	57.1	5.87	75	232
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	279	125	353	259	2510	28.3	77.9	79.8	165	462
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	4.22	7.56	31.3	5.68 U	15.6	0.627 J	6.38	0.284 U	5.79	29.4
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	23.2	39.4	192	255	8.98	4.7	6.38	1.02 J	5.86	53.4
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.12 J	0.932 U	3.72	2.13 J	9.34	0.359 J	0.746 J	1.66 J	1.65 J	3.7
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.5	9.75	51.7	66.9	2.75	1.33 J	1.9 J	0.844 J	2.21 J	15.6
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.11	4.29	12.5	9.96	30.1	0.75 J	3.05	2.46	4.76	16.1
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.66 U	0.776 U	0.327 U	0.326 U	0.194 U	0.173 U	0.463 U	0.277 U	0.655 U	1.62 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.28	2.42 J	7.18	4.09 J	13.7	1.91 J	2.11 J	3.27	2.9	7.56 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	14.4	23.3	110	153	2.61	2.93 J	4.68	0.712 J	3.65 J	33.2
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.9 J	2.2 J	14.4	17.8	2.89	0.551 J	0.893 J	0.75 J	1.32 J	6.23
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.52	3.45	12	15.9	3.79	0.518 J	1.35 J	0.803 J	1.81 J	9.71
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	12 J+	20.9 J+	91.9	126	2.62	2.76 J+	5.34 J+	0.933 J	5.55 J+	35.2 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	339	775	3460 J	4440 J	42.3	88.4	196	4.97	196	1400 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	88.7	213	1240 J	1610 J	16.2	33.7	45.5	1.87	44.1	351
Total heptachlorodibenzofuran (HpCDF)	pg/g	115 J	99 J	325 J	289 J	697 J	5.67 J	96.8 J	8.23 J	135 J	488 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	663 J	301 J	812 J	594 J	22600 J	84.7 J	210 J	225 J	425 J	998 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	72.8 J	82 J	358 J	444 J	131 J	9.51 J	30 J	9.5 J	38.8 J	212 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	83.7 J	69 J	127 J	105 J	833 J	57.7 J	52.9 J	71.2 J	73.4 J	157 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	62.3 J	85.4 J	337 J	460 J	22 J	9.8 J	33.7 J	11.8 J	37.8 J	184 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	11.7 J	11.6 J	33.5 J	40.8 J	26.5 J	10.2 J	10.4 J	13.9 J	11.8 J	35 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	663 J	1480 J	6680 J	8310 J	818 J	177 J	389 J	19.7 J	397 J	2460 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	101 J	240 J	1380 J	1800 J	23.5 J	44.7 J	59.4 J	10.7 J	56.7 J	399 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	138 J	**308 J**	**1670 J**	**2150 J**	70.6 J	45.5 J	71.6 J	5.92 J	73.7 J	**531 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	138 J	**308 J**	**1670 J**	**2160 J**	70.6 J	45.5 J	71.6 J	5.93 J	73.7 J	**531 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast
Sample Location:		NE-K1, NE-K2	NE-M1, NE-M2, NE-M3	NE-M1, NE-M2, NE-M3	NE-L2, NE-L3, NE-L4	NE-A1, NE-A2	NE-B1, NE-B2, NE-B3	NE-C1, NE-C2, NE-C3, NE-C4	NE-D1, NE-D2	NE-E1, NE-E2, NE-E3	NE-F1, NE-F2, NE-F3	NE-G1, NE-G2, NE-G3, NE-G4
Sample Identification:	Units	11215131-121621-S-BN-NE-B-3H	11215131-121721-S-BN-NE-B-4	11215131-121721-S-BN-NE-B-4H	11215131-020522-S-SB-NE-B-5	11215131-113021-S-JC-NE-O-1	11215131-113021-S-JC-NE-O-2	11215131-120121-S-JC-NE-O-3	11215131-113021-S-SPS-NE-O-4	11215131-113021-S-SPS-NE-O-5	11215131-120121-S-JC-NE-O-6	11215131-120121-S-JC-NE-O-7
Sample Date:		12/16/2021	12/17/2021	12/17/2021	02/05/2022	11/30/2021	11/30/2021	12/01/2021	11/30/2021	11/30/2021	12/01/2021	12/01/2021
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1680	4700	6200	5950	87	198	90	146	72.6	64	33.4
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2240	7360	5420	4590	3390	12900 J	8790	4330	2880	67600 J	26800 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	69.1	131	159	171	38.6	59.3	27.2	47.8	48.1	21.5	10.2
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	97.9	555	340	283	341	1000	248	326	235	1100	268
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	4.6	16	16.6	17.6	2.54	5.05	2.49	3.85	2.15 J	1.54 J	0.998 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.71	17.5	25.2	26	2.59	3.83	1.79 J	2.7	1.98 J	1.56 U	1.06 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.27 J	4.51	3.93	4.08	1.88 J	3.12 J	1.7 J	2.07 J	1.63 J	3.99	2.18 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.38 J	6.56	7.85	9.5	1.75 J	2.58	1.5 J	2.29 J	2.55	1.33 U	0.88 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.25	19.3	16.6	14.6	8.34	15.3	5.84	9.11	6.49	6.99	4.13
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.339 U	1.37 U	0.602 U	0.577 U	0.436 U	0.654 U	0.397 U	0.566 U	0.551 U	1.59 U	0.277 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.48	10.9	9.58	8.41	4.19	7.89	3.47	4.69	3.07	6.53 J	4.07
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	4.49	11.7	15.7	17.3	1.36 J	1.85 J	0.754 J	1.01 J	0.9 J	1.37 U	0.488 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.51 J	4.04	4.92	4.62 J	0.936 J	1.23 J	0.805 J	1.21 J	0.677 J	1.86 U	0.81 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.95 J	6.35	6.7	8.77	2.54	3.84	1.92 J	3.35	2.28 J	1.39 J	0.872 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5.65 J+	16 J+	20.2 J+	23.1	2.78 J+	5.12 J+	1.6 J	2.87 J+	2.36 J	1.43 U	1.23 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	198	533	724	741	3.29	12.9	3.79	3.52	3.75	5.04	3.13
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	57.8	116	229	239	0.498 J	2.19	0.811	0.446 J	0.594	1.71 U	0.573 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	113 J	302 J	348 J	332 J	105 J	219 J	90.4 J	152 J	117 J	63.5 J	26.6 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	262 J	1160 J	776 J	677 J	767 J	1910 J	591 J	685 J	500 J	2360 J	624 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	39.8 J	129 J	147 J	150 J	40.3 J	73.8 J	33.4 J	58.9 J	44.8 J	23.5 J	13.7 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	68.4 J	181 J	177 J	172 J	87.5 J	119 J	55.6 J	74.4 J	57.1 J	74 J	47.6 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	37.2 J	111 J	125 J	142 J	26.1 J	52.7 J	16.3 J	28.4 J	22.3 J	5.66 J	9.95 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	14.6 J	35.5 J	38.7 J	41.7 J	10.8 J	12.4 J	7.53 J	9.14 J	7.62 J	1.86 U	5.92 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	407 J	1060 J	1460 J	1510 J	28 J	67 J	16.9 J	22.2 J	23.4 J	11.1 J	11.9 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	75.8 J	143 J	279 J	294 J	3.66 J	5.14 J	1.67 J	1.53 J	2.08 J	1.71 U	1.01 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	85.8 J	196 J	**328 J**	**340 J**	9.63 J	24.5 J	9.56 J	10.4 J	7.92 J	33.9 J	14.2 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	85.9 J	196 J	**329 J**	**340 J**	9.65 J	24.6 J	9.58 J	10.5 J	7.95 J	36.2 J	14.3 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast
Sample Location:		NE-H1, NE-H2, NE-H3, NE-H4	NE-I1, NE-I2, NE-I3	NE-J1, NE-J2	NE-K1, NE-K2	NE-M1, NE-M2, NE-M3	NE-L2, NE-L3, NE-L4	NE-L2, NE-L3, NE-L4	NE-A1	NE-A2	NE-B3	NE-C1
Sample Identification:	Units	11215131-120121-S-SPS-NE-O-8	11215131-120121-S-SPS-NE-O-9	11215131-121621-S-BN-NE-O-10	11215131-121621-S-BN-NE-O-11	11215131-121721-S-BN-NE-O-12	11215131-020522-S-SB-NE-O-13	11215131-020522-S-SB-NE-O-14	11215131-113021-S-JC-NE-S-1	11215131-113021-S-JC-NE-S-2	11215131-113021-S-JC-NE-S-3	11215131-120121-S-JC-NE-S-4
Sample Date:		12/01/2021	12/01/2021	12/16/2021	12/16/2021	12/17/2021	02/05/2022	02/05/2022	11/30/2021	11/30/2021	11/30/2021	12/01/2021
Sample Type:		Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	186	69.3	1100	128	109	85.8	533	165	2690	8940 J	3010
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	12300 J	108000 J	7110	7580	15100 J	12600 J	9860	5670	3840	9310 J	6360 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	34.5	16	156	37.9	61.2	22.9	70.9	55.3	84.7	486	135
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	440	722	647	284	476	274	696	517	295	663	561
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	4.12 J	1.45 J	10.8	3.91 J	3.06	1.46 J	5.39	3.77	11.1	31.9	14.8
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.81 J	1.22 J	5.58	4.26	2.05 J	1.87 J	7.15	2.76	25.9	65.5	25.1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.6 J	2.79	2.68	1.48 J	2.87 J	1.23 J	4.13	2.85	1.98 J	5.48 J	4.1
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.844 J	0.61 J	3.15	2.39 J	1.77 J	1.17 J	5.53	1.91	8.1	20	9.01
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.81	4.55	15.7	6.05	10.8	4.6 J	17.6	11.7	8.82	23.9	16.3
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.657 U	0.533 U	1.12 U	1.07 U	1.41 U	0.325 U	0.535 U	0.692 U	0.738 U	1.36 U	1.23 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.85 J	4.43	6.1	2.56 J	6.16	2.8	9.09	6.71	4.92	13.1	8.34
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.478 J	0.535 J	2.52	2.05 J	1.45 J	1.13 J	4.13	1.35 J	17.7	44.5	16.9
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.866 J	0.937 J	1.34 J	1.15 J	1.04 U	0.656 J	2.58	1.29 J	3.15	7.95	3.93
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.58 J	0.882 J	4.73 J	2.7	2.45 J	1.71 J	6.68	3.28	4.95	15.8	6.6
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.22 J	1.23 J	4.97 J+	3.28	2.29 J	1.74 J	6.85	3.2	18.3 J+	48.2 J+	19.2 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3.44	2.52	99.5	10.9	3.46 J	5.11	65	5.24	636 J	1620 J	589 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.277 J	0.313 U	22.9	1.5 J	0.851 U	0.386 U	20.5	1.21 J	166	425	151
Total heptachlorodibenzofuran (HpCDF)	pg/g	140 J	58.8 J	432 J	129 J	162 J	81.7 J	192 J	180 J	203 J	998 J	347 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	809 J	1570 J	1900 J	624 J	1030 J	542 J	1380 J	1120 J	638 J	1370 J	1320 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	32.3 J	18.4 J	133 J	48.5 J	56 J	28 J	97.6 J	62.5 J	102 J	340 J	150 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	54.9 J	58.3 J	179 J	53 J	96.9 J	45.6 J	169 J	115 J	96.5 J	270 J	150 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	10.1 J	11 J	55 J	30.9 J	19.7 J	16 J	66.5 J	32.4 J	95.1 J	279 J	113 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.7 J	5.38 J	19.2 J	8.19 J	3.68 J	4.97 J	30.2 J	11.9 J	19.8 J	58.3 J	26.4 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	11.1 J	10.8 J	192 J	50.2 J	19.8 J	15.9 J	189 J	36.1 J	1200 J	2960 J	1190 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.31 J	0.313 U	27.5 J	1.5 J	1.23 J	0.386 U	41.2 J	3.81 J	194 J	501 J	176 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	11.8 J	42.8 J	50.2 J	12.3 J	13.7 J	9.85 J	47.6	14.5 J	**250 J**	**642 J**	237 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	11.9 J	42.8 J	50.2 J	12.4 J	14.7 J	10.1 J	47.6	14.5 J	**250 J**	**642 J**	237 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast
Sample Location:		NE-C3	NE-E1	NE-E2	NE-F1	NE-G1	NE-G2	NE-H1	NE-H3	NE-I1	NE-I2	NE-J1
Sample Identification:	Units	11215131-120121-S-JC-NE-S-5	11215131-113021-S-SPS-NE-S-6	11215131-113021-S-SPS-NE-S-7	11215131-120121-S-JC-NE-S-8	11215131-120121-S-JC-NE-S-9	11215131-120121-S-JC-NE-S-10	11215131-120121-S-SPS-NE-S-11	11215131-120121-S-SPS-NE-S-12	11215131-120121-S-SPS-NE-S-13	11215131-120121-S-SPS-NE-S-14	11215131-121621-S-BN-NE-S-15
Sample Date:		12/01/2021	11/30/2021	11/30/2021	12/01/2021	12/01/2021	12/01/2021	12/01/2021	12/01/2021	12/01/2021	12/01/2021	12/16/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans													
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	49	124	203	534	198	1390	271	402	4340	29.4	101
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	4850	9210 J	6740	7450 J	2040	10500 J	4550	4820	38100 J	5020	4270
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	13.2	60.8	82.4	23.3	14.9	55.2	62.4	62	410	7.39 J	26
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	164	510	669	172	79.2	179	419	477	1730	152	328
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.32 J	5.16	5.06 J	4.3	2.83	7.26	8.1	4.13 J	28.1	0.979 J	2.74
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.982 J	4.69	4.42 J	3.15	12.2	6.78	28.7	5.54	28	3.42	1.71 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.09 J	3.04 J	3.63 J	1.62	0.988 J	1.8 J	3.74	2.1 J	6.24	0.792 U	2.61
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.846 J	5.6	3.31 J	1.4 J	3.69	2.34	9.29	4.88	14.9	1.18 J	1.18 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.5	12.5	14.9	4.17	2.42	5.24	11.3	9.96	32.6	2.44	6.71
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.525 U	1.46 J	1.31 U	0.135 U	0.0966 U	0.282 U	0.142 U	0.863 U	1.53 U	0.611 U	0.231 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.41 J	5.59 J	6.45 J	3.12	2.52	3.7	6.22	4.95 J	14.5	2.37 J	4.7
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.471 U	2.15	1.58 J	2.02	8.06	4.56	19	4.24	17.7	1.79 J	0.873 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.492 U	1.69	1.4 U	0.883 J	1.51 J	1.91	3.23	1.59 J	4.75	0.619 U	0.557 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.869 J	6.31	3.83 J	1.56	1.27 J	1.92	5.7	6.31	14	0.783 J	1.41 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.787 J	3.92	3.51 J	2.63 J+	7.03	5.46 J+	17.4	7.09 J+	22.8 J+	1.92 J	1.06 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3.71	10.4	5.36	65.7	226	182	485	45.5	525	22.1	17.5
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	0.979 J	1.79 J	1.31 U	20.6	86.3	56.7	191	10.1	136	5.46	5.75
Total heptachlorodibenzofuran (HpCDF)	pg/g	45.9 J	183 J	243 J	59.6 J	33.7 J	114 J	201 J	151 J	1480 J	20.8 J	81.5 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	392 J	1050 J	1410 J	397 J	209 J	420 J	885 J	891 J	3680 J	321 J	1200 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	15.6 J	78.4 J	76.5 J	26 J	28.2 J	38.8 J	113 J	76.7 J	362 J	14.5 J	27.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	61.6 J	118 J	142 J	54.4 J	62.6 J	67.1 J	108 J	91.9 J	257 J	31 J	119
Total pentachlorodibenzofuran (PeCDF)	pg/g	6.86 J	44.6 J	33.9 J	19.5 J	30.4 J	30.5 J	83.4 J	75.2 J	167 J	15.4 J	9.02 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.82 J	19.8 J	14.9 J	9.2 J	14.2 J	14.6 J	14.8 J	21.8 J	54.7 J	0.619 U	7.01 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	9.3 J	59.1 J	24.1 J	110 J	448 J	309 J	973 J	169 J	1140 J	54.5 J	40.6 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	4.75 J	6.99 J	1.31 U	28.4 J	109 J	67.9 J	216 J	19.1 J	182 J	9.4 J	10.9 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	5.91 J	18.2 J	14.9 J	34.8 J	117 J	86.7 J	**261**	28.9 J	**246 J**	12.4 J	15.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	6.19 J	18.2 J	16.4 J	34.8 J	117 J	86.8 J	**261**	28.9 J	**246 J**	12.8 J	15.1 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottoms sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Northeast	Northeast	Northeast	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		NE-K1	NE-L1	NE-M1	SC-A1, SC-A2, SC-A3, SC-A4, SC-A5	SC-A1, SC-A2, SC-A3, SC-A4, SC-A5	SC-B1, SC-B2, SC-B3, SC-B4, SC-B5	SC-B1, SC-B2, SC-B3, SC-B4, SC-B5	SC-C1, SC-C2, SC-C3, SC-E1, SC-E2	SC-D1, SC-D2, SC-D3, SC-D4, SC-E3	SC-F1, SC-F2, SC-F3, SC-F4, SC-F5
Sample Identification:	Units	11215131-121621-S-BN-NE-S-16	11215131-121721-S-BN-NE-S-17	11215131-121721-S-BN-NE-S-18	11215131-120621-S-JC-SC-B-1	11215131-120621-S-JC-SC-B-1H	11215131-120621-S-SS-SC-B-2	11215131-120621-S-SS-SC-B-2H	11215131-120721-S-JC-SC-B-3	11215131-120721-S-SS-SC-B-4	11215131-120421-S-JC-SC-B-5
Sample Date:		12/16/2021	12/17/2021	12/17/2021	12/06/2021	12/06/2021	12/06/2021	12/06/2021	12/07/2021	12/07/2021	12/04/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	256	3250	1760	966	6130	9.85	0.634 U	5880	18.6	9.69
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	8980	13500 J	15900 J	61800 J	24400 J	658	347	10900 J	527	507 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	27.4	188	77.6	915	1720 J+	13.5	0.518 J+	492	3.63	3.2
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	274	527	274	3740	1610	46.2	14.4 J	758	24.8	30.5
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	4.03	33.2	7.42	200	615	7.02	0.517 U	118	0.826 J	0.817 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.09	222	15.4	1640	5020 J	63.9	0.366 U	960	7.62	6.6
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.08 J	3.94	3.16	28.3	11.5	0.659 J	0.614 U	5.47	0.495 J	0.334 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.48 J	60.6	4.87	451	1270	15.2	0.322 U	254	1.79 J	1.54 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.16	17.8	9.07	136	58.8	1.38 J	0.591 J	29.1	0.914 J	0.892 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.192 U	0.345 U	0.254 U	0.592 U	2.23 U	0.205 U	0.499 U	0.718 U	0.17 U	0.224 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.88	9.31	5.57	53.7	20.1	1.54 J	1.07 J	12.6	1.25 J	1.54 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.81 J	160	9.47	1070	2760	30.4	0.363 U	566	4.8	4.03
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.891 J	20.2	2.75	115	235	2.97	0.472 U	48.7	0.579 J	0.607 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.5 J	18.2	3.58	121	285	3.6	0.493 U	59.4	0.47 J	0.497 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2.41 J+	132 J+	10.5 J+	864 J+	1960 J+	26.2 J+	0.418 U	426 J+	3.07 J+	3.01
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	49.9	4620 J	329	28500 J	68200 J	725	9.34	13600 J	63.2	104
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	15.4	1760 J	111	10500 J	24000 J	268	3.53	4610 J	23.5	37.4
Total heptachlorodibenzofuran (HpCDF)	pg/g	68.6 J	417 J	175 J	2070	3170 J	25.8 J	0.518 J	934 J	5.99 J	6.66
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	611 J	1160 J	633 J	7970	3200 J	143 J	90 J	1610 J	85.7 J	91.7
Total hexachlorodibenzofuran (HxCDF)	pg/g	26.1 J	448 J	78.2 J	3130	7870 J	99.3 J	0.408 U	1620 J	12.3 J	11.4
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	59.3	193	90.6	1070	463 J	53.8 J	46.9 J	250 J	35.1 J	30.6
Total pentachlorodibenzofuran (PeCDF)	pg/g	16.6 J	513 J	62.1 J	3280	7400 J	93.3 J	0.389 U	1640 J	12.1 J	10.5
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.54 J	56.3 J	17.7 J	266	341 J	13.3 J	9.81 J	105 J	6.8 J	5.43
Total tetrachlorodibenzofuran (TCDF)	pg/g	90.7 J	8890 J	679 J	53900	125000 J	1470 J	15.2 J	26100 J	126 J	208
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	19.2 J	1980 J	131 J	11800	27000 J	310 J	12.6 J	5190 J	31.7 J	45.3
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	29.6 J	2330 J	163 J	**14100 J**	**32400 J**	**362 J**	4.88 J	**6310 J**	33.2 J	51.0 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	29.6 J	**2330 J**	163 J	**14100 J**	**32400 J**	**362 J**	5.30 J	**6310 J**	33.2 J	51.1 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SC-I1, SC-I2, SC-I3, SC-J1, SC-J2, SC-J3	SC-I1, SC-I2, SC-I3, SC-J1, SC-J2, SC-J3	SC-K1, SC-K2, SC-K3, SC-K4	SC-K1, SC-K2, SC-K3, SC-K4	SC-N1, SC-N2, SC-N3, SC-N4, SC-N5	SC-N6	SC-N6	SC-N1, SC-N2, SC-N3, SC-N4, SC-N5	SC-O1, SC-O2	SC-P1, SC-P2, SC-P3
Sample Identification:	Units	11215131-120621-S-SS-SC-B-6	11215131-120621-S-SS-SC-B-6H	11215131-120421-S-SS-SC-B-7	11215131-120421-S-SS-SC-B-7H	11215131-122121-S-BN-SC-B-8	11215131-011222-S-BN-SC-B-8A	11215131-011222-S-BN-SC-B-8aH	11215131-122121-S-BN-SC-B-8H	11215131-122021-S-BN-SC-B-9	11215131-122021-S-BN-SC-B-10
Sample Date:		12/06/2021	12/06/2021	12/04/2021	12/04/2021	12/21/2021	01/12/2022	01/12/2022	12/21/2021	12/20/2021	12/20/2021
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	92.5	0.897 U	1420 J	7840	320	1.4 J	0.349 U	604	9760	1.16 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1040	311	18200 J	6620	24700 J	590	450	31100 J	7720	448
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	161	0.513 J+	1850	310 J+	189	0.815 J	0.0992 U	338	515	1.07 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	67.5	16.6	1270	469	1270	30.5	22.7	1680	537	20.9
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	76.3	0.476 U	522 J	54.8	15.5	0.44 U	0.147 U	51.7	127	0.261 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	452	0.307 U	4260	291	14.6	1.06 J	0.232 J	321	951	1.42 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.757 J	0.64 U	5.65	5.97	7.35	0.661 J	0.411 J	9.67	4.74	0.454 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	106	0.302 U	1090	80.7	14.3	0.562 J	0.146 U	91.5	245	0.379 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.14 J	0.619 U	33.7	18.8	41.1	0.993 J	0.774 J	57	20.7	0.693 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.375 U	0.396 U	2.75 U	1.21 U	0.582 U	0.336 U	0.164 U	0.861 U	0.954 U	0.298 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.78 J	0.517 J	11.1	9.25	16.8	1.73 J	1.45 J	24.7	10.2	1.32 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	102	0.457 U	2250	166	3.87	1.26 J	0.321 J	208	500	0.675 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	11.3	0.402 U	213	21.4	3.76 J	0.52 U	0.401 J	26.8	28.2	0.567 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	14.1	0.461 U	213 J	20.2	11.2	0.287 U	0.146 U	33.4	49	0.375 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	78.3 J+	0.452 U	1760 J+	151	11.7 J+	0.875 J	0.228 U	176	280	0.554 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	3020 J	14	57200 J	5820 J	23.1	22.1	2.58	5680 J	8400 J	16.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1080 J	5.32	21300 J	1980 J	6.23	7.15	1.13	2080 J	2260 J	5.17
Total heptachlorodibenzofuran (HpCDF)	pg/g	277 J	1.29 J	2940 J	595 J	552 J	1.3 J	0.12 U	880 J	960 J	1.37 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	184 J	64.6 J	2530 J	1250 J	2860 J	98.4 J	72.7 J	3630 J	1190 J	86.2 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	644 J	0.358 U	6490 J	602 J	325 J	2.3 J	0.232 J	831 J	1610 J	2.2 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	69.5 J	32.3 J	232 J	237 J	328 J	26 J	26.4 J	472 J	203 J	35.8 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	288 J	0.454 U	6200 J	584 J	164 J	5.03 J	0.321 J	794 J	1270 J	2.11 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	27 J	5.92 J	288 J	61.2 J	36.8 J	4.88 J	4.53 J	86.3 J	69.6 J	5.39 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	5930 J	28.1 J	99600 J	11700 J	140 J	68.5 J	8.67 J	11300 J	16500 J	32.4 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1230 J	14.5 J	23800 J	2260 J	29.3 J	9.97 J	5.21 J	2370 J	2540 J	14.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**1480 J**	7.04 J	**28400 J**	**2690 J**	48.7 J	10.7 J	2.45 J	**2820 J**	**3370 J**	7.77 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**1480 J**	7.45 J	**28400 J**	**2690 J**	48.7 J	10.9 J	2.51 J	**2820 J**	**3370 J**	8.09 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold	Overburden and excavation bottoms sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SC-Q1, SC-Q2, SC-Q3, SC-Q4, SC-Q5	SC-Q1, SC-Q2, SC-Q3, SC-Q4, SC-Q5	SC-P4, SC-P5, SC-P6	SC-Q5, SC-Q6, SC-Q7	SC-Q5, SC-Q6, SC-Q7	SC-P7, SC-P8, SC-P9	SC-Q8, SC-Q9, SC-Q10, SC-Q11, SC-Q12	SC-Q8, SC-Q9, SC-Q10, SC-Q11, SC-Q12	SC-Q8, SC-Q9, SC-Q10, SC-Q11, SC-Q12	SCW-QR1
Sample Identification:	Units	11215131-122021-S-BN-SC-B-11	11215131-122021-S-BN-SC-B-11H	11215131-011222-S-BN-SC-B-12	11215131-011222-S-BN-SC-B-13	11215131-011222-S-BN-SC-B-13H	11215131-020622-S-SB-SC-B-14	11215131-020622-S-SB-SC-B-15	11215131-020622-S-SB-DUP-16	11215131-020622-S-SB-SC-B-15H	11215131-020622-S-SB-SC-B-16
Sample Date:		12/20/2021	12/20/2021	01/12/2022	01/12/2022	01/12/2022	02/06/2022	02/06/2022	02/06/2022	02/06/2022	02/06/2022
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Duplicate	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	636	2300	0.851 U	1340	2210	1.95 U	3200	3360	1320	2660
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	14600 J	2690	345	9620	2390	386	8540	8580	1650	3330
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	524	119	0.178 U	1230	94.1	0.233 U	566	533	64.2	360
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1390	175	15	620	173	18	778	844	112	255
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	167	18.7	0.314 U	513	18.5	0.407 U	202	176	12.9	122
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1510	108	0.24 U	4630	86.2	0.255 U	1730	1620	69.4	991
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.95	1.64 J	0.33 U	3.98	1.66 J	0.376 J	5.32	7.51	1.17 J	2.47 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	380	29.9	0.218 U	1100	21.5	0.208 U	418	403	14.8	221
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	27.5	7.84	0.3 U	20.9	6.75	0.699 J	22	22.6	4.26	9.41
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.903 U	0.315 U	0.288 U	1.07 U	0.308 U	0.289 U	0.594 U	0.567 U	0.381 U	0.562 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	12.5	4.21	0.353 U	7.13	3.67	0.969 J	12.9	11.9	3.31	4.77
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1040	60.6	0.361 U	2300	31.1	0.486 J	994	951	25.8	400
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	87.2	7.54	0.31 U	185	3.74	0.346 U	81.4	74.9	2.14 J	25.6
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	78.1 J-	7.28	0.238 U	235	5.43	0.223 U	87.6	84.7	3.75	43.1
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	793	52.5	0.335 U	1440 J+	23.6	0.263 U	682	598	14 J+	242
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	27800 J	1910 J	2.55 U	49700 J	765	7.49	21300 J	19000 J	341	6670 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	7710 J	628	0.465 U	18800 J	289	2.62 J	8140 J	7630 J	121	2450 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	979 J	228 J	0.23 U	2140 J	206 J	0.301 U	1030 J	988 J	122 J	626 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	2790 J	430 J	61.7 J	1240 J	436 J	83.6 J	2220 J	2540 J	282 J	663 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2420 J	214 J	0.242 U	6940 J	168 J	0.239 U	2650 J	2510 J	123 J	1490 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	263 J	91.1 J	20 J	143 J	82.8 J	40.4 J	366 J	467 J	64.2 J	132 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2920 J	211 J	0.348 U	5910 J	110 J	0.486 J	2630 J	2380 J	76.8 J	1020 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	132 J	27.3 J	3.99 J	231 J	16.7 J	7.4 J	132 J	137 J	13.4 J	50 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	55800 J	3820 J	2.17 J	88600 J	1550 J	14.1 J	39800 J	34800 J	696 J	13000 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	8410 J	717 J	6.95 J	21000 J	332 J	14.7 J	9120 J	8560 J	144 J	2760 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**11100 J**	**865 J**	0.254	**25100 J**	**394 J**	3.88 J	**10800 J**	**10050 J**	175 J	**3360 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**11100 J**	**865 J**	0.926	**25100 J**	**394 J**	4.15 J	**10800 J**	**10050 J**	175 J	**3360 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

	Overburden and excavation bottom sample exceed
Bold	240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE – Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SCW-QR1	SC-A1, SC-A2, SC-A3, SC-A4, SC-A5	SC-B1, SC-B2, SC-B3, SC-B4, SC-B5	SC-C1, SC-C2, SC-C3	SC-D1, SC-D2, SC-D3, SC-D4	SC-E1, SC-E2, SC-E3	SC-F1, SC-F2, SC-F3, SC-F4, SC-F5	SC-G1, SC-G2	SC-H1, SC-H2, SC-H3	SC-I1, SC-I2, SC-I3	SC-J1, SC-J2, SC-J3, SC-J4
Sample Identification:	Units	11215131-020622-S-SB-SC-B-16H	11215131-120621-S-JC-SC-O-1	11215131-120621-S-SS-SC-O-2	11215131-120721-S-JC-SC-O-3	11215131-120721-S-SS-SC-O-4	11215131-120721-S-JC-SC-O-5	11215131-120421-S-JC-SC-O-6	11215131-120421-S-JC-SC-O-7	11215131-120421-S-SS-SC-O-8	11215131-120621-S-SS-SC-O-9	11215131-120621-S-JC-SC-O-10
Sample Date:		02/06/2022	12/06/2021	12/06/2021	12/07/2021	12/07/2021	12/07/2021	12/04/2021	12/04/2021	12/04/2021	12/06/2021	12/06/2021
Sample Type:		Excavation Bottom	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	11.5	274	137	67.4	176	163	213	1510	413	392	197
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	356	16800 J	3750	5110	9890	9790	6540 J	15200 J	23500 J	19800 J	20800 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	4.92	147	40.7	38.2	102	104	70.5	597	236	163	95.7
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	20.6	957	259	263	712	671	463	1020	1730	1160	709
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	2.15 J	11.7	5.24	3.71	8.9	8.47	6.52	206	18.6	13.8	7.78
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	15.5	16.5	8.54	9.2	15.8	10.6	10.5	2020	22.2	13.3	9.36
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.624 J	8.12	2.47	2.76	5.16	5.27	3.87	7.54	12.4	7.86	5.32
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.06 J	10.3	3.3	4.42	8.87	8.18	5.6	494	16.5 J	10.8	6.48
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.765 J	33.4	7.4	9.71	23.6	23.3	15.8	36.3	54.4	33.5	21
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.364 U	0.288 U	0.245 U	0.32 U	0.302 U	0.368 U	0.264 U	0.471 U	0.278 U	0.446 U	0.399 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.43 J	16.2	4.66	5.68	11.2	11.2	8.67	14.6	25.4	14.2	10.1
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	6.1	6.46	3.37	5.83	7.05	3	3.87	1090	5.45	5.5	2.75
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.702 J	3.57	1.1 J	1.57 J	2.95	2.88	2.25 J	74.7	5.14 J	3.24	2.6
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.829 J	13.1	3.25	5.09	10.9	11.2	6.75	105	23.8	12	8.94
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	4.25	10.9 J+	3.88 J+	6.43 J+	12.5 J+	7.99 J+	7.92 J+	675 J+	16.2 J+	8.93 J+	7.42 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	114	89	38.9	12.7	39.8	14.8	53.7	20100 J	21.5	16.1	21.5
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	41.8	31	11.9	2.97	12.8	4.06	18	7500 J	4.9	3.45	5.45
Total heptachlorodibenzofuran (HpCDF)	pg/g	8.5 J	413	121 J	106 J	304 J	289 J	201	1220	681 J	542 J	290 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	70.2 J	2360	975 J	556 J	1560 J	1570 J	985	1970	3950 J	3240 J	1590 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	22 J	222	57.5 J	83.8 J	189 J	176 J	112	3150	375 J	232 J	153 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	31.9 J	310	98.4 J	82.2 J	200 J	206 J	134	239	447 J	358 J	182 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	15 J	94.1	29.5 J	63.6 J	126 J	107 J	75.2	2740	208 J	103 J	79.6 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.3 J	28.2	9.91 J	11.2 J	25.2 J	24.5 J	14.7	116	41.6 J	25.5 J	17.6 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	233 J	214	82 J	42.6 J	128 J	70.7 J	133	38700	127 J	58.9 J	70.2 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	51.9 J	43.1	15.4 J	5.84 J	23.7 J	11.1 J	24.8	8390	17.8 J	8.35 J	8.89 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	58.0 J	73.0 J	25.3 J	16.2 J	42.5 J	28.7 J	40.7 J	**10100 J**	59.7 J	39.7 J	33.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	58.0 J	73.0 J	25.3 J	16.2 J	42.5 J	28.7 J	40.7 J	**10100 J**	59.7 J	39.8 J	33.1 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. Those intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SC-K1, SC-K2, SC-K3, SC-K4	SC-L1, SC-L2, SC-L3, SC-L4, SC-L5	SC-M1, SC-M2, SC-M3, SC-M4, SC-M5	SC-M1, SC-M2, SC-M3, SC-M4, SC-M5	SC-N1, SC-N2, SC-N3, SC-N4, SC-N5	SC-N6	SC-O1, SC-O2	SC-P1, SC-P2, SC-P3	SC-Q1, SC-Q2, SC-Q3, SC-Q4, SC-Q5	SC-Q1, SC-Q2, SC-Q3, SC-Q4, SC-Q5
Sample Identification:	Units	11215131-120421-S-SS-SC-O-11	11215131-120421-S-JC-SC-O-12	11215131-120421-S-SS-DUP-3	11215131-120421-S-SS-SC-O-13	11215131-122121-S-BN-SC-O-14	11215131-011222-S-BN-SC-O-14A	11215131-122021-S-BN-SC-O-15	11215131-122021-S-BN-SC-O-16	11215131-122021-S-BN-DUP-9	11215131-122021-S-BN-SC-O-17
Sample Date:		12/04/2021	12/04/2021	12/04/2021	12/04/2021	12/21/2021	01/12/2022	12/20/2021	12/20/2021	12/20/2021	12/20/2021
Sample Type:		Overburden	Overburden	Duplicate	Overburden	Overburden	Overburden	Overburden	Overburden	Duplicate	Overburden
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	195	595	297	270	48	22	40.8	257	244	232
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	6800	31700 J	17100 J	15300 J	1050	568	1870	8720	13200 J	12600 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	112	194	150	141	12.2	7.51	16.3	162	91.8	93.6
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	622	3920	2030	2030	74.1	38	125	824	1650	1780
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	6.02	37.5	15.3	15.9	1.41 J	0.449 U	1.63 J	14.6	18.5	16.9
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.11	60.6	21.5	22.4	2.57	1.33 J	3.35	31.5	35	27.8
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.12	13.3	8.06	9.92	1.07 J	0.634 J	1.11 J	5.86	4.45	5.08
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.78	24.8	11.1	12.1	0.874 J	0.196 U	1.45 J	15.8	14.5	12.5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	23.1	96.3	48.3	54	2.61 J	1.36 J	3.57	30.7	32.4	43.3
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.169 U	0.773 U	0.745 U	0.474 U	0.418 U	0.244 U	0.326 U	0.614 U	1.17 U	0.755 J+
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	12	59.6	27.4	29.9	2.04 J	1.21 J	2.2 J	13.1	19.1	24.1
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.8 J	26.6	6.09	7.14	1.23 J	0.528 U	1.78 J	12.2	6.25 J	6.17
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.93 J	10.9	4.52	4.92	0.583 J	0.401 U	0.663 J	4.19 J	3.22	3.46 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.69	28.8	15	15.5	0.618 U	0.894 J	1.42 J	14.9	14.2	13.2
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	4.49 J+	58.5 J+	19 J+	23 J+	1.35 J	0.483 U	2.13 J	22.4 J+	22.3 J+	20.5 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	14.3	105	37.8	40.1	15.7	3.82 U	16.1	140	31.8	19.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3.72	6.65	5.68	2.9	4.54	1.47	4.02	22.6	2.22	1.55 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	298 J	604	427 J	398 J	31.9 J	19.8 J	48.3 J	440 J	278 J	277 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1330 J	7930	3940 J	3980 J	185 J	91.4 J	287 J	1650 J	3340 J	3370 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	123 J	370	204 J	217 J	16.4 J	10.1 J	26.5 J	313 J	208 J	189 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	198 J	963	457 J	487 J	36.5 J	15.2 J	34.5 J	208 J	334 J	419 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	50.3 J	366	133 J	159 J	9.24 J	1.65 J	18.5 J	233 J	150 J	145 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	22.5 J	113	53.9 J	54.8 J	4.85 J	0.401 U	4.69 J	21.1 J	34.2 J	45.9 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	49.5 J	640	163 J	193 J	31.4 J	7.02 J	37.1 J	310 J	173 J	143 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9.78 J	62.8	30.6 J	27.1 J	6.49 J	1.47 J	5.25 J	25.4 J	12.9 J	15.3 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	23.7 J	126 J	60.2 J	59.9 J	9.26 J	2.64 J	10.3 J	71.8 J	49.1 J	48.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	23.7 J	126 J	60.2 J	59.9 J	9.31 J	3.14 J	10.3 J	71.8 J	49.2 J	48.7 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SC-P4, SC-P5, SC-P6	SC-Q5, SC-Q6, SC-Q7	SC-P7, SC-P8, SC-P9	SC-Q8, SC-Q9, SC-Q10, SC-Q11, SC-Q12	SCW-QR1	SCW-QR1	SC-A1	SC-A1	SC-A2	SC-A3	SC-B1
Sample Identification:	Units	11215131-011222-S-BN-SC-O-18	11215131-011222-S-BN-SC-O-19	11215131-020622-S-SB-SC-O-20	11215131-020622-S-SB-SC-O-21	11215131-020622-S-SB-SC-O-22	11215131-020622-S-SB-SC-O-23	11215131-120621-S-JC-DUP-4	11215131-120621-S-JC-SC-S-1	11215131-120621-S-JC-SC-S-2	11215131-120621-S-JC-SC-S-3	11215131-120621-S-SS-SC-S-4
Sample Date:		01/12/2022	01/12/2022	02/06/2022	02/06/2022	02/06/2022	02/06/2022	12/06/2021	12/06/2021	12/06/2021	12/06/2021	12/06/2021
Sample Type:		Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Duplicate	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	181	305	100	390	124	455	1030	1030	2370	778	110 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	5500	14000 J	1590	26100 J	4450	28100 J	28300 J	19900 J	10900 J	27600 J	1610 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	69.4	306	21.4	161	33.1	157	731	557	304	686	36
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	429	1860	160	3170	388	2560	1560	1130	705	1770	140
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	6.54	90.4	2.31 J	34.7	3.16	23.5	220	162 J	62.7	190	6.97
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	13.4	777	3.77	92.6	4.82	34.8	1960	1520	383	1660	27.3
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.64	9.15	1.87 J	8.52	1.86 J	9.95	7.21	4.66	5.22	9.76	1.93 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.39	198	1.91 J	35.9	2.8	17	501	408	105	417	7.61
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	14.2	72.4	4.94	71.5	7.93	57.2	46	30.7	23.3	54.1	4.82
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.644 U	1.6 U	0.313 U	0.888 U	0.42 U	0.89 U	1.38 U	1.04 U	1.06 U	1.41 U	0.115 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	9.33	87.7	3.22	44.4	5.9	36.9	14.9	11.3	8.5 J	20.8	3.71
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	5.1 J	383	1.94 J	32.4	2.25 J	11	1240	965	237	978	9.65
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.91 J	47.4	0.764 J	9.84	1.22 J	6.94 J	101	69.6	22.7	69.7	1.41 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.34	43.8	2.47	28.2	2.3 J	20.8	106	91.5	30	93.4	3.12
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.82	265 J+	2.95	49.6	3.68	30.1 J+	898	804 J	197	688	7.61 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	80.8	8240 J	34.4	510	21.7	68.4	30300 J	20800 J	6290 J	20600 J	191
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	22.9	2940 J	15.2	199	7.9	15.1	8810 J	5890 J	1640 J	5840 J	66.8
Total heptachlorodibenzofuran (HpCDF)	pg/g	200 J	576 J	67.4 J	499 J	115 J	474 J	1440 J	1080 J	642 J	1440 J	80.4 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	867 J	4150 J	505 J	5890 J	794 J	5000 J	3170 J	2350 J	1510 J	3870 J	345 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	108 J	1290 J	33.5 J	399 J	47.1 J	279 J	3150 J	2480 J	743 J	2780 J	66.8 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	125 J	1780 J	74.4 J	748 J	83.8 J	605 J	325 J	228 J	181 J	435 J	62.8 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	65.9 J	1100 J	25 J	290 J	28.9 J	233 J	3390 J	2820 J	754 J	2770 J	39.4 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	16.3 J	204 J	10.6 J	82.9 J	8.75 J	72.7 J	160 J	109 J	46.4 J	118 J	9.35 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	179 J	16300 J	80.8 J	1230 J	59.1 J	351 J	58900 J	40500 J	12500 J	40400 J	391 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	28.8 J	3320 J	19.5 J	261 J	7.9 J	51.5 J	9840 J	6600 J	1860 J	6550 J	77.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	47.6 J	**4050 J**	24.5 J	**345 J**	20.6 J	91.9 J	**12500 J**	**8540 J**	**2430 J**	**8470 J**	97.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	47.6 J	**4050 J**	24.5 J	**345 J**	20.7 J	91.9 J	**12500 J**	**8540 J**	**2430 J**	**8470 J**	97.1 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold (shaded) — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SC-B2	SC-B3	SC-C1	SC-D1	SC-D2	SC-F1	SC-F2	SC-F3	SC-I1	SC-J1	SC-J2	SC-K2
Sample Identification:	Units	11215131-120621-S-SS-SC-S-5	11215131-120621-S-SS-SC-S-6	11215131-120721-S-JC-SC-S-7	11215131-120721-S-SS-SC-S-8	11215131-120721-S-SS-SC-S-9	11215131-120421-S-JC-SC-S-10	11215131-120421-S-JC-SC-S-11	11215131-120421-S-JC-SC-S-12	11215131-120621-S-SS-SC-S-13	11215131-120621-S-JC-SC-S-14	11215131-120621-S-JC-SC-S-15	11215131-120421-S-SS-SC-S-16
Sample Date:		12/06/2021	12/06/2021	12/07/2021	12/07/2021	12/07/2021	12/04/2021	12/04/2021	12/04/2021	12/06/2021	12/06/2021	12/06/2021	12/04/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans													
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4.01 J	81.5 J	2920	67.2	144	18.6	25.5	1050	523	123	50.7	103 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	492 J	2050 J	16300 J	3250 J	17800 J	1550	2020	5260	9890 J	7230 J	2250 J	2670 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	2.26 J	21.7	453	30.1	103	13.9	33.9	285	173	50.9	18.4	179
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	37	169	925	218	863	135	156	439	1740	399	185	242
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.469 J	2.87	150	3.16	6.91	1.19 J	8.07	88.9	13.4	5.62	2.13	69.2
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	2.7	4.78	1230	7.48	11.9	2.03 J	70.6	925	9.6	7.15	1.97	614
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.828 J	1.59 J	6.16	1.74	5.24	1.5 U	0.994 J	3.45	17.1	2.92 J	1.71 J	1.48 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.912 J	2.29 J	305	3.03	7.44	1.2 J	17.2	226	5.84	4.18	1.24 J	147
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.2 J	4.22	29.9	6.62	25.1	3.72	5.03	20.6	33	11.5	5.64	8.05
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.106 U	0.172 U	0.368 U	0.106 U	0.145 U	0.708 U	0.729 U	1.32 U	0.288 U	0.116 U	0.127 U	0.229 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.94 J	3.48	13.3	4.08	11.3	2.23 J	2.34 J	6.3	20.7	6.58	4.3	3.9
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.69 J	3.15 J	840	4.06	3.62	0.874 U	43.9	384	4.42	3.21	0.597 J	337
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.56 J	0.826 J	51.2	1.05 J	2.71 J	0.723 U	4.39	23.6	2.94	1.51 J	0.961 J	33.1
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.386 J	2.23 J	77	3.4	9.31	1.98 J	5.62	51.5	8.48	3.99	1.58 J	31.5
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.34 J	3.53 J+	575 J+	4.7 J+	8.43 J+	2.05 J	34.9	220	6.7 J+	4.47 J+	1.49 J+	235 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	38.5	30.2	14500 J	13.6	12.7	5.35	1080 J	7130 J	32.1	64.3	6.83	7950 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	13.6	9.39	4840 J	3.22	3.1	1.33	281	1870 J	8.17	22.6	2.27	2950 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	4.9 J	81.2 J	966 J	87.2 J	278 J	35.5 J	59.6 J	601 J	776 J	165 J	53 J	322 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	124 J	809 J	1830 J	480 J	1900 J	314 J	366 J	929 J	6760 J	962 J	473 J	516 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	6.71 J	36 J	2020 J	60.7 J	176 J	26 J	124 J	1490 J	250 J	76.9 J	28.6 J	938 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	36.5 J	92.8 J	224 J	84.7 J	247 J	41.7 J	56 J	172 J	1160 J	142 J	79.9 J	88.9 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	5.31 J	25.2 J	2280 J	43.2 J	92 J	18.5 J	131 J	963 J	64.5 J	38.4 J	14.5 J	888 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.3 J	11.2 J	94.9 J	14.3 J	45.9 J	0.723 U	9.05 J	43.8 J	65.1 J	17.3 J	9.02 J	51.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	82 J	74.4 J	28400 J	40.2 J	91.3 J	13.3 J	2150 J	13800 J	117 J	142 J	21.4 J	15600 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	19.3 J	17 J	5280 J	12.9 J	28.1 J	3.47 J	314 J	2090 J	23.2 J	37 J	7.14 J	3180 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	19.8 J	18.8 J	6700 J	13 J	32 J	5.57 J	418 J	2820 J	48 J	42 J	8.82 J	3950 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	19.8 J	18.8 J	6700 J	13 J	32 J	6.05 J	418 J	2820 J	48 J	42 J	8.77 J	3950 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

ED_014247_00001444-00025

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central	South Central
Sample Location:		SC-K3	SC-N1	SC-N2	SC-N3	SC-O1	SC-P1	SC-Q1	SC-Q2	SC-N6	SC-P5	SC-Q5
Sample Identification:	Units	11215131-120421-S-SS-SC-S-17	11215131-122121-S-BN-SC-S-18	11215131-122121-S-BN-SC-S-19	11215131-122121-S-BN-SC-S-20	11215131-122021-S-BN-SC-S-21	11215131-122021-S-BN-SC-S-22	11215131-122021-S-BN-SC-S-24	11215131-122021-S-BN-SC-S-25	11215131-011222-S-BN-SC-S-26	11215131-011222-S-BN-SC-S-27	11215131-011222-S-BN-SC-S-28
Sample Date:		12/04/2021	12/21/2021	12/21/2021	12/21/2021	12/20/2021	12/20/2021	12/20/2021	12/20/2021	01/12/2022	01/12/2022	01/12/2022
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4710 J	381	2650	3.75 J	17.5	1020	2820	15.6	22.9	25.6	130
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	19200 J	53800 J	14700 J	657	828	4640	16800 J	1160	1420	1280	2120
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	511	220	288	1.21 J	7.89	329	277	12.1	16.4	11.2	277
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1590	1520	1030	28.2	61.5	288	1990	111	80.5	131	139
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	72.8	15.5	56.3	0.325 U	0.928 J	108	77.3	2.95	3.41	1.24 J	87.2
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	465	13.7	325	0.37 J	2.53	912	557	21.1	27.8	6.07	777
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.94	9.38	9.62	0.46 J	0.937 J	2.17 J	6.24	0.884 J	0.789 U	1.19 J	0.966 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	128	15.2	91.2	0.278 J	1.06 J	218	139	5.37	7.15	1.88 J	190
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	52.9	50.3	37.6	0.894 J	2.27 J	10.9	45.7	3.33	2.15	2.82 J	3.86
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.544 U	0.76 U	0.742 U	0.211 U	0.282 U	0.635 U	0.831 U	0.299 U	0.596 U	0.357 U	0.422 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	27.3	20.9	17.5	1.5 J	1.95 J	5.6	26.6	2.8	1.68 J	3.06	2.17
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	281	4.15	307	0.567 J	1.76 J	543	391	13.3	20.1	3.94	389
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	36.6	5.08	17.4	0.259 J	0.573 J	44.8	34.4	1.56 J	2.38	0.82 J	29
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	42.8	14.7	33.1	0.258 U	0.814 J	45	36.4	1.31 J	2.04 J	1.3 J	32.1
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	233 J+	12.9 J+	225 J+	0.407 J	1.71 J	392 J+	304	10.8	15.8	3.74	268
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	8310 J	14.3	3840 J	3.61	23.8	12600 J	9050 J	299	491	66.1	9440 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2960 J	3.36	1330 J	0.95	8.11	4390 J	2980 J	114	129	6.89	2680 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	1350 J	672 J	715 J	2.42 J	22.3 J	573 J	614 J	26.3 J	41.2 J	28.3 J	426 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	3600 J	3340 J	2110 J	88.2 J	154 J	576 J	3670 J	237 J	179 J	361 J	302 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1080 J	336 J	747 J	2.11 J	16.6 J	1400 J	985 J	37.9 J	55.2 J	23.1 J	1150 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	527 J	423 J	303 J	26.3 J	30.8 J	100 J	466 J	47 J	25.4 J	60.7 J	43.5 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	939 J	192 J	962 J	3.96 J	14 J	1470 J	1180 J	40.6 J	61.7 J	18.3 J	1010 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	114 J	50.6 J	59.1 J	4.05 J	3.71 J	73.6 J	98.6 J	10.1 J	3.98 J	6.3 J	41.3 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	16400 J	128 J	7580 J	21.2 J	49.6 J	24400 J	18000 J	603 J	936 J	132 J	18800 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3250 J	37.3 J	1510 J	4.98 J	10.3 J	4880 J	3360 J	134 J	145 J	13.6 J	2960 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**4010 J**	60.1 J	**1880 J**	2.55 J	13.5 J	**5960 J**	**4130 J**	154 J	191 J	19.0 J	**3850 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**4010 J**	60.1 J	**1880 J**	2.58 J	13.6 J	**5960 J**	**4130 J**	154 J	191 J	19.0 J	**3850 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottoms sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		South Central	South Central	South Central	South Central	South Central	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SC-Q6	SC-P7, SC-P8, SC-P9	SC-P7, SC-P8, SC-P9	SC-Q8, SC-Q9, SC-Q10, SC-Q11, SC-Q12	SC-Q13	SW-A1, SW-A2, SW-A3, SW-A4, SW-A5	SW-B1, SW-B2, SW-B3, SW-B4, SW-B5	SW-B1, SW-B2, SW-B3, SW-B4, SW-B5	SW-C1, SW-C2, SW-C3, SW-C4, SW-C5	SW-C1, SW-C2, SW-C3, SW-C4, SW-C5
Sample Identification:	Units	11215131-011222-S-BN-SC-S-29	11215131-020622-S-SB-SC-S-30	11215131-020622-S-SB-SC-S-31	11215131-020622-S-SB-SC-S-32	11215131-021722-S-SB-SC-S-33	11215131-120221-S-JC-SW-B-1	11215131-120221-S-JC-SW-B-2	11215131-120221-S-JC-SW-B-2H	11215131-120321-S-JC-SW-B-3	11215131-120321-S-JC-SW-B-3H
Sample Date:		01/12/2022	02/06/2022	02/06/2022	02/06/2022	02/17/2022	12/02/2021	12/02/2021	12/02/2021	12/03/2021	12/03/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	638	7.87	34.2	1780	163	83.7	201	14.7	54.4	2.45 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	9610 J	454	1040	63300 J	9260	2350	2590	448	1770	352
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	948	4.04	11.7	563	46.8	90.2	134	6.13	85.7	2.29 J+
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	913	28.4	79.3	5760 J	1050	143	218	29.7	120	18.3
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	383	0.827 J	1.12 J	174	8.66	35.5	47.3	1.12 J	35.9	0.485 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3880	7.14	2.22 J	1010	12.3	336	399	4.8	354	7.93
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.52	0.484 U	0.877 J	15.9	3.45 J	0.897 J	2.78	0.379 U	0.695 J	0.82 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	952	2.03 J	1.09 J	247	6.25	83.8	94.6	1.31 J	85.8	2.3 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	20.9	0.811 J	2.18 J	120	30	3.85	10	0.998 J	2.98	0.706 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.692 U	0.328 U	0.269 U	0.68 U	0.311 U	0.713 U	0.78 U	0.229 U	0.913 U	0.604 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	8.22	1.16 J	2.02 J	82.1	29	2.55	5.08	1.15 J	1.85 J	0.71 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	2310	3.82	0.752 J	425	4.68	213	223	2.2 J	233	4.91
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	115	0.601 J	0.372 J	39.1	5.55	16.7	12.6	0.295 U	16.2	0.761 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	207	0.406 J	1.2 J	88.1	6.36	16.4	19.1	0.591 J	18.1	0.546 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1340 J+	3.04 J+	1.28 J	292	9.51 J+	168	146	1.63 J	179	3.17 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	34200 J	90.8	5.52	7180 J	55.7	5540 J	4260 J	47.2	5490 J	128
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	9900 J	33.9	1.96	2710 J	16.2	1520 J	1180 J	18.9	1510 J	43.5
Total heptachlorodibenzofuran (HpCDF)	pg/g	1620 J	9.75 J	34.5 J	1440 J	153 J	162 J	239	13.8 J	158	3.3 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1670 J	79.7 J	267 J	10900 J	2190 J	304 J	415	94.2 J	262	58.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	5860 J	12.8 J	18.3 J	1970 J	90 J	505 J	616	13.5 J	532	11.2 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	171 J	20 J	65.6 J	1260 J	573 J	48.5 J	81.1	33.3 J	47.3	18.3 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	5670 J	9.93 J	10.1 J	1330 J	67.3 J	595 J	584	7.9 J	648	12 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	159 J	3 J	10.6 J	163 J	50.2 J	28.1 J	32.1	6.51 J	27.2	2.28 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	67200 J	185 J	19.4 J	14400 J	165 J	11200 J	8630	96.5 J	11100	265 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	10900 J	38.6 J	10.7 J	3040 J	37.3 J	1690 J	1300	28.4 J	1670	50.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**14400 J**	46.2 J	5.49 J	**3810 J**	52.9 J	**2200 J**	**1730 J**	25.6 J	**2190 J**	58.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**14400 J**	46.3 J	5.51 J	**3810 J**	52.9 J	**2200 J**	**1730 J**	25.7 J	**2190 J**	59.3 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-D1, SW-D2, SW-D3, SW-D4, SW-D5	SW-D1, SW-D2, SW-D3, SW-D4, SW-D5	SW-D1, SW-D2, SW-D3, SW-D4, SW-D5	SW-E1, SW-E2, SW-E3, SW-E4, SW-H1, SW-H2	SW-E1, SW-E2, SW-E3, SW-E4, SW-H1, SW-H2	SW-F1, SW-F2, SW-G1, SW-I1, SW-I2	SW-F1, SW-F2, SW-G1, SW-I1, SW-I2	SW-J1, SW-J2, SW-J3, SW-J3, SW-J4, SW-J5	SW-J1, SW-J2, SW-J3, SW-J3, SW-J4, SW-J5
Sample Identification:	Units	11215131-120221-S-SPS-SW-B-4	11215131-120221-S-SPS-SW-B-4H1	11215131-120221-S-SPS-SW-B-4H2	11215131-120321-S-SPS-SW-B-5	11215131-120321-S-SPS-SW-B-5H	11215131-120321-S-JC-SW-B-6	11215131-120321-S-JC-SW-B-6H	11215131-120321-S-SS-SW-B-7	11215131-120321-S-SS-SW-B-7H1
Sample Date:		12/02/2021	12/02/2021	12/02/2021	12/03/2021	12/03/2021	12/03/2021	12/03/2021	12/03/2021	12/03/2021
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	2830	1130	593	5830	2040	4560	2100	213	904
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	4780	1530	725	6510	2560	3880 J	2060	1840	1220
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	223	63.2 J+	43.3	390	87.7 J+	185	96 J+	135	53.7 J+
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	326	93.6	44.2	436	162	260	147	145	70.7
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	47.9	9.46	1.67 J	91.1	8.16	41.7	8.78	49.7	2.61
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	359	68.1	2.28 J	684	26.9	162	19.8	436	4.3 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.39 J	1.55 J	0.913 J	3.79	1.35 J	3.51	2.35 J	1.32 J	0.933 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	84.3	19.1	0.794 J	175	8.21	41.2	9.53	105	1.76 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	10.7	4.16	1.77 J	15.9	6.86	13.6	8.11	4.09	3.16
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.03 U	0.559 U	0.233 U	1.47 U	0.5 U	0.597 U	0.604 U	0.167 U	0.667 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.92 J	2.77	1.62 J	7.42	4.24	7.35	4.49	3	2.06 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	235	42.5	1.56 J	424	17.9	78.2	9.16	280	3.06
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	25.3	4.81 J	0.82 J	33	2.76	11	3.64	19.8	0.794 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	21.5	4.04	0.71 J	38.1	4	12.4	6.48	22.5	0.935 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	205	36.7	2.21 J	302	17.6 J+	70.3 J+	16.3	200 J+	3.89
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	7980 J	1430 J	68.9	10600 J	579	2650 J	294	5720 J	122
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2280 J	513	20.4	2900 J	194	888	83.4	1970 J	38.1
Total heptachlorodibenzofuran (HpCDF)	pg/g	398	113 J	57.8 J	702	170 J	387	185 J	234 J	76.8 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	740	233 J	136 J	1040	463 J	642	364 J	385 J	190 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	594	130 J	14.4 J	1140	97.3 J	334	109 J	660 J	20.5 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	105	54.1 J	33.2 J	166	103 J	146	96.7 J	112 J	44.5 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	744	143 J	13.8 J	1210	97.3 J	283	136 J	761 J	20.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	49.3	13.7 J	7.39 J	70.3	23 J	41	50.1 J	44.2 J	9.09 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	16000	2900 J	145 J	21000	1160 J	5280	708 J	11300 J	250 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2530	583 J	28.5 J	3220	228 J	1020	135 J	2220 J	52.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**3230 J**	**686 J**	30.9 J	**4200 J**	**270 J**	**1220 J**	130 J	**2690 J**	55.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**3230 J**	**686 J**	30.9 J	**4200 J**	**270 J**	**1220 J**	130 J	**2690 J**	55.6 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-J1, SW-J2, SW-J3, SW-J3, SW-J4, SW-J5	SW-K1, SW-K2, SW-K3, SW-K3, SW-K4, SW-K5	SW-K1, SW-K2, SW-K3, SW-K3, SW-K4, SW-K5	SW-K1, SW-K2, SW-K3, SW-K3, SW-K4, SW-K5	SW-L1, SW-L2, SW-L3, SW-L4, SW-L5	SW-L1, SW-L2, SW-L3, SW-L4, SW-L5	SW-L1, SW-L2, SW-L3, SW-L4, SW-L5	SW-M1, SW-M2, SW-M3, SW-M4, SW-M5
Sample Identification:	Units	11215131-120321-S-SS-SW-B-7H2	11215131-120821-S-JC-SW-B-8	11215131-120821-S-JC-SW-B-8H1	11215131-120821-S-JC-SW-B-8H2	11215131-120221-S-SPS-SW-B-9	11215131-120221-S-SPS-SW-B-9H1	11215131-120221-S-SPS-SW-B-9H2	11215131-120821-S-JC-SW-B-10
Sample Date:		12/03/2021	12/08/2021	12/08/2021	12/08/2021	12/02/2021	12/02/2021	12/02/2021	12/08/2021
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	6030	1100	82.4	1.59 J	2460	884	0.546 U	0.535 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	5090	3240	639	499	5490	1310	350	422 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	216	155	7.95 J+	0.342 J	677	46.9 J+	0.162 U	0.289 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	344	243	33.3	25.6	384 J-	69.4	18.1	20.4
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	38.8	50.3	1.02 J	0.292 U	270 J	3.44	0.257 U	0.157 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	234	401	6.52	0.511 J	2390	7.81	0.159 U	0.539 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.33	1.95 J	0.887 U	0.359 U	2.38 J	0.647 U	0.426 U	0.449 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	62.7	97.2	1.73 J	0.184 U	578	2.91	0.147 U	0.139 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	15.8	7.42	1.09 J	0.76 J	11.3	2.62	0.846 J	0.631 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.693 U	0.213 U	0.324 U	0.238 U	3.19 U	0.515 U	0.168 U	0.098 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.44	4.22	1.51 J	1.26 J	5.56	2.29 J	1.19 J	1.28 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	158	225	3.62	1.13 J	889	5.16	0.18 U	0.517 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	19.9	20	0.937 U	0.346 U	50.1 J	1.26 J	0.331 U	0.232 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	17	20.3	0.432 U	0.192 U	84.7 J	1.51 J	0.141 U	0.111 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	141	165 J+	2.78 J	0.619 J	509	5.92	0.176 U	0.463 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	5250 J	5460 J	98.6	13.1	15700 J	176	0.207 U	11.6
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1760 J	1930 J	37.1	3.86	4560 J	56.3	0.341 U	3.88
Total heptachlorodibenzofuran (HpCDF)	pg/g	436 J	281 J	11.5 J	0.731 J	1160 J	80.8 J	0.203 U	0.289 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	829 J	623 J	100 J	79.7 J	772 J	188 J	52.6 J	85.3 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	461 J	627 J	11.6 J	0.511 J	3450 J	37.6 J	0.152 U	0.803 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	168 J	119 J	29.8 J	23 J	105 J	49.6 J	15.3 J	47.6 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	538 J	625 J	10.2 J	2.58 J	2130 J	38.8 J	0.178 U	1.55 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	54.9 J	42.5 J	6.07 J	4.83 J	78.3 J	11.3 J	0.886 J	8.25 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	10100 J	10700 J	215 J	39.6 J	30100 J	342 J	0.765 J	28 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2000 J	2170 J	46.8 J	6.14 J	4980 J	65.5 J	1.24 J	17.1 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**2400 J**	**2610 J**	49.6 J	6.05 J	**6680 J**	80.7 J	0.490 J	6.06 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**2400 J**	**2610 J**	50.2 J	6.28 J	**6680 J**	80.7 J	0.919 J	6.08 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold (shaded) — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-N1, SW-N2, SW-N3, SW-N4, SW-N5	SW-O1, SW-O2, SW-O3, SW-O4, SW-O5	SW-O1, SW-O2, SW-O3, SW-O4, SW-O5	SW-P1, SW-P2	SW-P3, SW-P4, SW-P5	SW-P3, SW-P4, SW-P5	SW-Q1, SW-Q2, SW-Q3, SW-Q4, SW-Q5	SW-Q1, SW-Q2, SW-Q3, SW-Q4, SW-Q5	SW-Q1, SW-Q2, SW-Q3, SW-Q4, SW-Q5	SW-Q1, SW-Q2, SW-Q3, SW-Q4, SW-Q5
Sample Identification:	Units	11215131-120821-S-SS-SW-B-11	11215131-120821-S-SS-SW-B-12	11215131-120821-S-SS-SW-B-12H	11215131-010622-S-BN-SW-B-13	11215131-010622-S-BN-SW-B-14	11215131-010622-S-BN-SW-B-14H	11215131-010622-S-BN-DUP-10	11215131-010622-S-BN-SW-B-15	11215131-010622-S-BN-SW-B-15H1	11215131-010622-S-BN-SW-B-15H2
Sample Date:		12/08/2021	12/08/2021	12/08/2021	01/06/2022	01/06/2022	01/06/2022	01/06/2022	01/06/2022	01/06/2022	01/06/2022
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Duplicate	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.89 J	5.7	1.47 J	3.35 J	166	14.2	3520	1690	2350	123
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	605	743	608	1510	3340	474	4430	2690	2560	549
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	5.05	7.49	0.937 J	1.32 J	126	3.41	264	110	227	15.3
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	42.1	55.3	29.8	39.4	280	27.6	254	153	170	28.7
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	1.67 J	2.68	0.257 U	0.239 U	42.8	0.45 J	37.6	20.7	10.8	0.269 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	16.3	24.1	2.53 J	0.225 U	363	2.54	269	138	28.1	2.59
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.835 J	1.01 J	0.711 J	0.8 J	3.22	0.333 J	3.1	1.61 J	2.22 J	0.54 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.81	5.94	0.582 J	0.223 U	108	0.776 J	74.5	38.2	11.5	0.597 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.34 J	1.75 J	1.04 J	1.1 J	11.5	0.686 J	11.5	6	7.98	0.969 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.211 U	0.161 U	0.156 U	0.244 U	0.278 U	0.186 U	0.716 U	0.431 U	0.488 U	0.248 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.23 J	2.51	1.98 J	1.77 J	7.61	0.91 J	6.84	3.67	4.75	1.23 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	9.71	16	2.09 J	0.271 U	197	1.64 J	137	78	13.5	1.51 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.29 J	2.12 J	0.742 J	0.269 U	7.6	0.255 J	10.2	5.56	2.47	0.332 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.754 J	1.25 J	0.144 U	0.282 U	23.5	0.243 J	18.6	9.43	5.37	0.206 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	7.43	13.6 J+	1.6 J	0.274 U	120	1.26 J	92.3 J+	59	14.7 J+	1.12 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	258	454	56.5	4.92	1910 J	36.8	2520 J	1400 J	345	28.2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	96.4	168	22.2	2.27	703	14.7	914	513	105	10.3
Total heptachlorodibenzofuran (HpCDF)	pg/g	8.95 J	14 J	1.47 J	2.17 J	232 J	5.87 J	425 J	204 J	325 J	17.9 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	117 J	146 J	92.7 J	127 J	590 J	66.7 J	610 J	382 J	477 J	90.8 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	24.1 J	37 J	3.39 J	0.241 U	618 J	5.2 J	544 J	259 J	118 J	5.75 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	33.5 J	41.9 J	37.6 J	31.1 J	103 J	21.7 J	136 J	81.1 J	110 J	27 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	27.1 J	46.7 J	5.6 J	0.273 U	491 J	4.93 J	434 J	245 J	108 J	4.24 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	6.73 J	9.74 J	8.14 J	3.72 J	26.6 J	3.5 J	33 J	16.4 J	25.6 J	4.01 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	530 J	929 J	118 J	10.8 J	3850 J	81.4 J	4820 J	2780 J	698 J	54.3 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	113 J	195 J	33 J	4.72 J	803 J	19.4 J	1030 J	581 J	133 J	13.9 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	129 J	225 J	30.3 J	3.99 J	**1000 J**	20.1 J	**1250 J**	**702 J**	158 J	14.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	129 J	225 J	30.3 J	4.22 J	**1000 J**	20.1 J	**1250 J**	**702 J**	158 J	14.9 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-R1, SW-R2, SW-R3, SW-S1, SW-S2, SW-S3	SW-R1, SW-R2, SW-R3, SW-S1, SW-S2, SW-S3	SW-U1, SW-U2, SW-U3, SW-U4, SW-U5	SW-U1, SW-U2, SW-U3, SW-U4, SW-U5	SW-U1, SW-U2, SW-U3, SW-U4, SW-U5	SW-T1, SW-T2, SW-T3, SW-T4, SW-T5	SW-V1, SW-V2, SW-V3, SW-V4, SW-V5	SW-V1, SW-V2, SW-V3, SW-V4, SW-V5	SW-R4, SW-R5, SW-R6
Sample Identification:	Units	11215131-010722-S-BN-SW-B-16	11215131-010722-S-BN-SW-B-16H	11215131-010522-S-BN-SW-B-17	11215131-010522-S-BN-SW-B-17H1	11215131-010522-S-BN-SW-B-17H2	11215131-010722-S-BN-SW-B-18	11215131-010522-S-BN-SW-B-19	11215131-010522-S-BN-SW-B-19H1	11215131-011922-S-BN-SW-B-20
Sample Date:		01/07/2022	01/07/2022	01/05/2022	01/05/2022	01/05/2022	01/07/2022	01/05/2022	01/05/2022	01/19/2022
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom
Dioxins/Furans										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	302	0.481 U	91.5	1.75 J	0.543 U	1.36 U	0.74 U	1.39 J	1820
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1250	477	2800	388	756	477	445	423	15900 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	93.6	0.472 J	159	0.655 J	0.138 U	0.325 U	0.277 J	1.16 J	1250
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	75.4	25.5	163	16.2	27.1	21.6	22.1	22.5	965
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	36.6	0.266 U	67.1	0.339 U	0.25 U	0.531 U	0.331 U	0.3 J	493
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	290	0.763 J	583	1.1 J	0.157 U	0.526 U	0.957 J	2.82	4830
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.793 J	0.449 U	1.11 J	0.418 J	0.513 J	0.71 U	0.488 U	0.405 J	5.19
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	76.4	0.331 J	150	0.209 U	0.136 U	0.482 U	0.231 U	0.672 J	1150
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.59	0.695 J	4.95	0.682 J	0.889 J	0.808 J	0.773 J	0.833 J	27.2
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.284 U	0.188 U	0.452 U	0.249 U	0.183 U	0.679 U	0.313 U	0.22 U	1.12 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.18 J	1.39 J	2.91	1.22 J	1.68 J	1.05 J	1.32 J	0.998 J	8.06
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	157	0.533 J	329	0.622 J	0.15 U	0.882 J	0.349 U	1.5 J	3060
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	23.3	0.537 J	28.8	0.202 U	0.281 U	0.6 U	0.467 U	0.464 J	196
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	13.6	0.152 U	27.6	0.174 U	0.149 U	0.959 U	0.272 U	0.188 U	257
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	129	0.198 U	240	0.554 J	0.153 U	0.54 U	0.346 U	0.796 J	1880 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	6420 J	7.07	8040 J	11.9	1.34 J	12.7	14.3	31	53700 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2310 J	2.42	2910 J	4.25	0.615	3.44	5.81	12.2	20100 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	173 J	0.472 J	294 J	0.655 J	0.183 U	0.4 U	0.277 J	1.89 J	2200 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	186 J	83.1 J	327 J	61.7 J	93.4 J	85.5 J	70.1 J	71 J	2030 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	451 J	1.09 J	893 J	1.1 J	0.154 U	0.622 U	0.957 J	3.96 J	7290 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	42 J	33.8 J	58.3 J	23 J	32.5 J	30.1 J	21.3 J	23.4 J	235 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	449 J	0.533 J	871 J	1.55 J	0.151 U	0.882 J	0.347 U	3.51 J	7530 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	32.9 J	8.5 J	42.2 J	4.34 J	4.79 J	6.43 J	2.19 J	4.35 J	267 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	12500 J	21.1 J	15500 J	25.2 J	4.26 J	24.4 J	28.9 J	66.7 J	91400 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	2600 J	18.8 J	3270 J	6.85 J	4.12 J	9.85 J	8.63 J	19.6 J	22500 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**3060 J**	4.40 J	**3910 J**	6.25 J	1.56 J	5.28 J	7.90 J	17.0 J	**27000 J**
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**3060 J**	4.47 J	**3910 J**	6.39 J	1.75 J	5.83 J	8.26 J	17.0 J	**27000 J**

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. Those intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-R4, SW-R5, SW-R6	SW-Q6, SW-Q7, SW-Q8	SW-Q6, SW-Q7, SW-Q8	SW-Q6, SW-Q7, SW-Q8	SW-T7, SW-T8, SW-T9, SW-T10, SW-T11	SW-V6	SW-V6	SW-R7, SW-R8, SW-R9, SW-R10, SW-R11	SW-R7, SW-R8, SW-R9, SW-R10, SW-R11	SW-R7, SW-R8, SW-R9, SW-R10, SW-R11
Sample Identification:	Units	11215131-011922-S-BN-SW-B-20H	11215131-011922-S-BN-SW-B-21	11215131-011922-S-BN-SW-B-21H1	11215131-011922-S-BN-SW-B-21H2	11215131-012022-S-BN-SW-B-22	11215131-011922-S-BN-SW-B-23	11215131-011922-S-BN-SW-B-23H	11215131-020422-S-SB-SW-B-24	11215131-020422-S-SB-DUP-15	11215131-020422-S-SB-SW-B-24H
Sample Date:		01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/20/2022	01/19/2022	01/19/2022	02/04/2022	02/04/2022	02/04/2022
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Duplicate	Excavation Bottom
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	2660	4980	2970	581	0.807 U	0.557 U	2.83 J	741	1300	1260
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2810	5770	3200	1040	439	525	349	4520	1880	2280
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	88.9	595	120	35.7	0.17 U	0.403 J	0.817 J	594	70.1	85.7
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	166	372	191	55	21.6	18.6	16.8	313	136	130
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	10.7	218 J-	14	2.89	0.358 U	0.665 U	0.265 U	207	15.3	4.91
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	15.3	2040	31.7	4.59	0.288 U	0.986 J	0.56 J	1750	142	12.2
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.82 J	3.64	2.01 J	0.881 J	0.493 U	0.483 U	0.25 U	2.24 J	1.74 J	1.17 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.79	545	8.76	1.35 J	0.267 U	0.251 U	0.17 U	471	31.7	3.83
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.47	14.1	8.97	2.27 J	0.558 J	0.421 U	0.228 U	10.7	4.93 J	5.09
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.351 U	0.854 U	0.407 U	0.417 U	0.346 U	0.324 U	0.222 U	0.473 U	0.522 U	0.31 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.67	7.4	5.48	2.17 J	1.09 J	1.34 J	1.11 J	4.81	3.08	3.04
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	9.61	1000	20.7	2.99	0.278 U	0.385 U	0.159 U	1050	84.1	7.75
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	2.5	45.9	3.6	1.03 J	0.414 U	0.757 U	0.341 U	85.7	1.59 J	1.63 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.19	111	4.95	1.42 J	0.246 U	0.229 U	0.184 U	93.7	8.74	2.52
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	13.1 J+	512	21.7 J+	3.59 J+	0.298 U	0.68 J	0.157 U	707	36.4	6.78
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	408	12300 J	682	91.1	2.14	10.4	4.85	23000 J	216	200
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	132	4450 J	238	28.4	0.815	3.86 J	1.79	8910 J	69.1	68.8
Total heptachlorodibenzofuran (HpCDF)	pg/g	184 J	1080 J	230 J	59 J	0.24 U	0.403 J	2.27 J	968 J	148 J	158 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	403 J	794 J	449 J	146 J	74.7 J	67.1 J	53.6 J	612 J	401 J	315 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	83.1 J	3210 J	117 J	22.6 J	0.28 U	0.986 J	0.56 J	2690 J	242 J	54.7 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	88.3 J	150 J	105 J	39.2 J	26.2 J	20.8 J	23.8 J	88.1 J	82.4 J	66.8 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	79.8 J	2330 J	115 J	22.9 J	0.288 U	0.68 J	0.158 U	2690 J	197 J	41.3 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	20.8 J	82.4 J	24 J	8.11 J	3.21 J	3.16 J	4.2 J	114 J	13.3 J	14 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	824 J	23500 J	1350 J	188 J	3.88 J	22.7 J	8.19 J	39700 J	437 J	405 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	163 J	5020 J	280 J	36.8 J	7.1 J	6.49 J	7.38 J	9960 J	84.9 J	84.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	188 J	**6200 J**	**328 J**	42.4 J	1.54 J	5.68 J	2.729 J	**11800 J**	128 J	98.7 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	188 J	**6200 J**	**328 J**	42.4 J	1.88 J	6.16 J	2.97 J	**11800 J**	128 J	98.8 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

ED_014247_00001444-00032

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-Q9, SW-Q10, SW-Q11, SW-Q12, SW-Q13	SW-Q9, SW-Q10, SW-Q11, SW-Q12, SW-Q13	SW-Q9, SW-Q10, SW-Q11, SW-Q12, SW-Q13	SW-T12, SW-T13, SW-T14, SW-T15, SW-T16	SW-V7	SW-V7	SW-A1, SW-A2, SW-A3, SW-A4, SW-A5	SW-A1, SW-A2, SW-A3, SW-A4, SW-A5	SW-B1, SW-B2, SW-B3, SW-B4, SW-B5
Sample Identification:	Units	11215131-020422-S-SB-SW-B-25	11215131-020422-S-SB-SW-B-25H1	11215131-020422-S-SB-SW-B-25H2	11215131-020522-S-SB-SW-B-26	11215131-020422-S-SB-SW-B-27	11215131-020422-S-SB-SW-B-27H	11215131-120221-S-JC-SW-DUP-1	11215131-120221-S-JC-SW-O-1	11215131-120221-S-JC-SW-O-2
Sample Date:		02/04/2022	02/04/2022	02/04/2022	02/05/2022	02/04/2022	02/04/2022	12/02/2021	12/02/2021	12/02/2021
Sample Type:		Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Excavation Bottom	Duplicate	Overburden	Overburden
Dioxins/Furans										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	164	122	1.37 J	0.612 U	3 J	0.492 U	136	122	79.7
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2850	519	310	539	390	329	3850	3630 J	3610
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	194	24	0.513 J	0.199 U	0.409 J	0.119 U	39.9	35.6	39.7
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	78.2	29	12.6	27.5	20	14.4	227	208	208
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	102	6.94	0.261 U	0.333 U	0.279 U	0.206 U	4.49	4.59	5.27
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	840	58.9	1.11 J	0.49 J	0.178 U	0.19 U	13.6	16	24.8
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.677 J	0.414 U	0.432 J	0.689 J	0.574 J	0.458 J	2.41 J	2.08 J	2.28 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	206	14.5	0.244 J	0.194 U	0.169 U	0.173 U	5.21	5.51	9.47
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.71 J	0.986 J	0.436 J	1.16 J	0.685 J	0.66 J	6.46	6.18	6.08
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.43 U	0.429 U	0.26 U	0.3 U	0.269 U	0.276 U	0.541 U	0.555 U	0.699 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.16 J	1 J	0.679 J	1.96 J	1.16 J	0.865 J	4.5	4.14	4.01
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	412	27.6	0.624 J	0.839 J	0.57 J	0.21 U	7.93	9.36	15.2
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	14.3	1.97 J	0.314 U	0.441 J	0.31 U	0.313 J	1.62 J	1.77 J	2.32 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	37.3	2.77	0.221 U	0.234 U	0.232 U	0.243 U	4.38	3.73	5.73
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	258	17.3	0.387 J	0.647 J	0.363 J	0.226 U	7.95	9.25	15.6
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	4800 J	454	6.53	4.1	1.71	0.186 U	146	196	294
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1420 J	136	1.92	1.72	0.36 U	0.367 U	33.1	47.7 J-	71.8
Total heptachlorodibenzofuran (HpCDF)	pg/g	354 J	38.2 J	0.513 J	0.254 U	0.409 J	0.15 U	100 J	92.9 J	92.5
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	195 J	90.1 J	47.9 J	95.7 J	64.4 J	69 J	541 J	476 J	467
Total hexachlorodibenzofuran (HxCDF)	pg/g	1240 J	89.3 J	1.35 J	0.894 J	0.206 U	0.214 U	64.3 J	61.1 J	84.7
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	30.1 J	21.9 J	21.1 J	37.2 J	17.5 J	33.4 J	71.1 J	63 J	64.9
Total pentachlorodibenzofuran (PeCDF)	pg/g	1040 J	68.7 J	1.29 J	4.87 J	2.18 J	0.217 U	52.9 J	56.5 J	90.8
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	21 J	4.98 J	3.09 J	6.14 J	2.32 J	6.18 J	9.35 J	10.3 J	15
Total tetrachlorodibenzofuran (TCDF)	pg/g	9280 J	895 J	11.9 J	20.1 J	20.3 J	0.224 J	305 J	410 J	610
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1580 J	151 J	9.46 J	6.77 J	2.03 J	8.61 J	39.8 J	56.4 J	84.9
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**2120 J**	198 J	3.22 J	3.66 J	0.861 J	0.754 J	59.5 J	79.5 J	118 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**2120 J**	198 J	3.40 J	3.66 J	1.24 J	1.04 J	59.5 J	79.5 J	118 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-D1, SW-D2, SW-D3, SW-D4, SW-D5	SW-E1, SW-E2, SW-E3, SW-E4	SW-H1, SW-H2, SW-H3, SW-H4	SW-K1, SW-K2, SW-K3, SW-K3, SW-K4, SW-K5	SW-L1, SW-L2, SW-L3, SW-L4, SW-L5	SW-L1, SW-L2, SW-L3, SW-L4, SW-L5	SW-M1, SW-M2, SW-M3, SW-M4, SW-M5	SW-M1, SW-M2, SW-M3, SW-M4, SW-M5	SW-N1, SW-N2, SW-N3, SW-N4, SW-N5
Sample Identification:	Units	11215131-120221-S-SPS-SW-O-3	11215131-120321-S-SPS-SW-O-4	11215131-120321-S-SPS-SW-O-5	11215131-120821-S-JC-SW-O-6	11215131-120221-S-SPS-DUP2	11215131-120221-S-SPS-SW-O-7	11215131-120821-S-JC-DUP-6	11215131-120821-S-JC-SW-O-8	11215131-120821-S-SS-SW-O-9
Sample Date:		12/02/2021	12/03/2021	12/03/2021	12/08/2021	12/02/2021	12/02/2021	12/08/2021	12/08/2021	12/08/2021
Sample Type:		Overburden	Overburden	Overburden	Overburden	Duplicate	Overburden	Duplicate	Overburden	Overburden
Dioxins/Furans										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	92.3	83.3	14.6	80.7	25.3	48.6	18	39.1	9.84
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	5210	5000	2170	1600	4710	3260	4430 J	2560 J	1750 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	128	27.1	15.6	79.9	11.5	27.6	7.63	9.12	4.08
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	108	227	74.2	139	93	111	76.6	64.8	49.7
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	58.9	1.94 J	7.2	27.9	2.37 J	6.42	1.69 J	1.31 J	0.561 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	480	2.35 J	65.7	187	21.6	58.3	7.3	5.51	1.58 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.11 J	1.78 J	0.673 J	1.48 J	0.827 U	1.03 J	0.801 J	0.673 J	0.675 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	115	1.35 J	15.6	45.1	5.66	14.9	1.79 J	1.56 J	0.451 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.02	4.84	1.79 J	3.93	1.59 J	2.85 J	1.59 J	2.1 J	1.29 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.922 U	0.464 U	0.608 U	0.154 U	0.837 U	0.617 U	0.178 U	0.218 U	0.129 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.5	3.6	2.27 J	3.01	1.59 J	2.35 J	1.52 J	1.62 J	1.21 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	205	1.04 J	36.4	104	11.7	34.4	3.99	3.55	0.919 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	13.7	0.69 J	3.32	9.55	1.26 J	3.8	0.903 J	0.749 J	0.39 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	21.4	1.79 J	3.26	8.67	0.962 J	3.86	0.74 J	0.774 J	0.285 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	141	1.77 J	33.8	80.6 J+	9.53	26.6	3.66 J+	3.27 J+	0.678 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	4370 J	13.9	1180 J	2630 J	260 J	943 J	114	89.8	11.9
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1220 J	2.71 J	330	938	65.5 J	264 J	42.5	34.1 J+	4.48
Total heptachlorodibenzofuran (HpCDF)	pg/g	226	73.4	30.6	142 J	23.7 J	56.4 J	18.7 J	24 J	11.8 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	240	730	203	319 J	251 J	283 J	172 J	150 J	117 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	706	29.9	99.8	288 J	38.3 J	101 J	17.1 J	17.2 J	6.73 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	36.3	90.3	47	48.5 J	48.9 J	39 J	22 J	26.9 J	17.2 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	530	14.6	112	292 J	35.3 J	103 J	15.2 J	14.9 J	3.75 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	20.6	7.05	10.6	18.5 J	7.3 J	7.22 J	3.79 J	3.5 J	1.88 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	8820	30.7	2390	5260 J	516 J	1850 J	225 J	181 J	22.1 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	1350	4.64	373	1050 J	75.3 J	295 J	47.5 J	38 J	4.78 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**1790 J**	11.0 J	**473 J**	**1270 J**	102 J	**382 J**	59.6 J	47.7 J	7.91 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**1790 J**	11.0 J	**473 J**	**1270 J**	102 J	**382 J**	59.6 J	47.7 J	7.92 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

	Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary

Southern Impoundment

San Jacinto River Waste Pits Site

Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-O1, SW-O2, SW-O3, SW-O4, SW-O5	SW-O1, SW-O2, SW-O3, SW-O4, SW-O5	SW-P1, SW-P2, SW-P3, SW-P4, SW-P5	SW-Q1, SW-Q2, SW-Q3, SW-Q4, SW-Q5	SW-R1, SW-R2, SW-R3	SW-S1, SW-S2, SW-S3	SW-U1, SW-U2, SW-U3, SW-U4, SW-U5	SW-T1, SW-T2, SW-T3, SW-T4, SW-T5	SW-V1, SW-V2, SW-V3, SW-V4, SW-V5	SW-R4, SW-R5, SW-R6
Sample Identification:	Units	11215131-120821-S-SS-DUP-5	11215131-120821-S-SS-SW-O-10	11215131-010622-S-BN-SW-O-11	11215131-010622-S-BN-SW-O-12	11215131-010722-S-BN-SW-O-13	11215131-010722-S-BN-SW-O-14	11215131-010522-S-BN-SW-O-15	11215131-010722-S-BN-SW-O-16	11215131-010522-S-BN-SW-O-17	11215131-011922-S-BN-SW-O-18
Sample Date:		12/08/2021	12/08/2021	01/06/2022	01/06/2022	01/07/2022	01/07/2022	01/05/2022	01/07/2022	01/05/2022	01/19/2022
Sample Type:		Duplicate	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	16.7	28.1	103	127	90	11.5	13.4	13.6	4.56 J	102
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	8340	8470	2850	10000 J	3000	1170	12300 J	337	8190	4260
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	6.41	13.1	35.3	44.1	14	11.5	3.38 J	4.3	2.34 J	31.9
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	144	185	245	232	114	63.2	94.4	26.4	76.3	483
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.946 J	2.13 J	3.3 J	9.57	1.17 J	3.72 J	0.7 J	0.929 U	0.396 J	3.78
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	3.19 J	14.1 J	8.14	58.1	1.88 J	36.3	2.53 J	3.64	1.83 J	6.5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.6 J	2.23 J	2.85	1.97 J	0.916 J	0.587 J	1.09 J	0.723 U	1.13 J	2.17 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.04 J	3.86	3.42	16.7	1.04 J	9.68	0.671 J	1.45 J	0.259 U	3.76
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.53	4.65	6.05 J	6.3	2.41 J	1.66 J	1.53 J	1.03 J	1.31 J	10.7
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.147 U	0.289 U	0.433 U	0.339 U	0.384 U	0.355 U	0.338 U	0.809 U	0.369 U	0.516 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.73	3.91	5.29	4.05	1.73 J	2.08 J	1.69 J	0.941 J	1.42 J	6.73
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.74 J	10.7 J	3.2	27.4	1.03 J	25.1	1.62 J	2.58	0.961 J	3.26 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	1.04 J	2.22 J	1.01 J	2.48	0.664 J	2.34 J	0.495 J	0.84 U	0.769 J	1.29 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.61 J	1.3 J	3.34	5.13	0.874 J	2.15 J	0.352 J	1.19 U	0.344 U	3.88
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	1.65 J+	9.45 J+	4.43	19.6 J+	1.27 J	20.4	1.55 J	2.81	0.713 J	8.49
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	37.1 J	299 J	22.6	424	26.5	653	47.1	76.7	10.6	68.3
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	12.4 J	107 J	5.72	145	9.2	238	17.6	22.4	3.8	7.97
Total heptachlorodibenzofuran (HpCDF)	pg/g	15.2 J	34.2 J	94.8 J	119 J	37.6 J	24 J	10.7 J	10.5 J	5.16 J	103 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	350 J	446 J	574 J	602 J	327 J	168 J	232 J	83.7 J	198 J	937 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	10.6 J	32.4 J	56 J	123 J	16.8 J	60 J	6.33 J	17 J	2.9 J	54.5 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	29.4 J	49.4 J	75.1 J	69.9 J	35.9 J	53.7 J	21.5 J	9.2 J	18.3 J	103 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	8.72 J	37.5 J	37.6 J	85.8 J	10.3 J	70.8 J	5.2 J	14.7 J	1.67 J	42.5 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	4.32 J	7.23 J	10.7 J	12.1 J	4.4 J	11.4 J	0.495 J	0.84 U	2.35 J	9.34 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	72.5 J	602 J	64.5 J	900 J	55.9 J	1320 J	97.8 J	150 J	17.3 J	132 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	14 J	120 J	8.29 J	167 J	11.5 J	277 J	19.1 J	23.9 J	3.8 J	9.24 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	22.9 J	150 J	17.0 J	212 J	16.0 J	**318 J**	28.8 J	32.1 J	9.69 J	28.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	22.9 J	150 J	17.1 J	212 J	16.0 J	**319 J**	28.8 J	32.7 J	9.74 J	28.6 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-Q6, SW-Q7, SW-Q8	SW-Q6, SW-Q7, SW-Q8	SW-T7, SW-T8, SW-T9, SW-T10, SW-T11	SW-V6	SW-R7, SW-R8, SW-R9, SW-R10, SW-R11	SW-Q9, SW-Q10, SW-Q11, SW-Q12, SW-Q13	SW-T12, SW-T13, SW-T14, SW-T15, SW-T16	SW-V7	SW-A1	SW-A2
Sample Identification:	Units	11215131-011922-S-BN-DUP-13	11215131-011922-S-BN-SW-O-19	11215131-012022-S-BN-SW-O-20	11215131-011922-S-BN-SW-O-21	11215131-020422-S-SB-SW-O-22	11215131-020422-S-SB-SW-O-23	11215131-020522-S-SB-SW-O-24	11215131-020422-S-SB-SW-O-25	11215131-120221-S-JC-SW-S-1	11215131-120221-S-JC-SW-S-2
Sample Date:		01/19/2022	01/19/2022	01/20/2022	01/19/2022	02/04/2022	02/04/2022	02/05/2022	02/04/2022	12/02/2021	12/02/2021
Sample Type:		Duplicate	Overburden	Overburden	Sidewall	Overburden	Overburden	Overburden	Overburden	Sidewall	Sidewall
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	4450	42.3	61.6	208	80	23.6	35.4	45.5	73.9	51.6
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	7360	17000 J	1150	6440	3640	21000 J	1160	975	1770	6150
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	621	29.1	29.4	267	27	15.1	11.4	8.02	35.9	29
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	535	186	76.7	440	460	196	69.5	37.4	136	161
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	159	9.42	3.06 J	96.7	3.03	5.72	1.62 J	0.849 J	10.9	9.23
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1370	88.2	3.44	777	4.47	57.8	4.82	1.99 J	76.3	69.8
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	4.22	1.63 J	0.491 U	2.23 J	2.25 J	1.32 J	0.785 J	0.493 J	1.89	1.25 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	360	21.9	1.78 J	208	2.68	13.3	2.12 J	0.62 J	19.6	18.8
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	19.1	2.07 J	3.45	10.7	12.3	2.2 J	2.22 J	0.916 J	6.25	3.12
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.724 U	0.298 U	0.327 U	0.418 U	0.409 U	0.296 U	0.282 U	0.386 U	0.091 U	0.118 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	9.71	1.96 J	1.39 J	4.62	7.79	2.23 J	1.41 J	1 J	4.33	3.39
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	831	43.7	0.586 J	470	1.66 J	21.5	5.91	0.834 J	47.3	43.5
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	62.6	4.39	0.461 U	49.4	1.36 J	1.4 J	1.4 J	0.283 U	5.29	4.17
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	77.1	4.12 J	2.33 J	40.2	2.9 J	2.4 J	1.57 J	0.336 U	4.65	4.41
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	543 J+	32.2	0.944 J	371	4.12	9.75	5.55	0.756 J	39.4	33.6
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	16600 J	906	2.13 J	11600 J	10.4	192	63.1	19.7	1300 J	1050 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6040 J	330	1.1 J	4940 J	2.76	52.4	19.9	5.82	468	383
Total heptachlorodibenzofuran (HpCDF)	pg/g	1030 J	53.8 J	97.8 J	501 J	83.9 J	32.6 J	32 J	15 J	68.2 J	55.5 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	1120 J	459 J	140 J	1160 J	863 J	492 J	167 J	120 J	266 J	358 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	2200 J	134 J	52.7 J	1190 J	44.8 J	89.5 J	23.4 J	6.57 J	132 J	118 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	197 J	28.8 J	13.8 J	117 J	123 J	32.8 J	22.5 J	34.8 J	73.2 J	65 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	2190 J	120 J	7.75 J	1320 J	34.8 J	49.7 J	46.1 J	3.31 J	148 J	128 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	113 J	8.47 J	0.461 U	71 J	12.2 J	5.14 J	6.26 J	4.8 J	19.8 J	15.6 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	31400 J	1720 J	2.9 J	22500 J	43.8 J	390 J	217 J	37.1 J	2680 J	2120 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	6780 J	366 J	1.1 J	5480 J	5.82 J	59.4 J	28.9 J	12.5 J	535 J	440 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**8150 J**	**455 J**	4.31 J	**6390 J**	15.7 J	93.0 J	31.9 J	9.31 J	630 J	517 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**8150 J**	**455 J**	4.58 J	**6390 J**	15.7 J	93.0 J	31.9 J	9.49 J	630 J	517 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-B1	SW-B2	SW-C1	SW-D1	SW-D2	SW-E1	SW-E2	SW-E3	SW-H1	SW-H2	SW-I1
Sample Identification:	Units	11215131-120221-S-JC-SW-S-3	11215131-120221-S-JC-SW-S-4	11215131-120321-S-JC-SW-S-5	11215131-120221-S-SPS-SW-S-6	11215131-120221-S-SPS-SW-S-7	11215131-120321-S-SPS-SW-S-8	11215131-120321-S-SPS-SW-S-9	11215131-120321-S-SPS-SW-S-10	11215131-120321-S-SPS-SW-S-11	11215131-120321-S-SPS-SW-S-12	11215131-120321-S-JC-SW-S-13
Sample Date:		12/02/2021	12/02/2021	12/03/2021	12/02/2021	12/02/2021	12/03/2021	12/03/2021	12/03/2021	12/03/2021	12/03/2021	12/03/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans													
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	129	72.3	35.2	32.8	236	124	358	1040	2410	7.89	4.47 J
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	3190	1520	1160	634	3650	2170 J	17800 J	6550 J	4800 J	708 J	628
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	58.9	22.2	12.5	7.66	130	25.3	153	199	492	6.65	4.89 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	225	102	85.6	47.2	258	165	503	247	343	40.5	32.5
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	11.4	3.09	1.82	0.713 J	42.9	3.08	52.1	74	160	2.33	1.04 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	77.6	13.3	8.71	4.21	435	6.42	513	642	1380	19.8	14.4
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.07	1.14 J	0.847 J	0.641 U	1.44 J	0.909 U	3.78	1.56 J	1.96	0.424 U	1.22 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	18.1	3.86	2.05 J	1.24 J	113	2.92	122	151	331	5.08	3.39
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	9.32	3.69	3.02	1.86	5.82	4.22 J	9.37	6.66	10.7	1.18 J	1.11 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.703 U	0.326 U	0.305 U	0.471 U	0.552 U	0.533 U	1.42 U	1.12 U	0.614 U	0.347 U	0.716 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	5.22	2.41	1.94	1.82	2.51 J	2.97	6.93	3.92	4.38	1.08 J	1.08 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	39.1	7.45	4.64	2.15	324	3.07	323	386	744	13.6	9.87
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	3.92	0.948 J	0.601 J	0.445 J	29.6	1.04 J	26.9	23.2	75.8	1.81	1.36 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	4.94	2	1.06 J	0.459 U	26.9	2.5	24.9	31.3	62.2	1.07 J	0.696 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	30.7	6.48 J+	4.48	1.78	278	3.83 J	235	245	529	11.5	7.98
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1030 J	152	115	63.6	9470 J	54.2	8390 J	7240 J	22500 J	428	302
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	295	43.1	34.8	18.3	2800 J	13.7	2360 J	2000 J	6820 J	127	87.6
Total heptachlorodibenzofuran (HpCDF)	pg/g	118 J	58.4 J	30.3 J	14.1 J	239 J	61.4 J	292 J	369 J	826 J	13.5 J	8.99 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	459 J	266 J	212 J	124 J	527 J	475 J	1430 J	550 J	712 J	127 J	109 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	147 J	42.8 J	25.4 J	10.2 J	679 J	37.7 J	784 J	968 J	2070 J	31.8 J	22.3 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	80.4 J	45.6 J	51.3 J	23.1 J	83.8 J	67.5 J	127 J	72.9 J	105 J	34.2 J	36.8 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	132 J	36 J	23.2 J	7.95 J	942 J	31 J	861 J	970 J	2000 J	39.4 J	25.8 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	16.9 J	6.59 J	7.9 J	3.92 J	50.5 J	10 J	41.5 J	37.4 J	107 J	6.39 J	7.48 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2090 J	302 J	237 J	133 J	18600 J	137 J	16600 J	14300 J	42700 J	859 J	591 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	339 J	50.6 J	42 J	22 J	3150 J	21.3 J	2650 J	2260 J	7640 J	146 J	99.6 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**428 J**	65.8 J	51.5 J	27.4 J	**3930 J**	25.9 J	**3390 J**	**2920 J**	**9520 J**	179 J	124 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**428 J**	65.8 J	51.5 J	27.5 J	**3930 J**	25.9 J	**3390 J**	**2920 J**	**9520 J**	179 J	124 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

	Overburden and excavation bottom sample exceed
Bold	240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-J1	SW-K1	SW-K2	SW-L1	SW-L2	SW-L3	SW-M1	SW-M2	SW-M3	SW-N1	SW-N2
Sample Identification:	Units	11215131-120321-S-SS-SW-S-14	11215131-120821-S-JC-SW-S-15	11215131-120821-S-JC-SW-S-16	11215131-120221-S-SPS-SW-S-17	11215131-120221-S-SPS-SW-S-18	11215131-120221-S-SPS-SW-S-19	11215131-120821-S-JC-SW-S-20	11215131-120821-S-JC-SW-S-21	11215131-120821-S-JC-SW-S-22	11215131-120821-S-SS-SW-S-23	11215131-120821-S-SS-SW-S-24
Sample Date:		12/03/2021	12/08/2021	12/08/2021	12/02/2021	12/02/2021	12/02/2021	12/08/2021	12/08/2021	12/08/2021	12/08/2021	12/08/2021
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans													
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	3.22 J	11.3 J	5.97 J	2600	11.9	38.7	26.5	23.9	25.9 J	7.14	31.5
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	482 J	773 J	489 J	8110	1470	1200	1110 J	1530 J	1040 J	668 J	3070 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	1.42 J	11.5	5.12	344	8.94	38.4	31.7	29.8	28.8	9.82	40.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	32.2	62.4	37.3	439	73.6	87.4	83.9	86.9	80.6	43.7	130
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	0.122 U	4.95	1.79 J	105	3.31	19.8	11.3	12.5	11.9	3.43	13.5
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1.36 J	40.7	17.2	832	26.7	141	96.4	108	100	30.3	117
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.625 J	0.74 J	0.591 J	3.31 J	0.812 J	0.832 J	0.823 J	0.657 J	0.721 J	0.703 J	1.36 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.34 J	9.66	4.14	206	6.84	35.1	24.5	26.2	24.1	7.38	29.2
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.971 J	1.44 J	0.963 J	14.4	1.56 J	2.16 J	2.33 J	2.24 J	2.35 J	1.37 J	3.06 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.0913 U	0.123 U	0.0735 U	0.42 U	0.161 U	0.119 U	0.144 U	0.117 U	0.0937 U	0.14 U	0.15 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.47 J	2.12	1.31 J	7.46	1.79	2.89	1.89 J	2.38 J	1.94 J	1.82 J	2.67
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.871 J	23.4	8.83	497	16.1	75.9	57.9	65.8	55.9	18.3	62.7
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	0.382 J	2.63	0.846 J	59	1.8	6.72	6.51	6.42	7.4	2.63	7.1
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	0.0884 J	2.2	1 J	46.9	1.54 J	7.17	5.54	6.34	5.56	1.49 J	6.38
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	0.688 J	20.3 J+	5.06 J+	389 J+	12.7	58.1	49.6 J+	54.1 J+	50.6 J+	15.3 J+	52.9 J+
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	16.1	557	99.3	13600 J	330	1590 J	1780 J	1750 J	1910 J	559	1720 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	5.52	207	43.9	5360 J	114	573	639	603	657	214	617
Total heptachlorodibenzofuran (HpCDF)	pg/g	3.38 J	23.3 J	11.2 J	624 J	17.8 J	75 J	61.3	58.7	55	18.3	75.8
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	117 J	175 J	148 J	881 J	171 J	213 J	190	212	186	124	342
Total hexachlorodibenzofuran (HxCDF)	pg/g	2.8 J	62.5 J	28.3 J	1320 J	43.6 J	216 J	153	169	155	46.4	183
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	38.9 J	51.2 J	30.4 J	173 J	29 J	85.4 J	40.3	113	42.5	35.4	57.6
Total pentachlorodibenzofuran (PeCDF)	pg/g	2.02 J	69.3 J	22.5 J	1430 J	47.4 J	214 J	170	190	169	53.2	182
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.92 J	10.3 J	5.95 J	100 J	6.81 J	22.8 J	15.2	23.7	17.3	9.05	16.3
Total tetrachlorodibenzofuran (TCDF)	pg/g	30.9 J	1130 J	221 J	26000 J	678 J	3180 J	3500	3500	3740	1120	3380
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	12.7 J	232 J	54.4 J	5940 J	132 J	654 J	704	667	727	243	686
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	8.72 J	279 J	59.6 J	7030 J	158 J	779 J	855 J	819 J	887 J	283 J	833 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	8.72 J	279 J	59.6 J	7030 J	158 J	779 J	855 J	819 J	887 J	283 J	833 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-O1	SW-O3	SW-O4	SW-P1	SW-P3	SW-Q1	SW-R1	SW-S1	SW-S2	SW-T1	SW-T1	
Sample Identification:	Units	11215131-120821-S-SS-SW-S-25	11215131-120821-S-SS-SW-S-26	11215131-120821-S-SS-SW-S-27	11215131-010622-S-BN-SW-S-28	11215131-010622-S-BN-SW-S-29	11215131-010622-S-BN-SW-S-30	11215131-010722-S-BN-SW-S-31	11215131-010722-S-BN-SW-S-32	11215131-010722-S-BN-SW-S-33	11215131-010722-S-BN-DUP-11	11215131-010722-S-BN-SW-S-34	
Sample Date:		12/08/2021	12/08/2021	12/08/2021	01/06/2022	01/06/2022	01/06/2022	01/07/2022	01/07/2022	01/07/2022	01/07/2022	01/07/2022	
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Duplicate	Sidewall	
Dioxins/Furans													
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	27	43.2	13.6	81.7	27.4	5.1	113	8.59	4.89 J	35.8	64.1 U	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	1260	3040	1440	1950	1750	550	7990	1420	680	1890	2750	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	36.7	63.4	19.7	14.9	8.64	1.71 J	81	4.92	3.18	6.43	19.7 U	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	90	179	86	94	79.1	27.1	79.3	64	35.3	225	340	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	14.4	24.7	7.61	1.48 J	0.804 J	0.576 U	34.7	0.593 J	0.586 J	0.752 J	1.79 J	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	121	216	64.2	3.91	2.55	2.9	318	3.73	5.91	6.68	11.7	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.763 J	1.23 J	1.09 J	0.897 J	0.82 J	0.886 U	0.916 J	0.78 J	0.794 J	0.625 J	1.1 J	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	31.3	53.8	16.1	1.34 J	1.16 J	1 J	78.9	1.26 J	1.72 J	1.36 J	2.94	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.13	4.21	2.23	3.42 J	2.34 J	0.753 J	2.24 J	1.65 J	1.08 J	2.76	4.42	
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.0937 U	0.309 U	0.105 U	0.266 U	0.175 U	0.522 U	0.513 U	0.25 U	0.172 U	0.586 U	0.197 U	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.06	2.77	3.05	2.47	1.51 J	0.971 J	1.82 J	1.77 J	1.73 J	2.06 J	2.43	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	71.8	168	41.9	1.54 J	1.17 J	1.66 J	158	2.44 J	3.49	4.88	5.93	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	7.09	13.8	5.35	0.894 J	0.316 J	0.753 U	21.8	0.454 J	0.73 J	0.704 U	0.968 J	
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	6.96	13	3.46	1.27 J	1 J	0.323 U	14.1	0.512 J	0.466 J	0.99 U	0.87 J	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	57.8 J+	146 J+	37.5 J+	2.16 J+	1.47 J	1.02 J	120 J+	2.19 J	3.24 J+	3.99	4.93 J+	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1860 J	3600 J	1270 J	25.2	20.9	24.4	5700 J	64.9	92.9	159	165 J	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	680	1310 J	484	9.86	8.49	6.79	2200 J	27.3	36.2	37.6	60.1	
Total heptachlorodibenzofuran (HpCDF)	pg/g	70.4 J	119 J	38 J	40.6 J	23.2 J	4.09 J	141 J	12 J	6.25 J	28.2 J	57 J	
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	219 J	386 J	256 J	232 J	183 J	95.5 J	219 J	157 J	119 J	721 J	1020 J	
Total hexachlorodibenzofuran (HxCDF)	pg/g	190 J	337 J	99.6 J	23.9 J	15.2 J	4.55 J	476 J	11.7 J	11.2 J	13.3 J	26.7 J	
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	49.8 J	46.4 J	84.3 J	40.8 J	27.5 J	23.4 J	56 J	37.8 J	40.9 J	97 J	112 J	
Total pentachlorodibenzofuran (PeCDF)	pg/g	203 J	500 J	126 J	18.4 J	10.6 J	3.94 J	440 J	9.93 J	12.6 J	12.8 J	19.5 J	
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	17.2 J	25 J	19.7 J	6.2 J	3.55 J	2.14 J	34.5 J	5.65 J	8.25 J	11.9 J	9.21 J	
Total tetrachlorodibenzofuran (TCDF)	pg/g	3670 J	7040 J	2520 J	59.7 J	46.1 J	57.6 J	11000 J	134 J	185 J	312 J	335 J	
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	739 J	1420 J	537 J	12.1 J	10.6 J	8.91 J	2390 J	38.7 J	49.2 J	58.4 J	77.5 J	
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**911 J**	**1770 J**	**639 J**	17.0 J	13.7 J	10.6 J	**2880 J**	37.1 J	49.1 J	59.1 J	85.8 J	
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**911 J**	**1770 J**	**639 J**	17.0 J	13.7 J	11.1 J	**2880 J**	37.1 J	49.1 J	59.5 J	85.9 J	

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Bold — Overburden and excavation bottom sample exceed 240 pg/g. Those intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold — Sidewall sample concentrations exceed 240 pg/g

ED_014247_00001444-00039

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-Q3	SW-U1	SW-T2	SW-T3	SW-T4	SW-V1	SW-V2	SW-R4	SW-Q6	SW-T7	SW-T8
Sample Identification:	Units	11215131-010622-S-BN-SW-S-35	11215131-010522-S-BN-SW-S-36	11215131-010722-S-BN-SW-S-37	11215131-010722-S-BN-SW-S-38	11215131-010722-S-BN-SW-S-39	11215131-010522-S-BN-SW-S-40	11215131-010522-S-BN-SW-S-41	11215131-011922-S-BN-SW-S-42	11215131-011922-S-BN-SW-S-43	11215131-012022-S-BN-SW-S-44	11215131-012022-S-BN-SW-S-45
Sample Date:		01/06/2022	01/05/2022	01/07/2022	01/07/2022	01/07/2022	01/05/2022	01/05/2022	01/19/2022	01/19/2022	01/20/2022	01/20/2022
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans												
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	1320	11.5 J	57.9 U	58.8 U	77.4	29	68.2	898	1670	65.7	123
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	4170	2260	1570	1540	2400	890	8420	4060	8140	2490	2550
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	331	10.7	82.8	61.2	100	47.5	106	287	281	86.7	79.3
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	242	47	116	107	179	57.9	172	322	225	167	186
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	122	4.86	29.6	18.4	36.6	19.4	45.7	93.3	87.6	35.2	30.3
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	1100	36.4	259	153	330	183	353	812	1070	258	248
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	2.06 J	0.798 U	0.764 J	0.853 J	0.953 J	0.565 U	1.34 J	1.8 J	1.8 J	0.853 J	1.28 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	269	9.63	63.5	39.3	80.8	45.6	89.1	206	265	71.3	65.5
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	7.04 J	1.24 J	3.19	2.93	5.19	1.5 J	3.18 J	7.99 J	6.92	4.19	5.51
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	1.52 U	0.869 U	0.427 U	0.355 U	0.394 U	0.774 U	0.84 U	0.534 U	0.642 U	0.436 U	0.352 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	3.75 J	0.945 J	1.73 J	2.35	2.76	1.67 J	2.12 J	4.55	4.16	2.69	3.12
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	704	20.4	143	90.9	202	97.1	196	412	950	123	145
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	37.9	2.24 J	12.7	9.88	21.2	7.32	17.2	38.3	20.6	13.2	14.8
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	51.5 J+	1.96 J+	13.5	8.63	17.8	7.86 J+	15.6	38.4	62.6	12.2	14.3
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	462	15	115 J+	81.2 J+	174 J+	64.5	145	307	477	111	122
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	10700 J	426	3740 J	2760 J	6060 J	1940 J	4650 J	11400 J	5540 J	3970 J	4450 J
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3100 J	114	1270 J	970 J	2280 J	549	1420 J	3950 J	1860 J	1360 J	1560 J
Total heptachlorodibenzofuran (HpCDF)	pg/g	570 J	21.1 J	147 J	107 J	187 J	83 J	194 J	491 J	469 J	159 J	145 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	602 J	130 J	223 J	223 J	353 J	135 J	378 J	643 J	552 J	340 J	383 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	1630 J	54.4 J	397 J	245 J	514 J	265 J	517 J	1240 J	1670 J	398 J	399 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	75.8 J	28.9 J	34.1 J	55.4 J	70 J	24.8 J	45.6 J	91 J	68.8 J	52.2 J	52.8 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	1800 J	52.8 J	406 J	279 J	593 J	240 J	520 J	1130 J	2200 J	366 J	426 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	55.6 J	6.11 J	22.8 J	23.1 J	40 J	10.9 J	25.1 J	60 J	34.6 J	25.5 J	25.5 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	20400 J	813 J	7210 J	5380 J	11700 J	3770 J	9130 J	21500 J	10400 J	7600 J	8650 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	3400 J	126 J	1390 J	1080 J	2470 J	617 J	1590 J	4470 J	2070 J	1530 J	1760 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	4520 J	170 J	1730 J	1310 J	3010 J	798 J	2000 J	5350 J	2760 J	1850 J	2100 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	4520 J	170 J	1730 J	1310 J	3010 J	798 J	2000 J	5350 J	2760 J	1850 J	2100 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.

Bold Sidewall sample concentrations exceed 240 pg/g

Table 1

PC-FSE– Soil Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Excavation Area:		Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest	Southwest
Sample Location:		SW-V6	SW-R7	SW-R11	SW-Q9	SW-Q10	SW-T12, SW-T13, SW-T14, SW-T15, SW-T16	SW-T12, SW-T13, SW-T14, SW-T15, SW-T16	SW-T12, SW-T13, SW-T14, SW-T15, SW-T16	SW-V7
Sample Identification:	Units	11215131-011922-S-BN-SW-S-46	11215131-020422-S-SB-SW-S-47	11215131-020422-S-SB-SW-S-48	11215131-020422-S-SB-SW-S-49	11215131-020422-S-SB-SW-S-50	11215131-020522-S-SB-SW-S-51	11215131-020522-S-SB-SW-S-52	11215131-020522-S-SB-SW-S-53	11215131-020422-S-SB-SW-S-54
Sample Date:		01/19/2022	02/04/2022	02/04/2022	02/04/2022	02/04/2022	02/05/2022	02/05/2022	02/05/2022	02/04/2022
Sample Type:		Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall	Sidewall
Dioxins/Furans										
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/g	29.5 J	7.71	113	11.3	9.32	2.65 J	4.45 J	21.7	462
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/g	2590	417	3700	389	428	349	756	960	717
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/g	32.3	2.77	88.4	10.1	1.32 J	1.33 J	2.64 J	24.9	63.3
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	48.7	29.5	349	22	19.9	20.9	37.3	78	42.4
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/g	14.5	0.255 J	13.2	4.82	0.165 U	0.211 U	0.886 J	8.57	1.95
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	117	0.453 J	35.1	32.8	0.204 J	1.59 J	7.95	61.5	2.3
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	0.455 U	0.509 J	1.97 J	0.562 J	0.505 J	0.416 U	0.578 J	0.961 J	0.671 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	32	0.222 J	12.7	8.33	0.197 J	0.45 J	2.08 J	15.8	1.16 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.22 J	0.919 J	10.3	0.638 J	0.628 J	0.773 J	1.16 J	2.37 J	1.69 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/g	0.355 U	0.117 U	0.533 U	0.21 U	0.244 J	0.208 U	0.147 U	0.237 U	0.232 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	1.23 J	0.775 J	7.08	0.972 J	1.19 J	1.01 J	1.75 J	2.15 J	1.42 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	60.3	0.261 J	17.1	12	0.171 J	0.981 J	5.75	34	1.4 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	5.62	0.144 U	3.41	1.02 J	0.375 J	0.309 J	0.8 J	3.63	0.599 J
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/g	5.45	0.296 J	12.7	1.74 J	0.0823 U	0.176 U	0.7 J	2.89	1.24 J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/g	44.8 J+	0.346 J	17.4 J+	7.94 J+	0.18 U	1.24 J	4.83 J+	28.8 J+	2.15
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/g	1280 J	3.84	329	155	1.46 J	31.7	165	920	50.1
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	443	1.43	125	57.6	0.467 J	12.2	63.1	346	11.3
Total heptachlorodibenzofuran (HpCDF)	pg/g	60.9 J	7.93 J	156 J	19 J	1.65 J	2.52 J	5.91 J	47.2 J	77 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/g	170 J	97.2 J	670 J	70.4 J	69.9 J	77.3 J	113 J	222 J	132 J
Total hexachlorodibenzofuran (HxCDF)	pg/g	180 J	3.42 J	120 J	50.9 J	1 J	4.83 J	14 J	94.8 J	17.4 J
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/g	31.6 J	18.4 J	134 J	18.3 J	20.8 J	43.4 J	59.7 J	48.9 J	30.4 J
Total pentachlorodibenzofuran (PeCDF)	pg/g	161 J	2.18 J	99.1 J	31.7 J	0.171 J	5.58 J	17.8 J	99.5 J	13 J
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/g	9.42 J	1.77 J	26.6 J	3.52 J	3.85 J	8.01 J	12.4 J	13.3 J	5.67 J
Total tetrachlorodibenzofuran (TCDF)	pg/g	2500 J	11 J	734 J	330 J	6.83 J	67.4 J	349 J	1890 J	80 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/g	498 J	2.89 J	156 J	67 J	3.75 J	18.8 J	81.6 J	401 J	15.8 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/g	**609 J**	2.70 J	181 J	81.9 J	1.63 J	16.8 J	84.1 J	**461 J**	19.9 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/g	**609 J**	2.77 J	181 J	81.9 J	1.67 J	16.8 J	84.1 J	**461 J**	19.9 J

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

J- - Estimated concentration, result may be biased low.

J+ - Estimated concentration, result may be biased high.

TEQ - Toxicity Equivalent Quotient

pg/g - picogram per gram

	Overburden and excavation bottom sample exceed 240 pg/g. These intervals may remain or be re-used within the excavated polygons if a depth weighted average below 240 pg/g can be achieved.
Bold	Sidewall sample concentrations exceed 240 pg/g

Table 2

PC-FSE – Rinstate Blank Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date:	Units	Rinsate 11215131-120221-S-JC-RB-1 12/02/2021	Rinsate 11215131-120421-S-SS-RB-3 12/04/2021	Rinsate 11215131-120621-S-JC-RB-4 12/06/2021	Rinsate 11215131-120821-S-JC-RB-6 12/08/2021	Rinsate 11215131-120821-S-SS-RB-5 12/08/2021	Rinsate 11215131-121321-S-BN-RB-8 12/13/2021	Rinsate 11215131-121321-S-SS-RB-7 12/13/2021	Rinsate 11215131-122121-S-BN-RB-9 12/21/2021
Dioxins/Furans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	9.9 U	7.63 U	8.58 U	15.1 J	5.19 U	5.49 U	3.92 U	7.55 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	10.5 U	12.8 U	11.9 U	7.48 U	10.8 U	7.66 U	5.52 U	10.2 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	3.51 U	2.79 U	2.37 U	11.2 J	1.37 U	1.58 J	1.2 J	2.19 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	4.83 U	5.23 U	4.95 U	2.76 U	2.71 U	3.22 U	1.7 U	3.87 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	4.03 U	3.52 U	2.94 U	2.89 U	2.24 U	1.78 U	1.21 U	2.86 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	3.84 U	2.87 U	2.86 U	3.78 J	1.35 U	1.15 U	0.706 U	3.35 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	6.11 U	4.3 U	4.65 U	3.01 U	1.89 U	1.55 U	1.07 U	3.85 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	3.8 U	2.75 U	2.73 U	2.19 U	1.32 U	1.03 U	0.645 U	2.34 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	5.96 U	4.3 U	4.91 U	2.95 U	1.65 U	1.46 U	1 U	3.87 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	4.81 U	3.17 U	3.18 U	3.04 U	1.45 U	1.17 U	0.737 U	4.03 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	5.92 U	4.01 U	4.36 U	3.19 U	1.67 U	1.55 U	0.991 U	3.98 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	3.88 U	3.86 U	3.19 U	2.68 U	1.33 U	0.883 U	0.922 U	3.71 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	4.61 U	5.16 U	4.07 U	3.61 U	1.48 U	1.46 U	1.2 U	4.41 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	4.59 U	2.98 U	3.09 U	3.05 U	1.54 U	1.19 U	0.847 U	2.51 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	4.04 U	3.32 U	3.06 U	2.5 U	1.33 U	0.863 U	0.903 U	3.67 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	3.74 U	3.84 U	3.41 U	3.74 U	1.39 U	1.08 U	0.945 U	5.23 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	4.82 U	3.92 U	3.37 U	4.11 U	2.64 U	2.46 U	2.04 U	5.28 U
Total heptachlorodibenzofuran (HpCDF)	pg/L	3.75 U	3.12 U	2.64 U	11.2	1.75 U	1.58	1.2	2.5 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	4.83 U	5.23 U	4.95 U	2.76 U	2.71 U	3.22 U	1.7 U	3.87 U
Total hexachlorodibenzofuran (HxCDF)	pg/L	4.23 U	2.93 U	2.95 U	7.67	1.41 U	4.58	0.728 U	2.93 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	5.99 U	4.19 U	4.62 U	3.05 U	1.73 U	1.52 U	1.02 U	3.9 U
Total pentachlorodibenzofuran (PeCDF)	pg/L	3.96 U	3.59 U	3.12 U	2.59 U	1.33 U	0.873 U	0.913 U	3.69 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	4.61 U	5.16 U	4.07 U	3.61 U	1.48 U	1.46 U	1.2 U	4.41 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	3.74 U	3.84 U	3.41 U	3.74 U	1.39 U	1.08 U	0.945 U	5.23 U
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	4.82 U	3.92 U	3.37 U	4.11 U	2.64 U	2.46 U	2.04 U	5.28 U
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/L	0	0	0	0.495 J	0	0.0158 J	0.012 J	0
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/L	7.38	6.57	5.74	5.86 J	2.93	2.65 J	2.14 J	6.96

Notes:
U - Not detected at the associated reporting limit.
J - Estimated concentration.
TEQ - Toxicity Equivalent Quotient
pg/L - picogram per liter

Table 2

PC-FSE – Rinstate Blank Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date:	Units	Rinstate 11215131-010622-S-BN-RB-10 01/06/2022	Rinstate 11215131-010722-S-BN-RB-11 01/07/2022	Rinstate 11215131-011022-S-BN-RB-12 01/10/2022	Rinstate 11215131-011922-S-BN-RB-13 01/19/2022	Rinstate 11215131-012222-S-BN-RB-14 01/22/2022	Rinstate 11215131-020522-S-SB-RB-15 02/05/2022	Rinstate 11215131-020622-S-SB-RB-16 02/06/2022
Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	12.7 U	7.08 U	6.01 U	12.6 U	5.08 U	2.65 U	5.28 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	10.6 U	8.59 U	7.41 U	94	9.44 J	4.83 U	4.58 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	3.13 U	2.36 U	2.38 U	2.75 U	1.78 U	1.33 U	1.66 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	5.29 U	3.54 U	3.67 U	5.79 U	2.78 U	2.34 U	2.54 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	5.15 U	3.4 U	3.73 U	5.89 U	2.38 U	1.86 U	2.24 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	3.25 U	2.55 U	2.53 U	2.54 U	1.68 U	1.11 U	1.64 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.73 U	4.16 U	4.14 U	4.19 U	2.91 U	1.54 U	2.57 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	3.06 U	2.26 U	2.22 U	2.47 U	1.48 U	0.974 U	1.5 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.23 U	3.7 U	3.27 U	4.04 U	2.55 U	1.49 U	2.47 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	4.3 U	3.04 U	3.07 U	3.83 U	1.72 U	1.17 U	1.84 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.55 U	4.26 U	4.04 U	4.5 U	2.99 U	1.44 U	2.37 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	4.32 U	4.44 U	3.42 U	3 U	2.31 U	1.25 U	1.66 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	5.03 U	3.6 U	3.2 U	3.94 U	2.52 U	2.67 U	2.66 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	3.78 U	2.77 U	2.81 U	2.98 U	1.24 U	0.989 U	1.46 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	4.42 U	4.14 U	3.38 U	2.61 U	2.11 U	1.29 U	1.58 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	5.51 U	2.84 U	3.76 U	2.94 U	1.96 U	1.64 U	1.5 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	8.55 U	5.68 U	5.39 U	3.42 U	3.75 U	2.17 U	3.83 U
Total heptachlorodibenzofuran (HpCDF)	pg/L	4 U	2.81 U	2.96 U	3.94 U	2.05 U	1.58 U	1.93 U
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	5.29 U	3.54 U	3.67 U	5.79 U	2.78 U	2.34 U	2.54 U
Total hexachlorodibenzofuran (HxCDF)	pg/L	3.52 U	2.62 U	2.61 U	2.86 U	1.49 U	1.05 U	1.59 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	4.49 U	4.03 U	3.78 U	4.24 U	2.81 U	1.49 U	2.47 U
Total pentachlorodibenzofuran (PeCDF)	pg/L	4.37 U	4.29 U	3.4 U	2.81 U	2.21 U	1.27 U	1.62 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	5.03 U	3.6 U	3.2 U	3.94 U	2.52 U	2.67 U	2.66 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	5.51 U	2.84 U	3.76 U	2.94 U	1.96 U	1.64 U	1.5 U
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	8.55 U	5.68 U	5.39 U	3.42 U	3.75 U	2.17 U	3.83 U
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/L	0	0	0	0.0282	0.00283 J	0	0
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/L	9.26	6.67	6.20	5.60	4.35 J	3.18	4.31

Notes:
U - Not detected at the associated reporting limit.
J - Estimated concentration.
TEQ - Toxicity Equivalent Quotient
pg/L - picogram per liter

Table 3

PC-FSE – Discrete Waste Characterization Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	NE-D1 11215131-113021-WC-SPS-NE-D1(6-8) 11/30/2021 (6-8) ft bgs	NE-G4 11215131-120121-WC-JC-NE-G4(4-6) 12/01/2021 (4-6) ft bgs	SW-B4 11215131-120221-WC-JC-SW-B4(2-4) 12/02/2021 (2-4) ft bgs	SC-B4 11215131-120621-WC-SS-SC-B4(2-4) 12/06/2021 (2-4) ft bgs	NC-Y2 11215131-121321-WC-SS-NC-Y2(6-8) 12/13/2021 (6-8) ft bgs	NC-E2 11215131-121321-WC-SS-NC-E2(8-10) 12/13/2021 (8-10) ft bgs
TCLP-Herbicides							
2,4,5-TP (Silvex)	mg/L	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U
Dinoseb	mg/L	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
TCLP-Metals							
Antimony	mg/L	0.0053 J	0.016 J	0.0047 U	0.0052 J	0.046 J	0.0047 U
Arsenic	mg/L	0.014 J	0.011 J	0.0091 J	0.0028 U	0.0028 U	0.034 J
Barium	mg/L	1.1	0.98	0.91	1.2	0.31	2.7
Beryllium	mg/L	0.00050 U	0.00050 U	0.00070 J	0.00050 U	0.010 U	0.0023
Cadmium	mg/L	0.0010 U	0.0023 J	0.0039 J	0.010	0.0076	0.016
Chromium	mg/L	0.0020 U	0.0068 J	0.0087 J	0.0032 J	0.095	0.0020 U
Lead	mg/L	0.0052 J	0.013 J	0.011 J	0.0018 U	0.0018 U	0.27
Mercury	mg/L	0.00037	0.000095 U	0.000095 U	0.00011 J	0.000095 U	0.000095 U
Nickel	mg/L	0.067	0.086	0.035	0.032	0.067	0.099
Selenium	mg/L	0.0049 U	0.0049 U	0.0049 U	0.0070 J	0.042 J	0.0049 U
Silver	mg/L	0.0056 J	0.0069 J	0.0072 J	0.0034 J	0.013	0.0019 U
Vanadium	mg/L	0.0018 U	0.0062 J	0.011 J	0.0018 U	0.015 J	0.040 J
PCBs							
Aroclor-1016 (PCB-1016)	mg/kg	0.023 U	0.020 U	0.018 U	0.018 U	0.037 U	0.028 U
Aroclor-1221 (PCB-1221)	mg/kg	0.031 U	0.027 U	0.023 U	0.024 U	0.049 U	0.037 U
Aroclor-1232 (PCB-1232)	mg/kg	0.032 U	0.027 U	0.024 U	0.024 U	0.050 U	0.038 U
Aroclor-1242 (PCB-1242)	mg/kg	0.020 U	0.018 U	0.015 U	0.016 U	0.032 U	0.025 U
Aroclor-1248 (PCB-1248)	mg/kg	0.044 U	0.038 U	0.034 U	0.303	0.070 U	0.054 U
Aroclor-1254 (PCB-1254)	mg/kg	0.027 U	0.0448	0.020 U	0.552	0.042 U	0.032 U
Aroclor-1260 (PCB-1260)	mg/kg	0.021 U	0.018 U	0.016 U	0.210	0.034 U	0.026 U
TCLP-Pesticides							
4,4'-DDD	mg/L	0.000038 U	0.000038 U	0.000038 U	0.000038 U	0.000038 U	0.000038 U
4,4'-DDE	mg/L	0.000034 U	0.000034 U	0.000034 U	0.000034 U	0.000034 U	0.000034 U
4,4'-DDT	mg/L	0.000046 U	0.000046 U	0.000046 U	0.000046 U	0.000046 U	0.000046 U
Chlordane, technical	mg/L	--	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Dieldrin	mg/L	0.000051 U	0.000051 U	0.000051 U	0.000051 U	0.000051 U	0.000051 U
Endosulfan I	mg/L	0.000035 U	0.000035 U	0.000035 U	0.000035 U	0.000035 U	0.000035 U
Endosulfan II	mg/L	0.000033 U	0.000033 U	0.000033 U	0.000033 U	0.000033 U	0.000033 U
Endrin	mg/L	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U
gamma-BHC (lindane)	mg/L	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U
Heptachlor	mg/L	0.000030 U	0.000030 U	0.000030 U	0.000030 U	0.000030 U	0.000030 U
Heptachlor epoxide	mg/L	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U
Methoxychlor	mg/L	0.000045 U	0.000045 U	0.000045 U	0.000045 U	0.000045 U	0.000045 U
Mirex	mg/L	0.000031 U	0.000031 U	0.000031 U	0.000031 U	0.000031 U	0.000031 U
Toxaphene	mg/L	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
TCLP-Semi-Volatile Organic Compounds (SVOCs)							
1,4-Dichlorobenzene	mg/L	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
2,4,5-Trichlorophenol	mg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
2,4,6-Trichlorophenol	mg/L	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U
2,4-Dinitrotoluene	mg/L	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
2-Methylphenol	mg/L	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U
3&4-Methylphenol	mg/L	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U
Hexachlorobenzene	mg/L	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U
Hexachlorobutadiene	mg/L	0.0049 U	0.0049 U	0.0049 U	0.0049 U	0.0049 U	0.0049 U
Hexachloroethane	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
Nitrobenzene	mg/L	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U
Pentachlorophenol	mg/L	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
Pyridine	mg/L	0.0039 U	0.0039 U	0.0039 U	R	0.0039 U	0.0039 U
TCLP-Volatile Organic Compounds (VOCs)							
1,1,1,2-Tetrachloroethane	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U

Table 3

PC-FSE – Discrete Waste Characterization Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Depth:	Units	NE-D1 11215131-113021-WC-SPS-NE-D1(6-8) 11/30/2021 (6-8) ft bgs	NE-G4 11215131-120121-WC-JC-NE-G4(4-6) 12/01/2021 (4-6) ft bgs	SW-B4 11215131-120221-WC-JC-SW-B4(2-4) 12/02/2021 (2-4) ft bgs	SC-B4 11215131-120621-WC-SS-SC-B4(2-4) 12/06/2021 (2-4) ft bgs	NC-Y2 11215131-121321-WC-SS-NC-Y2(6-8) 12/13/2021 (6-8) ft bgs	NC-E2 11215131-121321-WC-SS-NC-E2(8-10) 12/13/2021 (8-10) ft bgs
1,1,1-Trichloroethane	mg/L	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U
1,1,2,2-Tetrachloroethane	mg/L	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U
1,1,2-Trichloroethane	mg/L	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U
1,1-Dichloroethene	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
1,2,3-Trichloropropane	mg/L	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U
1,2-Dichloroethane	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
1,3-Dichloropropene	mg/L	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U
1,4-Dichlorobenzene	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	0.0093 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U
Acetone	mg/L	0.030 U	0.030 U	0.030 U	0.030 U	0.030 U	0.030 U
Acetonitrile	mg/L	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
Acrylonitrile	mg/L	0.0052 U	0.0052 U	0.0052 U	0.0052 U	0.0052 U	0.0052 U
Benzene	mg/L	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
Bromodichloromethane	mg/L	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U
Bromoform	mg/L	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U
Bromomethane (Methyl bromide)	mg/L	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U
Carbon disulfide	mg/L	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U
Carbon tetrachloride	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chlorobenzene	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chloroform (Trichloromethane)	mg/L	0.0073 U	0.0109 U	0.0108 U	0.0084 U	0.0102 U	0.0095 U
Dichlorodifluoromethane (CFC-12)	mg/L	0.0068 U	0.0068 U	0.0068 U	0.0068 U	0.0068 U	0.0068 U
Ethylbenzene	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
Hexachlorobutadiene	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Isobutanol (isobutyl alcohol)	mg/L	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U
m&p-Xylenes	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
Methyl acrylonitrile	mg/L	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
Methylene chloride	mg/L	0.0024 J	0.00050 U	0.0024 J	0.00050 U	0.00050 U	0.00050 U
o-Xylene	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
Styrene	mg/L	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
Tetrachloroethene	mg/L	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U
Toluene	mg/L	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U
trans-1,3-Dichloropropene	mg/L	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U
Trichloroethene	mg/L	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Trichlorofluoromethane (CFC-11)	mg/L	0.0042 U	0.0042 U	0.0042 U	0.0042 U	0.0042 U	0.0042 U
Vinyl chloride	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
Xylenes (total)	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
General Chemistry							
Cyanide (total)	mg/kg	0.23 U	0.19 U	0.17 J-	0.17 UJ	0.36 UJ	0.19 UJ
Ignitability	Deg F	200 U	200 U	200 U	200 U	200 U	200 U
Moisture content (dry weight)	%	50.6	37.8	26.2	22.3	139	88.6
Paint filter	mL/100g	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
pH corrosivity	s.u.	7.54 J	7.31 J	7.43 J	7.38 J	11.03 J	7.02 J
Reactive cyanide	mg/kg	11 U	9.6 U	9.2 U	8.9 UJ	16 U	14 U
Reactive sulfide	mg/kg	85 U	81 U	72 U	70 U	130 U	110 U
Sulfide	mg/kg	193	16.4	4.5 U	4.3 U	8.5 U	6.7 U

Notes:
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
J- - Estimated concentration, result may be biased low.
mg/L - milligram per liter
mg/kg - milligram per kilogram

Table 4

PC-FSE – Composite IDW Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Type:	Units	Decon Water Drums 11215131-120121-IDW-SPS-NE DECON 12/01/2021	Decon Water Drums 11215131-120721-IDW-SS-DECON2 12/07/2021	SS Purge 11215131-122021-IDW-SS-PURGE 12/20/2021	NE Soil Cutting Drums 11215131-120121-IDW-SS-NE 12/01/2021	SC Soil Cutting Drums 11215131-120721-IDW-SS-SC 12/07/2021	SW Soil Cutting Drums 11215131-120821-IDW-SS-SW 12/08/2021	NC Soil Cutting Drums 11215131-121421-IDW-BN-NC 12/14/2021
TCLP-Dioxins/Furans								
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	11.1 J	5.84 U	5.06 U	4.86 J	4.43 U	10.7 U	86.5
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	153	8.17 U	39.9 J	25.9 U	11.1 U	11.5 U	199
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	2.75 U	1.62 J	8.31 U	1.47 U	3.03 J	4.36 U	8.32 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	7.89 J	2.06 U	3.74 U	2.23 J	3.93 J	5.96 U	14.2 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	1.43 U	1.66 U	2.72 U	1.01 U	2.17 U	4.95 U	3.98 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	0.859 U	1.04 U	2.64 U	1.06 U	1.97 J	5.04 U	3.43 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.04 U	1.52 U	3.25 U	1.3 U	2.53 U	7.01 U	4.52 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	0.811 U	0.994 U	2.79 U	1.08 U	2.34 J	5.25 U	2.99 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.05 U	1.36 U	3.21 U	1.26 U	2.21 U	6.34 U	4.93 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	0.838 U	1.13 U	3.53 U	1.07 U	1.94 J	6.28 U	4.26 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	0.969 U	1.39 U	3.04 U	1.33 J	2.76 J	6.63 U	5.16 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	0.919 U	0.902 U	3.26 U	1.25 U	2.57 J	6.3 U	3.35 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	1.42 U	1.39 U	2.88 U	2.31 U	1.59 U	7.3 U	3.87 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	0.84 U	1.24 U	4.49 U	1.03 U	2.05 J	5.82 U	3.01 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	0.945 U	0.92 U	3.42 U	1.32 U	2.03 J	6.27 U	3.67 U
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	6.57 J	6.55 J	77.2 U	9.8	3.83 J	52.1	58.2
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	2.9 J	2.09 U	21.6 U	1.43 U	2.48 U	14.2 J	13.4
Total heptachlorodibenzofuran (HpCDF)	pg/L	5.71 J	1.62 J	5.55 J	1.32 J	3.03 J	4.64 U	15.1 J
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	16.8 J	2.06 U	3.74 U	4.84 J	3.93 J	5.96 U	35.7 J
Total hexachlorodibenzofuran (HxCDF)	pg/L	0.835 U	1.09 U	3.22 U	1.06 U	12.8 J	5.56 U	3.35 U
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.69 J	1.42 U	3.16 U	1.33 J	2.76 J	6.65 U	4.87 U
Total pentachlorodibenzofuran (PeCDF)	pg/L	0.932 U	0.911 U	3.34 U	1.29 U	4.6 J	6.29 U	3.51 U
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	1.42 U	1.39 U	2.88 U	2.31 U	1.59 U	7.3 U	3.87 U
Total tetrachlorodibenzofuran (TCDF)	pg/L	10.4 J	10.2 J	126 J	15.8 J	6.48 J	77 J	86.3 J
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	2.9 J	2.09 U	21.6 J	1.43 U	2.48 U	14.2 J	13.4 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/L	3.69 J	0.671 J	0.012 J	1.14 J	2.24 J	19.4 J	19.5 J
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/L	4.89 J	3.02 J	17.9 J	3.58 J	4.53 J	26.3 J	23.5 J
TCLP-Herbicides								
2,4,5-TP (Silvex)	mg/L	0.00039 J	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U
Dinoseb	mg/L	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
TCLP-Metals								
Antimony	mg/L	0.0047 U	0.0047 U	0.0047 U	0.0053	0.0047 U	0.0047 U	0.0047 U
Arsenic	mg/L	0.0042	0.0028 U	0.0028 U	0.012	0.0049	0.0028 U	0.0028 U
Barium	mg/L	0.057	0.10	0.21	1.2	0.60	1.1	0.40
Beryllium	mg/L	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U
Cadmium	mg/L	0.0010 U	0.0010 U	0.0019	0.0026	0.0043	0.0010	0.0011
Chromium	mg/L	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
Lead	mg/L	0.0026	0.0018 U	0.0040	0.0093	0.0018 U	0.0018 U	0.0053
Mercury	mg/L	0.000095 U	0.000095 U	0.000095 U	0.000095 U	0.000095 U	0.000095 U	0.000095 U
Nickel	mg/L	0.0045	0.0035	0.0022	0.050	0.044	0.018	0.020
Selenium	mg/L	0.0049 U	0.0049 U	0.0049 U	0.0049 U	0.0055	0.0065	0.0049 U
Silver	mg/L	0.0019 U	0.0019 U	0.0040	0.0049	0.0019 U	0.0019 U	0.0019 U
Vanadium	mg/L	0.0030	0.0018 U	0.0018 U	0.0029	0.011	0.0055	0.0018 U
TCLP-Pesticides								
4,4'-DDD	mg/L	0.000038 U	0.000038 U	0.000038 U	0.000038 U	0.000038 U	0.000038 U	0.000038 U
4,4'-DDE	mg/L	0.000034 U	0.000034 U	0.000034 U	0.000034 U	0.000034 U	0.000034 U	0.000034 U
4,4'-DDT	mg/L	0.000046 U	0.000046 U	0.000046 U	0.000046 U	0.000046 U	0.000046 U	0.000046 U
Chlordane, technical	mg/L	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Dieldrin	mg/L	0.000051 U	0.000051 U	0.000051 U	0.000051 U	0.000051 U	0.000051 U	0.000051 U
Endosulfan I	mg/L	0.000035 U	0.000035 U	0.000035 U	0.000035 U	0.000035 U	0.000035 U	0.000035 U
Endosulfan II	mg/L	0.000033 U	0.000033 UJ	0.000033 U	0.000033 UJ	0.000033 UJ	0.000033 UJ	0.000033 U
Endrin	mg/L	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U
gamma-BHC (lindane)	mg/L	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U
Heptachlor	mg/L	0.000030 U	0.000030 U	0.000030 U	0.000030 U	0.000030 U	0.000030 U	0.000030 U
Heptachlor epoxide	mg/L	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U	0.000040 U
Methomyl	mg/L	0.01 U	0.025 UJ	0.05 U	0.01 U	0.01 UJ	0.025 U	0.05 U
Methoxychlor	mg/L	0.000045 U	0.000045 U	0.000045 U	0.000045 U	0.000045 U	0.000045 U	0.000045 U
Mirex	mg/L	0.000031 U	0.000031 U	0.000031 U	0.000031 U	0.000031 U	0.000031 U	0.000031 U
Toxaphene	mg/L	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U

Table 4

PC-FSE – Composite IDW Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Type:	Units	Decon Water Drums 11215131-120121-IDW-SPS-NE DECON 12/01/2021	Decon Water Drums 11215131-120721-IDW-SS-DECON2 12/07/2021	SS Purge 11215131-122021-IDW-SS-PURGE 12/20/2021	NE Soil Cutting Drums 11215131-120121-IDW-SS-NE 12/01/2021	SC Soil Cutting Drums 11215131-120721-IDW-SS-SC 12/07/2021	SW Soil Cutting Drums 11215131-120821-IDW-SS-SW 12/08/2021	NC Soil Cutting Drums 11215131-121421-IDW-BN-NC 12/14/2021
Total Petroleum Hydrocarbons (TPH)								
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	--	--	--	12 UJ	31.6 J	7.0 U	13.1 J
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	--	--	--	12 UJ	68.5 J	7.0 U	27.2 J
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	--	--	--	17 UJ	23 U	9.7 U	12 U
Total Petroleum Hydrocarbons (C6-C35)	mg/kg	--	--	--	12 UJ	100 J	7.0 U	40.3 J
Total Petroleum Hydrocarbons (>C12-C28)	mg/L	2.78	1.37 J	0.56 UJ	--	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/L	2.05 J	0.61 U	0.56 UJ	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/L	0.907 J	1.02 J	0.73 UJ	--	--	--	--
Total Petroleum Hydrocarbons (C6-C35)	mg/L	5.74	2.39 J	0.56 UJ	--	--	--	--
TCLP-Glycol								
2-Ethoxyethanol	mg/L	1.0 U	25.0 U	1.0 U	1.0 U	25.0 U	25.0 U	1.0 U
Ethylene glycol	mg/L	5.2 U	14.7 U	12.7	4.8 U	14.7 U	14.7 U	24.1
Ethylene glycol monomethyl ether (2-methyoxyethanol)	mg/L	1.0 U	25.0 U	1.0 U	1.0 U	25.0 U	25.0 U	1.0 U
TCLP-Semi-Volatile Organic Compounds (SVOCs)								
1,2,4-Trichlorobenzene	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
1,2-Diphenylhydrazine	mg/L	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
1,3-Dinitrobenzene	mg/L	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
1,4-Dioxane	mg/L	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U
2,3,4,6-Tetrachlorophenol	mg/L	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
2,4,5-Trichlorophenol	mg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
2,4,6-Trichlorophenol	mg/L	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U
2,4-Dichlorophenol	mg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 UJ
2,4-Dimethylphenol	mg/L	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 UJ
2,4-Dinitrophenol	mg/L	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
2,4-Dinitrotoluene	mg/L	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U	0.0055 U
2,6-Dinitrotoluene	mg/L	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U
2-Chlorophenol	mg/L	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 UJ
2-Methylphenol	mg/L	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U
3&4-Methylphenol	mg/L	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U	0.0088 U
3,3'-Dichlorobenzidine	mg/L	0.0051 U	0.0051 U	0.0051 U	0.0051 U	0.0051 U	0.0051 U	0.0051 U
4-Chloro-3-methylphenol	mg/L	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 U	0.0089 UJ
Acenaphthene	mg/L	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Acetophenone	mg/L	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 UJ
Aniline	mg/L	R	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U
Anthracene	mg/L	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
Benzidine	mg/L	R	R	R	R	R	R	R
bis(2-Chloroethyl)ether	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
bis(2-Ethylhexyl)phthalate (DEHP)	mg/L	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U
Butyl benzylphthalate (BBP)	mg/L	0.0046 U	0.0046 U	0.0046 U	0.0046 U	0.0046 U	0.0046 U	0.0046 U
Diethyl phthalate	mg/L	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Dimethoate	mg/L	0.0024 U	0.0024 U	0.0024 U	0.0024 UJ	0.0024 U	0.0024 U	0.0024 U
Dimethyl phthalate	mg/L	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U
Diphenylamine	mg/L	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U
Disulfoton	mg/L	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U
Ethyl parathion	mg/L	0.0051 U	0.0051 U	0.0051 U	0.0051 U	0.0051 U	0.0051 U	0.0051 U
Fluoranthene	mg/L	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
Fluorene	mg/L	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U
Hexachlorobenzene	mg/L	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U
Hexachlorocyclopentadiene	mg/L	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U
Hexachloroethane	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
Hexachlorophene (HCP)	mg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Isophorone	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 UJ
Methyl parathion	mg/L	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
Nitrobenzene	mg/L	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U
N-Nitrosodimethylamine	mg/L	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U	0.0082 U
N-Nitrosodi-n-butylamine	mg/L	0.0060 U	0.0060 U	0.0060 U	0.0060 U	0.0060 U	0.0060 U	0.0060 U
N-Nitrosodi-n-propylamine	mg/L	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U
N-Nitrosomethylethylamine	mg/L	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U
N-Nitrosopyrrolidine	mg/L	0.0073 U	0.0073 U	0.0073 U	0.0073 U	0.0073 U	0.0073 U	0.0073 U
Pentachlorobenzene	mg/L	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U
Pentachloronitrobenzene	mg/L	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U
Pentachlorophenol	mg/L	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U

Table 4

PC-FSE – Composite IDW Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: Sample Identification: Sample Date: Sample Type:	Units	Decon Water Drums 11215131-120121-IDW-SPS-NE DECON 12/01/2021	Decon Water Drums 11215131-120721-IDW-SS-DECON2 12/07/2021	SS Purge 11215131-122021-IDW-SS-PURGE 12/20/2021	NE Soil Cutting Drums 11215131-120121-IDW-SS-NE 12/01/2021	SC Soil Cutting Drums 11215131-120721-IDW-SS-SC 12/07/2021	SW Soil Cutting Drums 11215131-120821-IDW-SS-SW 12/08/2021	NC Soil Cutting Drums 11215131-121421-IDW-BN-NC 12/14/2021
Phenol	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
p-Phenylenediamine	mg/L	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
Pronamide	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Pyrene	mg/L	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0023 J
Pyridine	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
TCLP-Volatile Organic Compounds (VOCs)								
1,1,1,2-Tetrachloroethane	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
1,1,1-Trichloroethane	mg/L	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U
1,1,2,2-Tetrachloroethane	mg/L	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U
1,1,2-Trichloroethane	mg/L	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0027 U
1,1-Dichloroethene	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
1,2,3-Trichloropropane	mg/L	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0024 U
1,2-Dichloroethane	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
1,3-Dichloropropene	mg/L	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U
1,4-Dichlorobenzene	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	0.0093 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U	0.0093 U
Acetone	mg/L	0.177 J+	0.0564	0.030 U	0.030 U	0.030 U	0.030 U	0.030 U
Acetonitrile	mg/L	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
Acrylamide	mg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 UJ
Acrylonitrile	mg/L	0.0052 U	0.0345 J	0.0052 U	0.0052 U	0.0052 U	0.0052 U	R
Benzene	mg/L	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0052
Bromodichloromethane	mg/L	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U	0.0029 U
Bromoform	mg/L	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U	0.0032 U
Bromomethane (Methyl bromide)	mg/L	0.0082 U	0.0082 U	0.0082 UJ	0.0082 U	0.0082 U	0.0082 U	0.0082 U
Carbon disulfide	mg/L	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U	0.0048 U
Carbon tetrachloride	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chlorobenzene	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Chloroform (Trichloromethane)	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0102 U	0.0058 U	0.0070 U	0.0080 U
Dichlorodifluoromethane (CFC-12)	mg/L	0.0068 U	0.0068 U	0.0068 U	0.0068 U	0.0068 U	0.0068 U	0.0068 U
Ethylbenzene	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0044 J
Hexachlorobutadiene	mg/L	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U	0.0028 U
Isobutanol (isobutyl alcohol)	mg/L	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U
m&p-Xylenes	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0168
Methyl acrylonitrile	mg/L	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
Methylene chloride	mg/L	0.0021 J	0.00050 U	0.00050 U	0.0016 J	0.00050 U	0.00050 U	0.00050 U
o-Xylene	mg/L	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0070
Styrene	mg/L	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
Tetrachloroethene	mg/L	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U
Toluene	mg/L	0.0027 U	0.0043 J	0.0027 U	0.0027 U	0.0027 U	0.0027 U	0.0279
trans-1,3-Dichloropropene	mg/L	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U
Trichloroethene	mg/L	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0026 U
Trichlorofluoromethane (CFC-11)	mg/L	0.0042 U	0.0042 U	0.0042 U	0.0042 U	0.0042 U	0.0042 U	0.0042 U
Vinyl chloride	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U
Xylenes (total)	mg/L	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.0238
General Chemistry								
Ignitability	Deg F	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Percent solids	%	--	--	--	74.4	79.4	78.0	76.8
Reactive cyanide	mg/kg	--	--	--	9.2 U	9.1 U	8.9 U	9.6 UJ
Reactive cyanide	mg/L	10 U	10 U	10 UJ	--	--	--	--
Reactive sulfide	mg/kg	--	--	--	73 U	72 U	70 U	76 UJ
Reactive sulfide	mg/L	42 U	43 U	43 UJ	--	--	--	--

Notes:
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
J+ - Estimated concentration, result may be biased high.
mg/L - milligram per liter
mg/kg - milligram per kilogram
pg/L - picogram per liter

Table 5

PC-FSE – Water Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Type:	Units	PZ-SW 11215131-012022-GW-BN-PZ-SW 01/20/2022	PZ-NC 11215131-012022-GW-BN-PZ-NC 01/20/2022	PZ-NE 11215131-012022-GW-BN-PZ-NE 01/20/2022	PZ-NE 11215131-012022-GW-BN-DUP-1 01/20/2022 Duplicate	PZ-SC 11215131-012022-GW-BN-PZ-SC 01/20/2022	PZ-SW 11215131-121621-GW-SS-PZ-SW 12/16/2021	PZ-SC 11215131-121621-GW-SS-PZ-SC 12/16/2021	PZ-NC 11215131-121621-GW-SS-PZ-NC 12/16/2021	PZ-NE 11215131-121721-GW-SS-PZ-NE 12/17/2021	PZ-NE 11215131-121721-GW-SS-DUP-1 12/17/2021 Duplicate
Dioxins/Furans											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	4 U	2.32 U	3.44 U	2.77 U	4.11 J	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	9.47 J	16.5 J	14.4 J	14.7 J	15.7 J	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	1.71 J	0.964 U	0.795 U	1.13 U	0.817 U	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	1.66 U	1.72 U	1.84 U	1.49 U	1.53 U	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	1.83 U	1.39 U	1.17 U	1.67 U	1.21 U	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	1.31 U	1.19 U	0.989 U	1.34 U	0.791 U	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.62 U	1.58 U	1.94 U	1.37 U	1.56 U	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	1.27 U	1.21 U	0.979 U	1.18 U	0.799 U	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.44 U	1.34 U	1.77 U	1.25 U	1.44 U	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	1.36 U	1.38 U	1.23 U	1.51 U	0.904 U	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.56 U	1.36 U	1.82 U	1.27 U	1.51 U	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	1.1 U	1.1 U	1.13 U	0.827 U	0.829 U	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	1.6 U	1.87 U	1.97 U	2 U	1.4 U	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	1.17 U	0.979 U	0.854 U	1.13 U	0.742 U	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	1 U	1.17 U	1.03 U	0.787 U	0.784 U	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	1.05 U	4.02 J	4.11 J	4.65 J	16.6	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	2.19 U	1.84 U	1.95 U	2.11 U	3.52 J	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF)	pg/L	1.71 J	1.15 U	0.961 U	1.37 U	0.995 U	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	1.66 U	1.72 U	1.84 U	1.49 U	2.92 J	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF)	pg/L	1.27 U	1.17 U	0.998 U	1.27 U	0.802 U	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	1.54 U	1.42 U	1.84 U	1.3 U	1.5 U	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF)	pg/L	1.05 U	1.14 U	1.08 U	0.807 U	0.806 U	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	1.6 U	1.87 U	1.97 U	2 U	1.4 U	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF)	pg/L	1.05 U	6.81 J	4.11 J	7.15 J	32.2 J	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	2.19 U	1.84 U	1.95 U	2.11 U	3.52 J	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0)	pg/L	0.02 J	0.407 J	0.415 J	0.469 J	5.16 J	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5)	pg/L	2.64 J	2.93 J	3.05 J	3.13 J	6.42 J	--	--	--	--	--
Dioxins/Furans (Dissolved)											
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) (dissolved)	pg/L	3.37 U	3.27 U	3.33 U	2.89 U	2.77 U	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) (dissolved)	pg/L	15.1 U	5.83 U	14.2 U	7.96 J	10.9 U	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	2.63 J	1.19 U	1.21 U	1.34 U	0.95 U	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) (dissolved)	pg/L	1.95 U	2.61 U	2.17 U	2.08 U	3.69 U	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	1.9 U	1.85 U	1.91 U	1.91 U	1.41 U	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	1.43 U	1.27 U	1.04 U	1.15 U	1.14 U	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	1.55 U	1.54 U	1.64 U	1.84 U	1.78 U	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	1.44 U	1.24 U	0.902 U	1.13 U	1.18 U	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	1.54 U	1.36 U	1.52 U	1.71 U	1.48 U	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	1.68 U	1.48 U	1.11 U	1.22 U	1.36 U	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	1.56 U	1.36 U	1.53 U	1.7 U	1.68 U	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	1.34 U	1.26 U	1.02 U	1.28 U	1.43 U	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD) (dissolved)	pg/L	1.86 U	2 U	1.67 U	1.58 U	1.65 U	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	1.37 U	1.3 U	0.896 U	1.11 U	1.17 U	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	1.24 U	1.22 U	0.991 U	1.23 U	1.43 U	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF) (dissolved)	pg/L	1.2 U	1.15 U	1.32 U	1.16 U	3.12 J	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (dissolved)	pg/L	2.13 U	2.37 U	2.27 U	1.73 U	2.09 U	--	--	--	--	--
Total heptachlorodibenzofuran (HpCDF) (dissolved)	pg/L	2.63 J	1.48 U	1.51 U	1.59 U	1.15 U	--	--	--	--	--
Total heptachlorodibenzo-p-dioxin (HpCDD) (dissolved)	pg/L	1.95 U	2.61 U	2.17 U	2.08 U	3.98 J	--	--	--	--	--
Total hexachlorodibenzofuran (HxCDF) (dissolved)	pg/L	3.55 J	1.31 U	0.979 U	1.15 U	1.2 U	--	--	--	--	--
Total hexachlorodibenzo-p-dioxin (HxCDD) (dissolved)	pg/L	1.55 U	1.42 U	1.56 U	1.75 U	1.64 U	--	--	--	--	--
Total pentachlorodibenzofuran (PeCDF) (dissolved)	pg/L	1.29 U	1.24 U	1.01 U	1.25 U	1.43 U	--	--	--	--	--
Total pentachlorodibenzo-p-dioxin (PeCDD) (dissolved)	pg/L	1.86 U	2 U	1.67 U	1.58 U	1.65 U	--	--	--	--	--
Total tetrachlorodibenzofuran (TCDF) (dissolved)	pg/L	1.2 U	1.15 U	1.32 U	1.16 U	3.12 J	--	--	--	--	--
Total tetrachlorodibenzo-p-dioxin (TCDD) (dissolved)	pg/L	2.13 U	2.37 U	2.27 U	1.73 U	2.09 U	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0) (dissolved)	pg/L	0.0263 J	0	0	0.00239 J	0.312 J	--	--	--	--	--
Total WHO Dioxin TEQ(Human/Mammal)(ND=0.5) (dissolved)	pg/L	2.84 J	2.95	2.66	2.44 J	2.94 J	--	--	--	--	--
Metals											
Aluminum	ug/L	--	--	--	--	--	150 U	150 U	191 J	150 U	150 U
Antimony	ug/L	--	--	--	--	--	4.7 U	4.7 U	6.4	4.7 U	4.7 U
Arsenic	ug/L	--	--	--	--	--	5.4	2.8 U	2.8 U	3.0	4.6
Barium	ug/L	--	--	--	--	--	686	420	115 J	425	432
Beryllium	ug/L	--	--	--	--	--	0.70 J	0.50 U	2.6	0.50 U	0.50 U
Boron	ug/L	--	--	--	--	--	759	816	628	418	420
Cadmium	ug/L	--	--	--	--	--	2.3 J	2.5 J	1.2 J	2.1 J	2.1 J
Calcium	ug/L	--	--	--	--	--	163000 J-	285000 J-	250000	125000 J-	126000 J-
Chromium	ug/L	--	--	--	--	--	2.0 U	2.9 J	2.4 J	2.0 J	2.7 J
Cobalt	ug/L	--	--	--	--	--	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U
Copper	ug/L	--	--	--	--	--	5.9 U	5.9 U	5.9 U	5.9 U	5.9 U
Iron	ug/L	--	--	--	--	--	2330	1000	10700	20000	20600
Lead	ug/L	--	--	--	--	--	1.8 U	1.9 J	2.4 J	1.8 U	1.8 U

Table 5

PC-FSE – Water Analytical Results Summary
Southern Impoundment
San Jacinto River Waste Pits Site
Harris County, Texas

Sample Location: / Sample Identification: / Sample Date: / Sample Type:	Units	PZ-SW 11215131-012022-GW-BN-PZ-SW 01/20/2022	PZ-NC 11215131-012022-GW-BN-PZ-NC 01/20/2022	PZ-NE 11215131-012022-GW-BN-PZ-NE 01/20/2022	PZ-NE 11215131-012022-GW-BN-DUP-1 01/20/2022 Duplicate	PZ-SC 11215131-012022-GW-BN-PZ-SC 01/20/2022	PZ-SW 11215131-121621-GW-SS-PZ-SW 12/16/2021	PZ-SC 11215131-121621-GW-SS-PZ-SC 12/16/2021	PZ-NC 11215131-121621-GW-SS-PZ-NC 12/16/2021	PZ-NE 11215131-121721-GW-SS-PZ-NE 12/17/2021	PZ-NE 11215131-121721-GW-SS-DUP-1 12/17/2021 Duplicate
Magnesium	ug/L	--	--	--	--	--	186000	55100	141000	52400	52700
Manganese	ug/L	--	--	--	--	--	2360	1290	731	676	649
Mercury	ug/L	--	--	--	--	--	0.095 U	0.095 U	0.095 U	0.095 U	0.095 U
Molybdenum	ug/L	--	--	--	--	--	3.6 U	3.6 U	5.4 J	3.6 U	3.6 U
Nickel	ug/L	--	--	--	--	--	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
Potassium	ug/L	--	--	--	--	--	63400	128000	75800	35800	35900
Selenium	ug/L	--	--	--	--	--	4.9 U	4.9 U	5.9 J	4.9 U	4.9 U
Silver	ug/L	--	--	--	--	--	6.1 U	6.7 J	6.1 U	6.1 U	6.1 U
Sodium	ug/L	--	--	--	--	--	1270000	156000	421000	154000	155000
Strontium	ug/L	--	--	--	--	--	1890	1200	1800	894	896
Thallium	ug/L	--	--	--	--	--	1.8 U	1.8 U	5.5 J	1.8 U	1.8 U
Tin	ug/L	--	--	--	--	--	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Titanium	ug/L	--	--	--	--	--	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	ug/L	--	--	--	--	--	2.8 J	2.6 J	2.5 J	1.8 U	1.8 U
Zinc	ug/L	--	--	--	--	--	13.9 J	13.5 J	22.8	13.7 J	13.7 J
Metals (Dissolved)											
Aluminum (dissolved)	ug/L	--	--	--	--	--	150 U	150 U	150 U	150 U	--
Antimony (dissolved)	ug/L	--	--	--	--	--	4.7 U	4.7 U	6.8	4.7 U	--
Arsenic (dissolved)	ug/L	--	--	--	--	--	5.1	3.4	3.3	4.2	--
Barium (dissolved)	ug/L	--	--	--	--	--	681	426	117 J	439	--
Beryllium (dissolved)	ug/L	--	--	--	--	--	0.80 J	0.50 U	2.6	0.50 U	--
Boron (dissolved)	ug/L	--	--	--	--	--	757	837	643	426	--
Cadmium (dissolved)	ug/L	--	--	--	--	--	2.2 J	2.4 J	1.3 J	2.2 J	--
Calcium (dissolved)	ug/L	--	--	--	--	--	164000 J-	289000 J-	249000	128000 J-	--
Chromium (dissolved)	ug/L	--	--	--	--	--	2.0 U	2.7 J	2.4 J	2.0 U	--
Cobalt (dissolved)	ug/L	--	--	--	--	--	2.6 U	2.6 U	2.6 U	2.6 U	--
Copper (dissolved)	ug/L	--	--	--	--	--	5.9 U	5.9 U	5.9 U	5.9 U	--
Iron (dissolved)	ug/L	--	--	--	--	--	6270	1220	10500	21100	--
Lead (dissolved)	ug/L	--	--	--	--	--	1.8 U	1.8 U	1.8 U	1.8 U	--
Magnesium (dissolved)	ug/L	--	--	--	--	--	188000	56600	143000	53600	--
Manganese (dissolved)	ug/L	--	--	--	--	--	2310	1360	743	631	--
Mercury (dissolved)	ug/L	--	--	--	--	--	0.095 U	0.095 U	0.095 U	0.095 U	--
Molybdenum (dissolved)	ug/L	--	--	--	--	--	3.6 U	3.6 U	5.6 J	3.6 U	--
Nickel (dissolved)	ug/L	--	--	--	--	--	2.0 J	1.7 U	1.7 U	1.7 U	--
Potassium (dissolved)	ug/L	--	--	--	--	--	64000	130000	77300	36500	--
Selenium (dissolved)	ug/L	--	--	--	--	--	4.9 U	4.9 U	5.8 J	4.9 U	--
Silver (dissolved)	ug/L	--	--	--	--	--	6.1 U	6.2 J	6.1 U	6.1 U	--
Sodium (dissolved)	ug/L	--	--	--	--	--	1270000	163000	425000	155000	--
Strontium (dissolved)	ug/L	--	--	--	--	--	1910	1220	1820	909	--
Thallium (dissolved)	ug/L	--	--	--	--	--	1.8 J	1.8 J	5.8 J	1.8 U	--
Tin (dissolved)	ug/L	--	--	--	--	--	3.7 U	3.7 U	3.7 U	3.7 U	--
Titanium (dissolved)	ug/L	--	--	--	--	--	2.5 U	2.5 U	2.5 U	2.5 U	--
Vanadium (dissolved)	ug/L	--	--	--	--	--	3.7 J	2.3 J	1.8 J	1.8 U	--
Zinc (dissolved)	ug/L	--	--	--	--	--	18.7 J	6.9 U	7.9 J	10.6 J	--
General Chemistry											
Alkalinity, total (as CaCO3)	mg/L	--	--	--	--	--	717	1120	1140	598	607
Ammonia-N	mg/L	--	--	--	--	--	0.11 J	7.1	5.6	3.5	3.3
Biochemical oxygen demand (BOD)	mg/L	--	--	--	--	--	6.0 U	1.0 U	6.0 U	1.0 U	6.0 U
Bromide	mg/L	--	--	--	--	--	8.3 J-	3.4 J-	1.0 J-	2.6 J-	4.1 J-
Chemical oxygen demand (COD)	mg/L	--	--	--	--	--	200	133	66.7	37.5	32.5
Chloride	mg/L	--	--	--	--	--	2680	133	185	209	205
Fluoride	mg/L	--	--	--	--	--	0.75	0.61	0.61	2.3	2.3
Nitrate	mg/L	--	--	--	--	--	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U
Nitrite	mg/L	--	--	--	--	--	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
Nitrite/Nitrate	mg/L	--	--	--	--	--	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U
pH	s.u.	--	--	--	--	--	7.05 J	6.08 J	6.89 J	8.15 J	7.04 J
Phosphorus	mg/L	--	--	--	--	--	0.74	0.97	0.34	0.24	0.25
Sulfate	mg/L	--	--	--	--	--	241	32.1	714	6.9	9.0
Sulfide	mg/L	--	--	--	--	--	0.48 U	4.3	0.48 U	0.48 U	0.48 U
Total dissolved solids (TDS)	mg/L	--	--	--	--	--	4730	1500	2130	340	540
Total organic carbon (TOC)	mg/L	--	--	--	--	--	16.8	37.0	17.3	12.0	12.1
Total suspended solids (TSS)	mg/L	--	--	--	--	--	16.0	1.5 U	16.0	28.0	30.0

Notes:
U - Not detected at the associated reporting limit.
J - Estimated concentration.
UJ - Not detected; associated reporting limit is estimated.
J- - Estimated concentration, result may be biased low.
mg/L - milligram per liter
pg/L - picogram per liter
ug/L - microgram per liter

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 11/15/2021 10:54:40 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; CSP Philip J. Slowiak (philip.slowiak@ipaper.com) [philip.slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Charles Munce [charles.munce@ghd.com]
Subject: San Jacinto River Waste Pits Site Southern Impoundment RA - Monthly Progress Report No. 02
Attachments: 11215131-LTR-Poulos-3 - Monthly Progress Report No. 02 - October 2021.pdf

Flag: Follow up

Good afternoon Lauren,

On behalf of International Paper Company (IPC), GHD Services Inc. (GHD) submits the October 2021 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order* for *Remedial Action of the Southern Impoundment*, U.S. EPA Region 6, CERCLA Docket No. 06-05-21 (Order). This Monthly Progress Report No. 02 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of October 2021 or are projected to take place during the six week period following the reporting period.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

11451 Katy Freeway, Suite 400
Houston, Texas 77079
United States
www.GHD.com

Our Ref.: 11215131-Poulos-3

November 15, 2021

Ms. Lauren Poulos
Remedial Project Manager
United States Environmental Protection Agency - 6SF RL
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

San Jacinto River Waste Pits Superfund Site
Southern Impoundment, Harris County, Texas
Monthly Progress Report No. 02 - October 2021
Unilateral Administrative Order for Remedial Action of the Southern Impoundment, USEPA Region 6, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
Docket No. 06-05-21

Dear Ms. Poulos:

On behalf of International Paper Company (Respondent), GHD Services Inc. (GHD) submits the October 2021 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order* for *Remedial Action of the Southern Impoundment*, USEPA Region 6, CERCLA Docket No. 06-05-21 (Order). This Monthly Progress Report No. 02 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of October 2021 or are projected to take place during the six week period following the reporting period.

Consistent with the requirements in Section 4, Subsection 4.1 of the Statement of Work (SOW) attached to the Order, this progress report is organized into the following subject areas:

- Actions taken during the reporting period toward achieving compliance with the Order.
- A cumulative summary of sampling, tests, and all other data results received or generated pursuant to the Order and a summary of validated results generated during the reporting period.
- UAO deliverables Respondent submitted to the EPA during the reporting period.
- Activities scheduled relating to the RA Construction for the six weeks following the reporting period.
- An updated RA Construction Schedule detailing percentage complete, potential schedule delays, and efforts to mitigate the anticipated delays.
- Modifications to approved work plans or schedules that have been proposed or approved by EPA during the reporting period.
- Community Involvement Plan activities conducted during the reporting period and to be undertaken during the six weeks following the reporting period.

1. Actions Taken During Reporting Period

- Pursuant to Section 3, Subsection 3.2.b of the Order SOW, weekly conference calls were held between Respondent's Project Coordinator and the EPA.

- The Respondent, GHD, and the EPA met with representatives from the Texas Department of Transportation (TxDOT) via video conference on October 13, 2021, to provide an update regarding the Southern Impoundment RA and Northern Impoundment remedial design (RD) and TxDOT provided an update on the proposed Interstate 10 (I-10) bridge replacement project.
- In accordance with Section 3, Subsection 3.1 of the Order SOW, the Respondent submitted a *Remedial Action Work Plan* (RAWP) for the Southern Impoundment RA to the EPA on October 14, 2021. The RAWP included an updated *Pre-Construction Field Sampling Plan* (PCFSP) with respect to an additional analytical investigation to be conducted prior to Southern Impoundment RA Construction and which is to include soil confirmation sampling, waste characterization sampling, and water sampling to be used to establish the volume of water to be managed during RA Construction.
- Pursuant to Section 2, Subsection 2.1.b of the Order SOW, the Respondent provided information to the EPA for the EPA's use in connection with the next scheduled Community Advisory Group (CAG) meeting.
- The Respondent submitted to the EPA's Project Manager a certification pursuant to Section XVII, Paragraph 89 of the Order.
- The Respondent made a submission to the EPA on October 5, 2021, to satisfy relevant insurance requirements under Section XIII, Paragraph 79 of the Order.
- The Respondent and the EPA conferred via email and met via video conference on October 22, 2021, regarding the Respondent's submission to the EPA demonstrating relevant insurance requirements under Section XIII, Paragraph 79 of the Order, after which the EPA's counsel issued an e-mail to the Respondent dated October 25, 2021.
- The Respondent continued preparations and planning to conduct the Pre-Construction Field Sampling Event (PCFSE).
- The Respondent submitted to EPA a letter dated October 4, 2021, pursuant to Section XI, Paragraph 68 of the Order regarding its efforts to obtain access and other rights related to the Southern Impoundment RA, to which the EPA's counsel responded by email dated October 8, 2021.
- The Respondent continued efforts to obtain property access rights related to performing the PCFSE and the Southern Impoundment RA Construction.

2. Sampling, Testing, and Data Results

- No sampling or testing results have been collected or received under the Order, and none were collected or received during the reporting period.

3. UAO Deliverables Submitted to the EPA During the Reporting Period

- In accordance with Section 3, Subsection 3.1 of the Order SOW, the Respondent submitted to the EPA on October 14, 2021, a RAWP for the Southern Impoundment RA, including a proposed RA Construction Schedule, as required by Subsection 3.1.a.

4. Activities Scheduled for the Next Six Weeks

- Pursuant to Section 3, Subsection 3.2.b of the Order SOW, weekly conference calls are scheduled to take place between Respondent's PC and the EPA.
- The Respondent will review and address any EPA comments to the RAWP once comments are received.
- In accordance with Section 6, Subsection 6.2 of the Order SOW, the Respondent will hold a Pre-Construction Sampling Conference within 14 days following EPA approval of the updated PCFSP.
- The Respondent will continue to prepare to conduct the PCFSE field work, with the objective of commencing PCFSE field work within 30 days of EPA approval of the PCFSP.
- The Respondent will continue efforts to obtain property access rights related to performing the PCFSE and the Southern Impoundment RA.
- The Respondent will make a further submission to the EPA as requested in response to its submission pursuant to Section XI, Paragraph 68, regarding access and proprietary controls.

5. Updated RA Schedule

- During the reporting period, no final RA Construction schedule was in place. The Respondent submitted a proposed RA Construction schedule and PCFSE schedule as part of the RAWP on October 14, 2021. These schedules will be discussed in the next progress report following receipt of the EPA's comments on them. At this time, there is no basis for reporting a percent complete for the RA or addressing potential schedule concerns.

6. Modifications to Approved Work Plans or Schedules

- No modifications to approved work plans or schedules were proposed or approved during the reporting period.

7. Community Involvement Plan Activities

- No community involvement plan activities were conducted during the reporting period.
- The next CAG meeting is currently scheduled for November 8, 2021, and the Respondent will continue to assist the EPA in its preparations for the meeting.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (713) 734-3090.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(225) 773-5770
Charles.Munce@GHD.com

CWM/jlf/3

cc: Katie Delbecq, TCEQ
Phil Slowiak, IPC
Brent Sasser, IPC

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 5/16/2022 10:00:18 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Philip J Slowiak [Philip.Slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Charles Munce [charles.munce@ghd.com]
Subject: San Jacinto River Waste Pits Site Southern Impoundment RA - April Monthly Progress Report No. 08
Attachments: 11215131-LTR-Poulos-9 - Complete - Monthly Progress Report No. 08 - April 2022.pdf

Flag: Follow up

Good afternoon Lauren,

On behalf of International Paper Company (IPC), GHD Services Inc. (GHD) submits the April 2022 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order* for *Remedial Action of the Southern Impoundment*, U.S. EPA Region 6, CERCLA Docket No. 06-05-21 (Order). This Monthly Progress Report No. 08 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of April 2022 or are projected to take place during the six-week period following the reporting period.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 5/11/2022 2:24:50 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Charles Munce [charles.munce@ghd.com]
Subject: RE: Waste Characterization Requested Items & Information
Attachments: Cumulative Waste Characterization Data Table.xlsx; 11215131_202205_MISC002_GIS001 - Figure 1 - Waste Characterization Sampling Locations.pdf; ATT00001.txt

Flag: Follow up

Good morning Lauren,

Please find the cumulative table showing waste samples collected from the Southern Impoundment during the PC-FSE, PDI-1, and PDI-2. I have also included a map showing the sample locations along with the associated shape files as requested. We are currently coordinating with the landfills, but I wanted to get the available information over.

Kind regards,
Meagan

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Monday, April 4, 2022 3:46 PM
To: Meagan Willis <Meagan.Willis@ghd.com>
Cc: Charles Munce <charles.munce@ghd.com>; 'Philip Slowiak' <Philip.Slowiak@ipaper.com>
Subject: Waste Characterization Requested Items & Information

Hi Meagan,

As we discussed during last week's check in, I wanted to provide you an email requesting as soon as available:

- Comprehensive waste characterization sample results from the Pre-Construction Sampling Event (PCFSE), PDIs 1 & 2, and any other samples collected for this objective consolidated in an Excel spreadsheet,
- An associated map(s) with labeled sample points and the geospatial data files used to create it/them,
- and the relevant disposal facility or facilities sampling requirements (i.e., frequency by volume, lab analyses required, timelines, etc.)

Thank you for your efforts in sharing these items, and please let me know if you have any questions or need any clarification on any of the details. I understand that IP/GHD has begun discussing the sampling requirements with the disposal facility or facilities, but the last we spoke, I don't think anything had yet been received. I also understand that GHD is still conducting data validation on the waste characterization and other samples from the PCFSE, but this process should be concluded by April 18th.

As always, I appreciate your coordination and look forward to hearing back from you on the above.

Thanks,

Lauren Poulos
Remedial Project Manager
Arkansas/Texas Section (SEDRA)
Superfund Division
U.S. EPA Region 6
214-665-8371

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not

copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 12/7/2021 3:32:08 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; CSP Philip J. Slowiak (philip.slowiak@ipaper.com) [philip.slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Charles Munce [charles.munce@ghd.com]
Subject: RE: San Jacinto River Waste Pits Site Southern Impoundment RA - Monthly Progress Report No. 02
Attachments: 11215131-LTR-Poulos-3 - Rev.2 - Monthly Progress Report No. 02 - October 2021 Revision.pdf

Good morning Lauren,

Please find the revised monthly report reflecting the 10/26/21 date as directed below.

Kind regards,
Meagan

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Monday, December 6, 2021 5:35 PM
To: Meagan Willis <Meagan.Willis@ghd.com>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; CSP Philip J. Slowiak (philip.slowiak@ipaper.com) <philip.slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Charles Munce <charles.munce@ghd.com>
Subject: RE: San Jacinto River Waste Pits Site Southern Impoundment RA - Monthly Progress Report No. 02

Hi Meagan,

I reviewed the Oct Monthly Progress Report and only noticed one typo – Section 1., 4th bullet from the bottom, the EPA email to the Respondent regarding the submission pursuant to paragraph 79 of the UAO was dated 10/26/2021 (not 10/25).

Sorry for the delay in response, and thanks for coordinating. Let me know if you have any questions or need anything else.

Lauren Poulos
214-665-8371

From: Meagan Willis <Meagan.Willis@ghd.com>
Sent: Monday, November 15, 2021 4:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; CSP Philip J. Slowiak (philip.slowiak@ipaper.com) <philip.slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Charles Munce <charles.munce@ghd.com>
Subject: San Jacinto River Waste Pits Site Southern Impoundment RA - Monthly Progress Report No. 02

Good afternoon Lauren,

On behalf of International Paper Company (IPC), GHD Services Inc. (GHD) submits the October 2021 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order* for *Remedial Action of the Southern Impoundment*, U.S. EPA Region 6, CERCLA Docket No. 06-05-21 (Order). This Monthly Progress Report No. 02 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of October 2021 or are projected to take place during the six week period following the reporting period.

Kind regards,

Meagan

MEAGAN WILLIS

GHD

Proudly employee owned | ghd.com

11451 Katy Freeway Suite 400 Houston TX 77079 USA

D 713-907-3710 **E** Meagan.Willis@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

11451 Katy Freeway, Suite 400
Houston, Texas 77079
United States
www.GHD.com

Our Ref.: 11215131-Poulos-3

December 7, 2021

Ms. Lauren Poulos
Remedial Project Manager
United States Environmental Protection Agency - 6SF RL
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

San Jacinto River Waste Pits Superfund Site
Southern Impoundment, Harris County, Texas
Monthly Progress Report No. 02 - October 2021 Revision
Unilateral Administrative Order for Remedial Action of the Southern Impoundment, USEPA Region 6, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
Docket No. 06-05-21

Dear Ms. Poulos:

On behalf of International Paper Company (Respondent), GHD Services Inc. (GHD) submits the October 2021 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Unilateral Administrative Order* for *Remedial Action of the Southern Impoundment*, USEPA Region 6, CERCLA Docket No. 06-05-21 (Order). This Monthly Progress Report No. 02 summarizes remedial action (RA) activities for the Southern Impoundment of the San Jacinto River Waste Pits Superfund Site (Site) that took place during the month of October 2021 or are projected to take place during the six week period following the reporting period.

Consistent with the requirements in Section 4, Subsection 4.1 of the Statement of Work (SOW) attached to the Order, this progress report is organized into the following subject areas:

- Actions taken during the reporting period toward achieving compliance with the Order.
- A cumulative summary of sampling, tests, and all other data results received or generated pursuant to the Order and a summary of validated results generated during the reporting period.
- UAO deliverables Respondent submitted to the EPA during the reporting period.
- Activities scheduled relating to the RA Construction for the six weeks following the reporting period.
- An updated RA Construction Schedule detailing percentage complete, potential schedule delays, and efforts to mitigate the anticipated delays.
- Modifications to approved work plans or schedules that have been proposed or approved by EPA during the reporting period.
- Community Involvement Plan activities conducted during the reporting period and to be undertaken during the six weeks following the reporting period.

1. Actions Taken During Reporting Period

- Pursuant to Section 3, Subsection 3.2.b of the Order SOW, weekly conference calls were held between Respondent's Project Coordinator and the EPA.

- The Respondent, GHD, and the EPA met with representatives from the Texas Department of Transportation (TxDOT) via video conference on October 13, 2021, to provide an update regarding the Southern Impoundment RA and Northern Impoundment remedial design (RD) and TxDOT provided an update on the proposed Interstate 10 (I-10) bridge replacement project.
- In accordance with Section 3, Subsection 3.1 of the Order SOW, the Respondent submitted a *Remedial Action Work Plan* (RAWP) for the Southern Impoundment RA to the EPA on October 14, 2021. The RAWP included an updated *Pre-Construction Field Sampling Plan* (PCFSP) with respect to an additional analytical investigation to be conducted prior to Southern Impoundment RA Construction and which is to include soil confirmation sampling, waste characterization sampling, and water sampling to be used to establish the volume of water to be managed during RA Construction.
- Pursuant to Section 2, Subsection 2.1.b of the Order SOW, the Respondent provided information to the EPA for the EPA's use in connection with the next scheduled Community Advisory Group (CAG) meeting.
- The Respondent submitted to the EPA's Project Manager a certification pursuant to Section XVII, Paragraph 89 of the Order.
- The Respondent made a submission to the EPA on October 5, 2021, to satisfy relevant insurance requirements under Section XIII, Paragraph 79 of the Order.
- The Respondent and the EPA conferred via email and met via video conference on October 22, 2021, regarding the Respondent's submission to the EPA demonstrating relevant insurance requirements under Section XIII, Paragraph 79 of the Order, after which the EPA's counsel issued an e-mail to the Respondent dated October 26, 2021.
- The Respondent continued preparations and planning to conduct the Pre-Construction Field Sampling Event (PCFSE).
- The Respondent submitted to EPA a letter dated October 4, 2021, pursuant to Section XI, Paragraph 68 of the Order regarding its efforts to obtain access and other rights related to the Southern Impoundment RA, to which the EPA's counsel responded by email dated October 8, 2021.
- The Respondent continued efforts to obtain property access rights related to performing the PCFSE and the Southern Impoundment RA Construction.

2. Sampling, Testing, and Data Results

- No sampling or testing results have been collected or received under the Order, and none were collected or received during the reporting period.

3. UAO Deliverables Submitted to the EPA During the Reporting Period

- In accordance with Section 3, Subsection 3.1 of the Order SOW, the Respondent submitted to the EPA on October 14, 2021, a RAWP for the Southern Impoundment RA, including a proposed RA Construction Schedule, as required by Subsection 3.1.a.

4. Activities Scheduled for the Next Six Weeks

- Pursuant to Section 3, Subsection 3.2.b of the Order SOW, weekly conference calls are scheduled to take place between Respondent's PC and the EPA.
- The Respondent will review and address any EPA comments to the RAWP once comments are received.
- In accordance with Section 6, Subsection 6.2 of the Order SOW, the Respondent will hold a Pre-Construction Sampling Conference within 14 days following EPA approval of the updated PCFSP.
- The Respondent will continue to prepare to conduct the PCFSE field work, with the objective of commencing PCFSE field work within 30 days of EPA approval of the PCFSP.
- The Respondent will continue efforts to obtain property access rights related to performing the PCFSE and the Southern Impoundment RA.
- The Respondent will make a further submission to the EPA as requested in response to its submission pursuant to Section XI, Paragraph 68, regarding access and proprietary controls.

5. Updated RA Schedule

- During the reporting period, no final RA Construction schedule was in place. The Respondent submitted a proposed RA Construction schedule and PCFSE schedule as part of the RAWP on October 14, 2021. These schedules will be discussed in the next progress report following receipt of the EPA's comments on them. At this time, there is no basis for reporting a percent complete for the RA or addressing potential schedule concerns.

6. Modifications to Approved Work Plans or Schedules

- No modifications to approved work plans or schedules were proposed or approved during the reporting period.

7. Community Involvement Plan Activities

- No community involvement plan activities were conducted during the reporting period.
- The next CAG meeting is currently scheduled for November 8, 2021, and the Respondent will continue to assist the EPA in its preparations for the meeting.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (713) 734-3090.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(225) 773-5770
Charles.Munce@GHD.com

CWM/jlf/3 - Revision 2

cc: Katie Delbecq, TCEQ
Phil Slowiak, IPC
Brent Sasser, IPC

Message

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 10/18/2021 8:58:04 PM
To: latrice.babin@pcs.hctx.net
CC: Poulos, Lauren [poulos.lauren@epa.gov]; Wyatt, Janal (PCS) [Janal.Wyatt@pcs.hctx.net]
Subject: San Jacinto River Waste Pits Monthly Report
Attachments: 11215702-LTR-Howard-11 - Complete - San Jacinto RD Monthly Report No. 41.pdf

Good Afternoon,

Please find the attached Monthly Progress Report for the San Jacinto River Waste Pits site. This report has the validated data that was available as of the date of this report.

The October 19 TWG meeting will discuss the data presented in this report and we will update you during the next TWG update meeting.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

Message

From: Baumgarten, Gary [baumgarten.gary@epa.gov]
Sent: 11/19/2020 6:53:41 PM
To: Janie Smith [Janie.Smith@ghd.com]
CC: CSP Philip J. Slowiak (philip.slowiak@ipaper.com) [philip.slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; jarmour [jarmour@wm.com]; Charles Munce [charles.munce@ghd.com]; Howard, Ashley [Howard.Ashley@epa.gov]; Poulos, Lauren [poulos.lauren@epa.gov]; Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
Subject: RE: Northern Impoundment Waste Characterization Evaluation
Attachments: EPA Review SJRWP Waste Characterization Evaluation-Northern Impoundment 11-19-20.pdf

Janie,
Attached is a letter with EPA's findings on the Northern Waste Impoundment waste characterization evaluation GHD submitted on October 20, 2020.
Please let me know if you have any questions.
Gary

From: Janie Smith <Janie.Smith@ghd.com>
Sent: Tuesday, October 20, 2020 2:59 PM
To: Baumgarten, Gary <baumgarten.gary@epa.gov>
Cc: CSP Philip J. Slowiak (philip.slowiak@ipaper.com) <philip.slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; jarmour <jarmour@wm.com>; Charles Munce <charles.munce@ghd.com>
Subject: Northern Impoundment Waste Characterization Evaluation

Gary,

As requested during a call on August 7, 2020, please see attached a letter summarizing the waste characterization evaluation for the Northern Impoundment at the San Jacinto River Waste Pits Superfund Site.

Please let us know if you have any questions or comments.

Thanks,

Janie Smith

GHD
Proudly employee owned
T: +1 225 292 9007 | D: +1 225 296 6550 | M: +1 919 260 8533 | VOIP: 871550 | E: janie.smith@ghd.com
5551 Corporate Blvd., Ste 200 Baton Rouge, LA 70808 | www.ghd.com

Connect

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Please consider our environment before printing this email

This communication and any accompanying document(s) are confidential and are intended for the sole use of the addressee. If you are not the intended recipient, please notify me at the telephone number shown above or by return e-mail and delete this e-mail and any copies. You are advised that any disclosure, copying, distribution, or the taking of any action in reliance upon the communication without consent is strictly prohibited.

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any

purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 3/17/2021 10:56:29 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Poulos, Lauren [poulos.lauren@epa.gov]
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Thank you for the comments. I will work through them and let you know if I have any questions.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, March 17, 2021 5:11 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Hello Ashley and Lauren,

TCEQ's comments letter on the Supplemental Design Investigation Sampling Plan is attached.

Thanks,
Katie

Katie Delbecq, P.G.
Project Manager, Superfund Section
Phone: 512-239-2505

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Wednesday, March 10, 2021 1:43 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Katie,

I spoke with management about this request. We are on a tight timeline with this project and are attempting to get comments to GHD within 30 days, which is next Friday. We would like to have all comments in by Wednesday if possible so that we have time to review and process before submitting consolidated comments to GHD Friday. Please call me if there are any questions.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Friday, March 5, 2021 4:36 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Hi Ashley and Lauren,
Following our call this morning I continued internal discussions about the archived samples for vertical waste delineation we discussed this morning. My management would like to request an extension until March 19 for our comments letter on the supplemental design sampling plan so that we can consider information and discussions with GHD at the TWG on 3/10 before submitting TCEQ's comments letter to EPA. Please let me know if you have concerns or would like to discuss further.

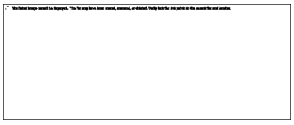
Thanks, and have a nice weekend!
Katie

Katie Delbecq
Project Manager
Superfund Section
Texas Commission on Environmental Quality

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Thursday, March 4, 2021 1:33 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Sure. Does 9am work?

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov



From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Thursday, March 4, 2021 1:17 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>; Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Good afternoon,
Would the two of you be available to have a brief call tomorrow (3/5) to discuss a couple questions/comments that TCEQ is considering about the plan? Specifically, we're considering making a comment on GHD's proposal to archive intervals below 18 ft and only analyze them as needed.

I'm available for a call any time tomorrow between 8-5pm.
Thanks,
Katie

From: Katie Delbecq
Sent: Friday, February 26, 2021 3:01 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Thanks for letting me know EPA's timeline. We should be able to have our comments letter to you by March 12.

Have a nice weekend!

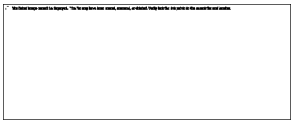
From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Friday, February 26, 2021 2:19 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: FW: San Jacinto Supplemental Design Investigation Sampling Plan

Katie,

Due to the tight time constraints on this project, and the limited scope of this plan, we are asking for all comments by March 12, 2021 (2 Weeks from today). Let us know if you want to have a call to discuss this plan.

Note: One known comment is that we are asking for additional waste characterization to be done during this sampling event. We can discuss if needed.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov



From: Janie Smith <Janie.Smith@ghd.com>
Sent: Friday, February 19, 2021 5:07 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Philip J Slowiak <Philip.Slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Armour, Judy <jarmour@wm.com>; Charles Munce <charles.munce@ghd.com>
Subject: San Jacinto Supplemental Design Investigation Sampling Plan

Hi Ashley,

On behalf of International Paper Company and McGinnes Industrial Maintenance Corporation (collectively referred to as the Respondents), GHD submits the attached *Supplemental Design Investigation Sampling Plan* for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site.

Please let us know if you have any questions.

Thanks,

Janie Smith

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 3/10/2021 2:08:35 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Poulos, Lauren [poulos.lauren@epa.gov]
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Katie,

I discussed this with my management as well. Next Friday is the month mark when we planned on returning comments to GHD. I had asked everyone for comments by this Friday so that EPA could process and review them before submitting them. Since the meeting is today, could you provide comments by next Wednesday so that we have a day to review?

We are available for calls and discussions any day before Wednesday to discuss any concerns. Hopefully our previous conversation about the plan last week and this TWG meeting helps refine those comments.

There will be a couple of weeks to review and comment on the next plan, although we plan on it being an expedited review.

Please let me know if you have any questions.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Friday, March 5, 2021 4:36 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Hi Ashley and Lauren,
Following our call this morning I continued internal discussions about the archived samples for vertical waste delineation we discussed this morning. My management would like to request an extension until March 19 for our comments letter on the supplemental design sampling plan so that we can consider information and discussions with GHD at the TWG on 3/10 before submitting TCEQ's comments letter to EPA. Please let me know if you have concerns or would like to discuss further.

Thanks, and have a nice weekend!
Katie

Katie Delbecq

Project Manager
Superfund Section
Texas Commission on Environmental Quality

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Thursday, March 4, 2021 1:33 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Sure. Does 9am work?

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Thursday, March 4, 2021 1:17 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>; Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Good afternoon,
Would the two of you be available to have a brief call tomorrow (3/5) to discuss a couple questions/comments that TCEQ is considering about the plan? Specifically, we're considering making a comment on GHD's proposal to archive intervals below 18 ft and only analyze them as needed.

I'm available for a call any time tomorrow between 8-5pm.
Thanks,
Katie

From: Katie Delbecq
Sent: Friday, February 26, 2021 3:01 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto Supplemental Design Investigation Sampling Plan

Thanks for letting me know EPA's timeline. We should be able to have our comments letter to you by March 12.

Have a nice weekend!

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Friday, February 26, 2021 2:19 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>

Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: FW: San Jacinto Supplemental Design Investigation Sampling Plan

Katie,

Due to the tight time constraints on this project, and the limited scope of this plan, we are asking for all comments by March 12, 2021 (2 Weeks from today). Let us know if you want to have a call to discuss this plan.

Note: One known comment is that we are asking for additional waste characterization to be done during this sampling event. We can discuss if needed.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Janie Smith <Janie.Smith@ghd.com>
Sent: Friday, February 19, 2021 5:07 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Philip J Slowiak <Philip.Slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Armour, Judy <jarmour@wm.com>; Charles Munce <charles.munce@ghd.com>
Subject: San Jacinto Supplemental Design Investigation Sampling Plan

Hi Ashley,

On behalf of International Paper Company and McGinnes Industrial Maintenance Corporation (collectively referred to as the Respondents), GHD submits the attached *Supplemental Design Investigation Sampling Plan* for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site.

Please let us know if you have any questions.

Thanks,

Janie Smith

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 3/15/2021 10:44:58 PM
To: Gustavson, Karl [Gustavson.Karl@epa.gov]; Schroeder, Paul R ERDC-RDE-EL-MS CIV [Paul.R.Schroeder@erdc.dren.mil]; Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Poulos, Lauren [poulos.lauren@epa.gov]; Meyer, John [Meyer.John@epa.gov]; Villarreal, Chris [villarreal.chris@epa.gov]; Monica Harris [monica.harris@tceq.texas.gov]
Subject: FW: Southern Impoundment Final 100% Remedial Design - Review and Comments
Attachments: EPA Review and Comments on Final Southern Impoundment RD Submittal 031521.pdf

Good Afternoon,

Please find attached the Agency's review comments that were provided to the PRPs' contractor.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Howard, Ashley
Sent: Monday, March 15, 2021 5:27 PM
To: Charles Munce <charles.munce@ghd.com>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Janie Smith <Janie.Smith@ghd.com>; Phil Slowiak <philip.slowiak@ipaper.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Poulos, Lauren <poulos.lauren@epa.gov>; Trae Camble <tcamble@porthouston.com>; latrice.babin@pcs.hctx.net
Subject: Southern Impoundment Final 100% Remedial Design - Review and Comments

Charles,

Please find attached comments on the San Jacinto River Waste Pits Final 100% Remedial Design for South Impoundment.

Let me know if you have any questions or would like to set up a meeting to discuss the comments.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

Message

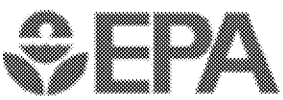
From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 3/15/2021 10:27:02 PM
To: Charles Munce [charles.munce@ghd.com]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Janie Smith [Janie.Smith@ghd.com]; Phil Slowiak [philip.slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Poulos, Lauren [poulos.lauren@epa.gov]; Trae Camble [tcamble@porthouston.com]; latrice.babin@pcs.hctx.net
Subject: Southern Impoundment Final 100% Remedial Design - Review and Comments
Attachments: EPA Review and Comments on Final Southern Impoundment RD Submittal 031521.pdf

Charles,

Please find attached comments on the San Jacinto River Waste Pits Final 100% Remedial Design for South Impoundment.

Let me know if you have any questions or would like to set up a meeting to discuss the comments.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov



Message

From: Janie Smith [Janie.Smith@ghd.com]
Sent: 11/16/2020 4:01:33 PM
To: Baumgarten, Gary [baumgarten.gary@epa.gov]
CC: Armour, Judy [jarmour@wm.com]; Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Philip J Slowiak [Philip.Slowiak@ipaper.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Charles Munce [charles.munce@ghd.com]; David Keith [dkeith@anchorqea.com]; John Laplante (jlaplante@anchorqea.com) [jlaplante@anchorqea.com]; Poulos, Lauren [poulos.lauren@epa.gov]; Howard, Ashley [Howard.Ashley@epa.gov]
Subject: San Jacinto River Waste Pits Site Remedial Design - Monthly Progress Report No. 30
Attachments: 11215702-October 2020 Monthly Report.pdf

Flag: Follow up

Gary,

On behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC; collectively referred to as the Respondents), GHD Services Inc. (GHD) submits the October 2020 Monthly Progress Report to the United States Environmental Protection Agency (EPA), in accordance with the *Administrative Settlement Agreement and Order on Consent* (AOC), for the San Jacinto River Waste Pits Site (CERCLA Docket No. 06-02-18) located in Harris County, Texas (Site). This Monthly Progress Report No. 30 summarizes remedial design (RD) activities performed during the month of October 2020.

Consistent with your directive in email correspondence dated April 9 2020, a hard copy of this report will be submitted to the EPA as soon as GHD is notified that the EPA has resumed working from the office.

Thanks!

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

(s) are confidential and are intended for the sole use of the addressee. If you are not the intended recipient, please notify me at the telephone number shown above or by return e-mail and delete this e-mail and any copies. You are advised that any disclosure, copying, distribution, or the taking of any action in reliance upon the communication without consent is strictly prohibited.

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: latrice.babin@pcs.hctx.net [latrice.babin@pcs.hctx.net]
Sent: 10/30/2020 8:20:14 PM
To: Baumgarten, Gary [baumgarten.gary@epa.gov]
Subject: Harris County Comments on 90% design.docx
Attachments: Harris County Comments on 90% design.docx

Hello Gary,
Please see the attached comments on the 90% design on the Southern Impoundment. My apologies that is it slightly late, but it was a busy week (dealing with some unforeseen COVID related issues) that distracted my attentions slightly.

Thank you,
Latrice

Latrice Babin, PhD
Director
Harris County Pollution Control

Email: latrice.babin@pcs.hctx.net
Office: (713) 274-6433 | Main: (713) 920-2831
Address: 101 South Richey Suite H Pasadena, TX 77506

Message

From: michael.musso@hdrinc.com [michael.musso@hdrinc.com]
Sent: 10/28/2020 9:02:35 PM
To: Baumgarten, Gary [baumgarten.gary@epa.gov]
CC: Trae Camble [tcamble@porthouston.com]
Subject: RE: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment
Attachments: Comments on the 90% RD - SI - Port Houston-HDR - Oct 2020.pdf

HDR / Port Houston comments,

Michael P. Musso, M.S., MPH, P.E. (NY)
D 201.335.9412 **M** 845.304.9639

hdrinc.com/follow-us

From: Musso, Michael <Michael.Musso@hdrinc.com>
Sent: Wednesday, October 28, 2020 4:02 PM
To: Baumgarten, Gary <baumgarten.gary@epa.gov>
Cc: Trae Camble <tcamble@porthouston.com>
Subject: RE: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

Gary,
I am finalizing comments on behalf of Port Houston, for the SI 90% RD. You should have a pdf from me soon,

Thank you for consideration, and for pulling together / processing all comments that EPA receives.

Mike

Michael P. Musso, M.S., MPH, P.E. (NY)
D 201.335.9412 **M** 845.304.9639

hdrinc.com/follow-us

From: Baumgarten, Gary <baumgarten.gary@epa.gov>
Sent: Tuesday, October 6, 2020 8:01 AM
To: Musso, Michael <Michael.Musso@hdrinc.com>
Cc: Trae Camble <tcamble@porthouston.com>
Subject: RE: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Mike – In order to keep the project on schedule, I requested comments be submitted to me on or before October 27, 2020.
Gary

From: Musso, Michael <Michael.Musso@hdrinc.com>
Sent: Thursday, October 1, 2020 4:34 PM
To: Baumgarten, Gary <baumgarten.gary@epa.gov>
Cc: Trae Camble <tcamble@porthouston.com>
Subject: RE: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

Text, Tables, Figures along with Appendices C,D, and E were successfully downloaded.
Thanks for links, Gary.

Gary – can you let us know the comment period for this deliverable ?

Thank you,
Mike

Michael P. Musso, M.S., MPH, P.E. (NY)
D 201.335.9412 **M** 845.304.9639

hdrinc.com/follow-us

From: Baumgarten, Gary <baumgarten.gary@epa.gov>
Sent: Wednesday, September 30, 2020 3:16 PM
To: Musso, Michael <Michael.Musso@hdrinc.com>
Cc: Trae Camble <tcamble@porthouston.com>
Subject: RE: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Mike,
It looks like you were able to click on the design documents I'm sharing with you.
Sometimes the access codes go to spam or junk mail.
Gary

From: Musso, Michael <Michael.Musso@hdrinc.com>
Sent: Wednesday, September 30, 2020 11:47 AM
To: Baumgarten, Gary <baumgarten.gary@epa.gov>
Cc: Trae Camble <tcamble@porthouston.com>
Subject: FW: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

Gary

Could you please forward me access to PRP and EPA documents associated with the San Jacinto Superfund site ? I would like to download the 90% RD for the SI (but am having trouble doing so from the EPA regional website). I believe there is a portal for which Port Houston and other stakeholders can get access to project documents.

Many Thanks,
Mike

Michael P. Musso, M.S., MPH, P.E. (NY)
D 201.335.9412 **M** 845.304.9639

hdrinc.com/follow-us

From: Trae Camble <tcamble@porthouston.com>
Sent: Friday, September 25, 2020 11:30 AM
To: Baumgarten, Gary <baumgarten.gary@epa.gov>
Cc: Musso, Michael <Michael.Musso@hdrinc.com>
Subject: Re: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hey Gary,

Tom has retired from HDR. The contact to use now is Michael Musso. He is copied on this email. Thanks!

Sent from my iPhone

On Sep 25, 2020, at 8:08 AM, Baumgarten, Gary <baumgarten.gary@epa.gov> wrote:

CAUTION: **This email originated from outside Port Houston. Exercise caution when opening attachments or clicking links, especially from unknown senders. Please forward any suspicious content to IT Support .**

Trae,
I sent an email to Tom Pease this morning to let him know the 90% RD for the southern impoundment was available.
I received the message below that he is no longer with HDR.
Please let me know the new contact person at HDR.
Gary

From: Pease, Thomas E. <Thomas.Pease@hdrinc.com>
Sent: Friday, September 25, 2020 8:06 AM
To: Baumgarten, Gary <baumgarten.gary@epa.gov>
Subject: Automatic reply: San Jacinto River Waste Pits - Pre-Final 90% Remedial Design - Southern Impoundment

I am no longer employed with HDR. Please contact Edward Schwetz or Carolyn Piranio for all future inquiries.

Message

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 5/10/2021 2:31:57 AM
To: Janie Smith [Janie.Smith@ghd.com]; Charles Munce [charles.munce@ghd.com]
CC: Poulos, Lauren [poulos.lauren@epa.gov]
Subject: RE: Modified Boring Locations for Upcoming Sampling
Attachments: RevisedProposed_BoringLocations_1966Aerial_20210507.pdf; RevisedProposed_BoringLocations_1989_90Aerial_20210507.pdf; Borings_GHD_EPA.xlsx

Please see reference attachments.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Howard, Ashley
Sent: Sunday, May 9, 2021 9:30 PM
To: Janie Smith <Janie.Smith@ghd.com>; Charles Munce <charles.munce@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: Modified Boring Locations for Upcoming Sampling

Charles/Janie -

Since EPA first requested an analysis of proposed boring locations compared to historical site features be completed on Tuesday April 27th, GHD and EPA have discussed multiple data sets for potential boring locations. EPA mapped each submission of data onto the 1966 and 1989 historical maps from the RI. The proposed boring locations were then analyzed to ensure (1) they were not on historically upland areas, (2) they addressed data gaps inside and outside of the historic berm, and (3) they addressed a data gap near SJSB052-C1. Relocating borings using this criteria also resulted in some shifting of other borings to create more even spacing between historical and proposed boring locations.

EPA mapped the most recent revised proposed sampling locations submitted on May 6 on the aforementioned historical figures. EPA also considered GHD's additional analysis that was discussed in a May 6 meeting regarding potential boring locations outside of the current limit of excavation. EPA also briefly reviewed an additional GHD submission of data points on historical figures submitted May 7, but it was determined that the map had inaccurate data points and was disregarded after discussions with GHD.

Although some of the revised boring locations submitted by GHD on May 6 addressed EPA's concerns, such as several borings being moved off the historic berm, six of the thirty four boring locations were modified by EPA after doing the analysis described above. EPA has attached two figures that show the modified boring locations overlayed on the 1966 and 1989 aerials for reference, along with a table with the modified GPS coordinates.

After considering GHD's analysis and discussion on May 6, EPA is in agreement that additional samples in the area of "Additional Proposed Borings 1 and 2" may be helpful to address any uncertainty in the extent of contamination outside of the current excavation boundary. Locations of these borings are identical to those submitted by GHD to EPA on May 6. However, since there is still uncertainty near the historical berm, borings SJSB092 and SJSB091 were left in the proposed boring locations that EPA discussed on May 5.

The locations of the borings been submitted, discussed, and revised multiple times to address EPA concerns and comments. In order to prevent disruption of the work and get in the field in a timely manner, please incorporate the modified sampling locations into your workplan. As stated in the last email, EPA would support GHD's choice to add additional borings if needed.

On May 7, GHD also presented new Geotech data that they would like to collect during this sampling event. After discussion, EPA is approving the collection of the following data:

- One CPT boring near the area where the piezometers are to be installed to address data gap in this area.
- Shelby tube samples when installing piezometers to analyze for various geotechnical parameters.
- Shear vane testing along the NW area to address data gap in this area.

Please include objectives, details, and SOPs related to this additional data collection in the workplan as appropriate.

Additionally, EPA and GHD discussed using SJSB101 for waste characterization sampling in leu of SJSB076 because dioxin concentrations were higher along that area of the ACBM in previous investigations.

Lastly, please respond with the date that the revised sampling plan will be submitted.

Please reach out to Lauren and I if you have any questions.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Howard, Ashley
Sent: Wednesday, May 5, 2021 2:46 PM
To: Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <charles.munce@ghd.com>
Subject: RE: Boring Location Discussion

Charles/Janie -

The EPA included the following comment in the March 29 Supplemental Design Investigation Plan Comments: *"Conduct more extensive delineation in the southeast corner of the site in the vicinity of cores SJSB046, SJSB046-C1, and SJSB047-C1."* The primary challenges in the southeast area are:

- Significant waste above the ROD cleanup level at depths of at least 20ft.
- One boring has not reached the depth of contamination.
- A "clean" RI boring is approximately 100ft from a boring with contaminated waste to 20ft below mudline.

- There is a berm on the south side that cannot be moved, making this area potentially more challenging to excavate.

During the TWG meeting on April 19, GHD responded to this comment by proposing an additional boring location (SJSB102) be added to the southeastern corner just south of SJSB046. Since that meeting, EPA has suggested that the boring be moved west to inform the slope towards SJSB029 on the berm. EPA and GHD agreed this location would help with the design.

However, this additional boring did not address the need for characterization in the area between the deep waste and the clean RI boring to the north. To better understand the nature of contamination in this area and to evaluate GHDs's response, EPA reviewed historic aerial photos from the RI report. The 1966 and 1989 aerial photos indicate that a berm separated a portion of the east pond. It was also noted that the "clean" RI boring SJGB017 and PDI 2 boring SJSB052 appear to be along this potential berm. As a result, EPA sought to map the completed and proposed boring locations onto maps of historical features.

On Tuesday April 27, EPA requested GHD to overlay the data points onto the historical figures for analysis. After discussion with the PRPs, GHD and EPA further discussed the request on April 28 and GHD stated that they would not map their proposed sampling locations on historical imagery. On April 29, EPA informed GHD that EPA would proceed with the analysis and requested all of the GIS related data from Figure 2 of the proposed RTC table so that EPA could perform the mapping. GHD sent location data on Friday April 30. After mapping the data, EPA noted that the data did not provide precise sampling location coordinates, and requested additional data on Monday May 3. EPA received the data and developed maps on May 4. The analysis was completed on May 5.

After review of the data, it appears that the two borings questioned by EPA (SJGB017 and SJSB052-C1) are located on the historic berm, that appears to have been an upland feature during the period of waste disposal. The sampling effort seeks to better characterize the location of waste to ensure its removal during remediation. Thus, sampling stations should be located to optimize characterization of the volume of materials likely requiring remediation, consistent with ROD requirements. Therefore, EPA believes it is necessary for the additional borings that are proposed to be located along this previously upland feature to be moved towards depositional areas that are more likely to have contamination. The remaining borings should be adjusted to ensure adequate distance from upland features and more equal spacing across the area. Addressing the uncertainty in this area with confirmation sampling after excavation would require an overly robust plan with a higher density of samples and other additional parameters that may not be required otherwise. It may also lead to delays in the field and other complications as further excavation will be needed if these confirmation samples do not meet the cleanup goal defined by the ROD. Therefore, EPA prefers incorporating knowledge of this berm, and the other historical features on this map, into the current sampling plan rather than addressing the uncertainty with confirmation sampling post excavation. Since the depth of contamination outside and inside the berm is uncertain and significant, the movement of proposed boring locations into these areas will help inform design. However, since it could significantly impact excavation depths, EPA would support GHD's choice to add additional borings along the berm to also characterize that feature.

A proposed approach to confirmation sampling has not been submitted to EPA, as the supplemental sampling results will help inform the approach. However, EPA has requested that the TWG begin to discuss the topic this summer. EPA has also requested that conceptual methods for designing the excavation prism be presented in the TWG for discussion.

Additionally, after reviewing the PDI 2 data utilizing the overlay, EPA suggests that SJSB092 be moved outside of the current excavation boundary between borings SJSB052, SJSB052-C1 and SJSB050-C1 to confirm that waste was not along the northeast area outside of the berm.

EPA has also approved the following changes to the workplan since the April TWG meeting:

- Additional deep piezometer to be installed in SE area of site.
- Additional boring added in NW corner of site.
- Waste Characterization samples moved to areas with higher concentrations of known waste.

- Collection of site specific sediment samples to analyze sediment size in area of BMP installment to support turbidity monitoring during RA.
- Collection of site specific river velocity data to support turbidity monitoring during the RA.

These approved changes, as well as the changes to boring locations discussed in this email, should be incorporated in the revised workplan to be submitted for EPA approval.

EPA would like to have a meeting to discuss changes to boring locations in more detail.

Additionally, please provide an updated RD Deliverables Schedule to be incorporated in Section 6 of the SOW.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Janie Smith <Janie.Smith@ghd.com>
Sent: Monday, May 3, 2021 3:33 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <charles.munce@ghd.com>
Subject: RE: Boring Location Discussion

Ashley – please see attached a table with the latitudes, longitudes, and state plane eastings and northings for all of the boring locations (past and proposed). These should be the locations of the borings in the version of Figure 2 that was sent out with the TWG pre-read.

Please let me know if you have any questions.

Thanks.

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Monday, May 3, 2021 12:56 PM
To: Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <Charles.Munce@ghd.com>
Subject: RE: Boring Location Discussion

Correction, the data points should also include what was presented at the TWG meeting in response to the EPA comments from March, but not what has been discussed since on weekly calls.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Howard, Ashley
Sent: Monday, May 3, 2021 12:46 PM
To: Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <charles.munce@ghd.com>
Subject: RE: Boring Location Discussion

Janie,

After looking at the overlays using the data provided Friday evening, it does not appear that we were provided the data from Figure 2 from the draft RTC table, but maybe revised data with some tentative borings based on various discussions. There are also other discrepancies with boring locations that our GIS person has said is from rounding the coordinates. Some of the rounding is causing significant changes to the locations.

The EPA GIS person working on the overlay has requested the following for our analysis:

- Shape file with the coordinates listed as an attribute with the latitude and longitude to the 6 significant digit.
- Since it is in state plane projection where it is listed in ft vs decimal degrees, please provide the coordinate measurement for feet.
- Confirm that it is the data from Figure 2 on the Draft RTC table.

We are trying to move forward with our analysis and recommendations but we need the full data from the original table before proceeding. Please provide this information ASAP. Call if there are any questions.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102

P: 214-665-7597
Howard.Ashley@epa.gov

From: Janie Smith <Janie.Smith@ghd.com>
Sent: Friday, April 30, 2021 4:38 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <charles.munce@ghd.com>
Subject: RE: Boring Location Discussion

Hey Ashley – not sure why the attachment didn't go through, but I've taken the individual files out of the zip file and attached them directly. Please let me know if this works.

Thanks.

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Friday, April 30, 2021 4:27 PM
To: Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <Charles.Munce@ghd.com>
Subject: RE: Boring Location Discussion

Janie,

I do not see the file attached. I am not sure if the email took the attachment off. It would be great to have all the data that was on your map (i.e the cap boundary and proposed excavation boundary).

I appreciate it.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500

Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Janie Smith <Janie.Smith@ghd.com>
Sent: Friday, April 30, 2021 4:23 PM
To: Howard, Ashley <Howard.Ashley@epa.gov>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>; Charles Munce <charles.munce@ghd.com>
Subject: RE: Boring Location Discussion

Ashley - please see attached the shape file for the historic boring locations (RI, PDI-1, and PDI-2) and the proposed boring locations. Sorry for the delay – we were trying to figure out the best way to share the data. This should open and be georeferenced in a GIS program. Please let us know if you have problems or questions.

Thanks.

JANIE SMITH

GHD - Proudly employee owned | ghd.com
5551 Corporate Blvd, Suite 200, Baton Rouge, LA 70808 USA
D 225 296 6550 **M** 919 260 8533 **E** janie.smith@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Friday, April 30, 2021 4:04 PM
To: Charles Munce <Charles.Munce@ghd.com>; Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: Boring Location Discussion

Charles,

Any update as to when I will receive the requested information?

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102

P: 214-665-7597
Howard.Ashley@epa.gov

From: Howard, Ashley
Sent: Thursday, April 29, 2021 1:14 PM
To: Charles Munce <charles.munce@ghd.com>; Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: Boring Location Discussion

Charles,

EPA is going to have a contractor do the overlay. Please provide the data table from Figure 2 from the draft RTC table. I do see that there are coordinates for the boring locations, but I was asked for more specific coordinates, as well as the data from previous investigations.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

From: Howard, Ashley
Sent: Tuesday, April 27, 2021 5:48 PM
To: Charles Munce <charles.munce@ghd.com>; Janie Smith <Janie.Smith@ghd.com>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: Boring Location Discussion

Charles,

After several meetings regarding locations of borings, we began to review old arial photos of the site, as well as process history. We are particularly interested in the clean RI boring and the deep waste near it. We would like to have a discussion before making a final comment about delineating the southeast area of the site.

For our discussion, can you please overlay your current boring locations on figure 6-4 from the RI (attached). This would be for discussion purposes only. I have also included some other figures that we would like to discuss as well.

Lastly, have you decided where the velocity meters would be located? I did not see them on the updated figure. We would want to make sure they are located in areas that may have the highest velocity to make sure the worst case scenario is captured. I would like to discuss this new component ASAP to see if we can include it in the current plan.

Thanks,
Ashley Howard

Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 10/8/2021 9:16:34 PM
To: Wyatt, Janal (PCS) [Janal.Wyatt@pcs.hctx.net]; Brady, Andrew (PCS) [Andrew.Brady@pcs.hctx.net]; Dimetra.hamilton [Dimetra.hamilton@pcs.hctx.net]; Meilahn, Nancy (PCS) [Nancy.Meilahn@pcs.hctx.net]; Stuart.Mueller [Stuart.Mueller@pcs.hctx.net]; Lozano, Marisela (PCS) [marisela.lozano@pcs.hctx.net]; Russo, Nick (Engineering) [Nick.Russo@eng.hctx.net]; Stuckett, Marcus (Flood Control) [Marcus.Stuckett@hcfcd.hctx.net]; Holley, Jonathan (Flood Control) [Jonathan.Holley@hcfcd.hctx.net]; Green, Dena (Flood Control) [Dena.Green@hcfcd.hctx.net]; Zeve, Matthew (Flood Control) [Matthew.Zeve@hcfcd.hctx.net]; Randy Palachek [Randy.M.Palachek@Parsons.com]; Dean, Kirk [Kirk.Dean@parsons.com]; Poulos, Lauren [poulos.lauren@epa.gov]
CC: Utley, Sarah (CAO) [Sarah.Utley@cao.hctx.net]; Bily, Eric (CAO) [Eric.Bily@cao.hctx.net]; Chen, Jing (Flood Control) [Jing.Chen@hcfcd.hctx.net]
Subject: RE: San Jacinto Design Update - Meeting with HCPCS
Attachments: SJRWP September TWG Update HCPCS 10-8-21.pdf

Thank you all for attending the meeting this afternoon. I have attached the presentation.

Thanks,
Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

-----Original Appointment-----
From: Wyatt, Janal (PCS) <Janal.Wyatt@pcs.hctx.net>
Sent: Monday, October 4, 2021 9:51 AM
To: Wyatt, Janal (PCS); Brady, Andrew (PCS); Dimetra.hamilton; Meilahn, Nancy (PCS); Stuart.Mueller; Lozano, Marisela (PCS); Russo, Nick (Engineering); Stuckett, Marcus (Flood Control); Holley, Jonathan (Flood Control); Green, Dena (Flood Control); Zeve, Matthew (Flood Control); Randy Palachek; Dean, Kirk; Howard, Ashley; Poulos, Lauren; Janie.Smith@ghd.com; Charles Munce
Cc: Utley, Sarah (CAO); Bily, Eric (CAO); Chen, Jing (Flood Control)
Subject: San Jacinto Design Update - Meeting with HCPCS
When: Friday, October 8, 2021 3:30 PM-4:30 PM (UTC-06:00) Central Time (US & Canada).
Where: Microsoft Teams Meeting

Good morning - -

Friday after hours, Ashley received additional information that she would like to incorporate into the presentation to have one meeting that encompasses all of the updates. I checked the scheduling assistant and found Friday, October 8, 3:30 – 4:30 works for almost everyone. If you are not available, please send a representative.

Thank you,
Janal

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting
Or call in (audio only)
+1 281-985-1862,,703588150# United States, Houston
Phone Conference ID: 703 588 150#
Find a local number | Reset PIN
Learn More | Meeting options

From: Howard, Ashley <Howard.Ashley@epa.gov>
Sent: Thursday, September 30, 2021 1:59 PM
To: Babin, Latrice (PCS) <Latrice.Babin@pcs.hctx.net>
Cc: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: San Jacinto Design Update - Meeting with HCPCS

Good Afternoon,

Please find the attached Monthly Progress Report for the San Jainto River Waste Pits site.

The Supplemental Design Investigation has concluded, and the attached monthly report has the validated data received as of the date of the report.

The August 30th TWG meeting topics are also summarized in this report. We would like to have a meeting with Harris County to discuss these topics:

- Ambient Turbidity Monitoring (Separate email sent)
- Turbidity Curtain Deployment: (letter attached explaining complications)
- Access Issues for RA
- CWA Project
- RD Schedule
- General update of SDI

We may also discuss EPA's comments on the *Background Turbidity Measurements Plan* and supplemental *Framework for Selection of Ambient Turbidity Monitoring Locations*, if not already discussed separately.

The meeting can include EPA only, or GHD can attend on request. We can also discuss the turbidity monitoring separately, if you would like GHD and their subcontractor to participate in that discussion. Please let us know your preference. The following is our availably during the week of Oct 4.

Availability for EPA and GHD:
Monday: 12:30 – 1:30; 3 - 5
Tuesday: N/A
Wednesday: 3 – 5
Thursday: N/A
Friday: 3:30 – 5

Additional availability if EPA only:
Monday: Anytime
Tuesday: 11:30-3
Wednesday: 1:30-3
Thursday 11-5

Friday: Anytime

EPA plans to meet with the larger CAC after the next TWG meeting, which is currently scheduled for Oct 19. EPA should have more information about the above topics, as well as more validated data, at that time.

Thanks,

Ashley Howard
Remedial Project Manager
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102
P: 214-665-7597
Howard.Ashley@epa.gov

Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 10/22/2021 4:59:52 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Charles Munce [charles.munce@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Philip J Slowiak [Philip.Slowiak@ipaper.com]
Subject: CAG Slide Deck
Attachments: CAG Information Slide Deck 10.22.2021.pptx

Flag: Follow up

Good morning Lauren,

Please find the CAG information slide deck as discussed attached.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

EPA Community Advisory Group Meeting - Southern Impoundment 10/28/2021

San Jacinto River Waste Pits Superfund Site
Southern Impoundment

Site Background

History

- The Southern Impoundment is approximately 20 acres in size and is located on a small peninsula that extends south of the Interstate Highway 10 bridge
- The Southern Impoundment consists of an impoundment built in the mid-1960s and used in that time period for disposal of pulp and paper mill material and later for disposal of miscellaneous anthropogenic waste. This anthropogenic waste was not associated with the paper mill operations.

Key Milestones

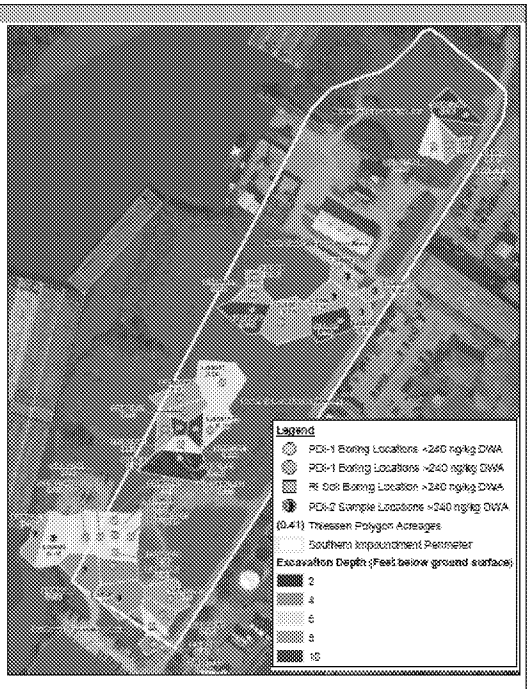
- Record of Decision (ROD) - October 2017
- Remedial Design (RD) Administrative Settlement Agreement and Order – effective April 2018
- Southern Impoundment 100% RD (Amended April 2021) - approved by the U.S. EPA May 2021
- Remedial Action (RA) Unilateral Administrative Order – effective September 2, 2021
- RA Work Plan (RAWP) - submitted to the U.S. EPA by Respondent on October 14, 2021

Remedial Design

- The RA involves excavation of soil in the Southern Impoundment that is greater than the risk-based cleanup level of 240 ng/kg $TEQ_{DF,M}$ based on a depth weighted average (DWA) from 0 – 10 feet below ground surface (bgs).
- Soil will be removed from select areas up to a depth of 10 feet below grade.
- Implementation of this RA will be timed to avoid hurricane season and high water periods of the San Jacinto River.
- Excavated soil will be disposed of at a permitted landfill.
- The excavation will be backfilled with imported clean soil, and vegetative cover re-established.

Previous Investigations

- Soil samples collected at 2-foot vertical intervals to a depth of 10'
  - Remedial Investigation (RI) – 25 soil borings
  - Pre-Design Investigation (PDI) 1 – 39 soil borings
  - PDI-2 – 21 soil borings
- Data from the RI, PDI-1 and PDI-2 were combined to generate Thiessen polygons to determine the vertical and horizontal extent of the dioxins and furans concentrations in the soil greater than 240 ng/kg $TEQ_{DF,M}$ based on a depth weighted average

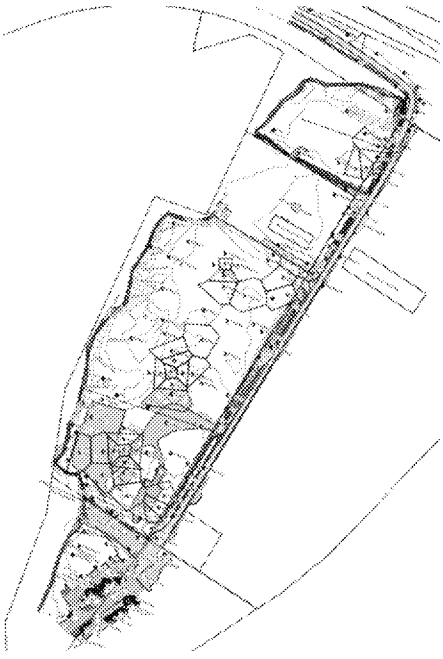


Pre-Construction Field Sampling Event (PCFSE)

- As the initial step of the RA, a pre-construction field sampling event will be completed to provide additional data to refine and update the excavation extents identified in the 100% Southern Impoundment RD (Amended April 2021).
- The pre-construction field sampling event will include:
  - Confirmation of excavation extent
  - Additional waste characterization sampling
  - Additional hydrogeologic assessment to refine water volumes to be managed during excavation work
- Design Drawings and Technical Specifications Updates
  - Results from the pre-construction field sampling will be incorporated into updated design drawings and technical specifications submitted to the U.S. EPA for review and approval

Planned Remedial Action

- The RA includes removal of soil such that the resulting DWA is less than 240 ng/kg $TEQ_{DF,M}$
- Excavation depths up to 10 feet bgs
- Installation of a bulkhead along southwest corner to facilitate excavation in the area
- Total volume estimated for offsite disposal of approximately 25,000 cubic yards based on the 100% RD (Amended April 2021).



Message

From: Meagan Willis [Meagan.Willis@ghd.com]
Sent: 1/20/2022 9:28:08 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Charles Munce [charles.munce@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Philip J Slowiak [Philip.Slowiak@ipaper.com]
Subject: CAG Meeting 1/27/2022 Support Information
Attachments: CAG Information 1.20.2022.pptx

Flag: Follow up

Good afternoon Lauren,

Please find the information summarizing the PC-FSE activities as requested in preparation for the CAG meeting scheduled for 1/27/2022.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

EPA Community Advisory Group Meeting - Southern Impoundment Update - 01/27/2022

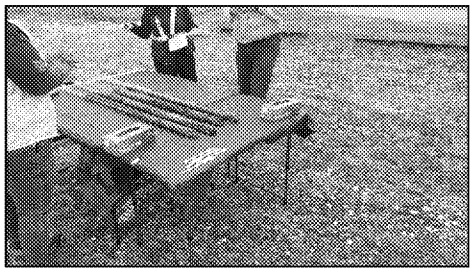
San Jacinto River Waste Pits Superfund Site
Southern Impoundment

Pre-Construction Field Sampling Event (PC-FSE)

- Respondent initiated field activities November 29, 2021 in accordance with the EPA approved Pre-Construction Field Sampling Plan (PC-FSP)
- Oversight provided by EPA RPM and EPA contractor
- Field activities have included the following:
  - Collection of confirmatory soil samples to confirm excavation extent
  - Collection of additional waste characterization and investigation-derived waste samples
  - Additional hydrogeologic assessment to refine water volumes to be managed during excavation work

PC-FSE Confirmation Sampling

- Three different types of confirmation samples collected:
  - Overburden soil samples
  - Sidewall samples
  - Bottom of excavation samples



Proposed Excavation Areas Initial Sampling Completed

- 202 Confirmation Borings and 161 Soil Samples Collected
- Northeast Excavation Area
  - 26 Soil Borings
  - 25 Composite Samples
- North Central Excavation Area
  - 62 Soil Borings
  - 50 Composite Samples
- South Central Excavation Area
  - 51 Soil Borings
  - 37 Composite Samples
- Southwest Excavation Area
  - 63 Soil Borings
  - 49 Composite Samples

Pending Activities

- Continue step-out borings until sidewall sample results greater than 240 ng/kg $TEQ_{DF,M}$ are fully delineated (NE area complete, NC, SC, and SW in progress)
- Continue processing, reviewing, and validating analytical results and hydrogeologic data
- Update Remedial Design, Specifications, and Supplemental Deliverables incorporating results from the PC-FSE
- EPA review and approval of the updated Remedial Design, Specifications, and Supplemental Deliverables

Message

From: Charles Munce [Charles.Munce@ghd.com]
Sent: 10/24/2022 8:05:42 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
Subject: FW: San Jacinto River Waste Pits Superfund Site - Southern Impoundment CERCLA OSR Confirmation

Lauren – I noticed you were not copied on this original email.

Charles W Munce PE | GHD | (225) 773-5770

From: Shannon, Wilkin <shannon.wilkin@epa.gov>
Sent: Monday, October 24, 2022 3:03 PM
To: Wells Richard <Wells.Richard@ghd.com>
Cc: Brent Sasser <Brent.Sasser@ipaper.com>; Charles Munce <charles.munce@ghd.com>
Subject: RE: San Jacinto River Waste Pits Superfund Site - Southern Impoundment CERCLA OSR Confirmation

Good afternoon, both facilities mentioned in your email, RS Golden Triangle Landfill, Beaumont, TX (TCEQ ID #MSW 2027), and WC Texas Seabreeze Environmental Landfill, Angleton, TX (TCEQ ID #1530A), are acceptable for CERCLA waste.

Wilkin "Ron" Shannon
RCRA Enforcement Officer
Toxics Enforcement Section (ECDST)
Waste Enforcement Branch
Enforcement and Compliance Assurance Division
U.S. Environmental Protection Agency Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Wk: (214) 665-2282
Fax: (214) 665-7446
e-mail: shannon.wilkin@epa.gov

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 18, 2022 4:11 PM
To: Shannon, Wilkin <shannon.wilkin@epa.gov>
Cc: Brent Sasser <Brent.Sasser@ipaper.com>; Charles Munce <charles.munce@ghd.com>
Subject: San Jacinto River Waste Pits Superfund Site - Southern Impoundment CERCLA OSR Confirmation

Good afternoon,

Please see the attached request for confirmation that 2 waste disposal facilities identified in our correspondence dating between June 1, 2022, and June 9, 2022, are still acceptable to receive CERCLA waste.

Please let me know if you have any questions.

Thank you and have a great day.

Wells Richard

Engineer

GHD

Proudly employee-owned | ghd.com

5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA

D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
Sent: 11/8/2022 7:26:33 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

FYI, I left you a voicemail earlier today; don't need a call back right away though, we can roll that into the next time we talk.

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Tuesday, November 8, 2022 1:24 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Wonderful – thanks so much, Katie! I'll reach out to you tomorrow so we can set something up, and I look forward to TCEQ's feedback.

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Tuesday, November 08, 2022 1:21 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren,
Our letter is with management for final approval; targeted to have to you by COB today. I'm happy to have a call tomorrow or Thursday if you'd like to discuss comments in an expedited fashion.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Tuesday, November 8, 2022 1:18 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>

Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I just wanted to send out a gentle reminder that agency comments on the Updated Supplemental Deliverables materials have been requested by EPA by COB today. Please let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Wednesday, October 26, 2022 12:22 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I'm glad you were able to access all the documents, and thank you, Robert for helping trouble shoot all of that. As we discussed at the Pre-Construction Conference yesterday, EPA is requesting any feedback be provided by November 8, 2022. Please let me know if you have any questions or need anything else at this time.

Additionally, we received the waste profile information from GHD in a separate email this morning. EPA will be working to complete our waste characterization analysis now that we have the profile info and sampling requirements from the disposal facilities. I'll reach out separately to coordinate a timeline on that so we can incorporate any feedback from the state as well.

Thanks,

Lauren Poulos
214-665-8371

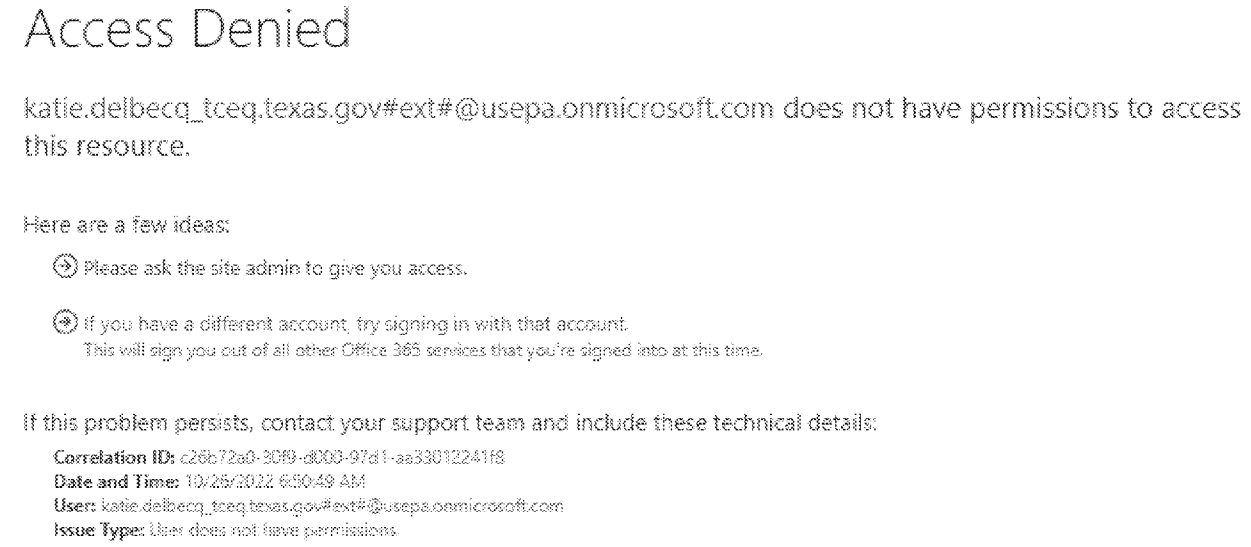
From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 9:39 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi all, Robert sent me a new folder link and I got the files downloaded. Thanks!

From: Katie Delbecq
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

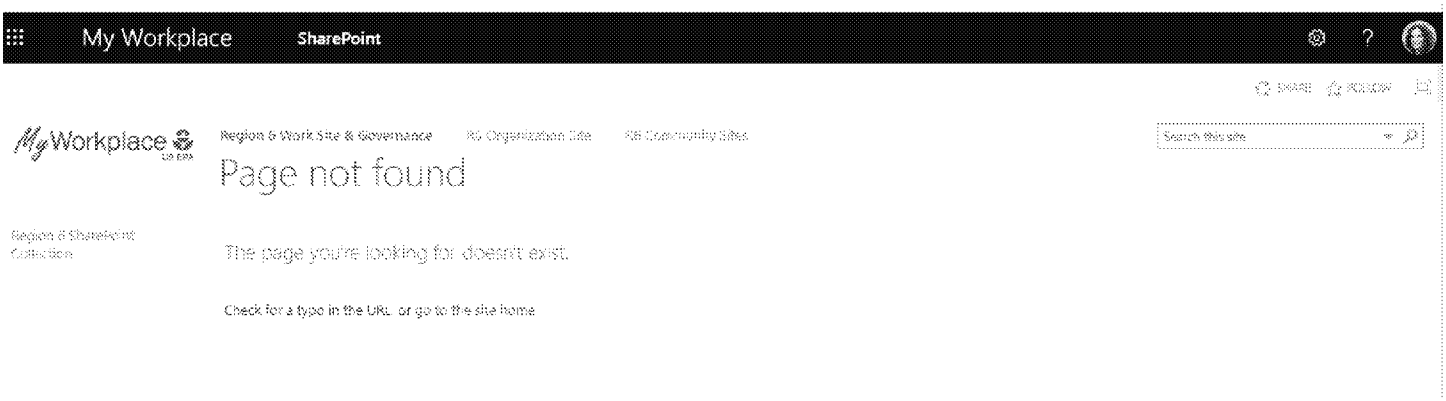


Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Wells Richard [Wells.Richard@ghd.com]
Sent: 11/22/2022 7:34:11 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
CC: Charles Munce [charles.munce@ghd.com]; Willie Beal [Willie.Beal@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]
Subject: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Flag: Follow up

Good afternoon Lauren,

Please see the following clarification following our 11/21/2022 call regarding TPH sample collection for the upcoming waste confirmation sampling at the site beginning 11/28/2022:

GHD Services, Inc. (GHD) proposes to collect samples from 26 grid areas across the removal limits as descried in the Field Sampling Plan (FSP). Three borings will be completed within each grid area. A sample from each boring will be collected from the entire vertical profile of material that will be removed for disposal. The three samples will then be homogenized into a single composite sample for each one of the 26 grid areas.

EPA requested in the November 17, 2022, email that any samples for VOCs be collected as discrete samples rather than composites. GHD does not plan to collect samples for VOCs. However, the samples will be analysed for TPH by Method 1005, which does include the volatile hydrocarbon fractions in the nC6 to nC12 range. TX Method 1005 also specifies using Method SW846-5035 sampling procedures when collecting solid samples for volatile analysis (nC6 to nC12 range).
After review of TX Method 1005 and the proposed sampling procedures, GHD concludes that the composite bulk sampling that is currently proposed in the FSP is appropriate for characterizing the material to be excavated and generated. Three samples were previously collected for waste characterization and analysed for TPH and the results are summarized below:

		TPH (C6-C12)	*TPH (C12-C28)*	*TPH (C25-C36)*
		mg/kg	*mg/kg*	*mg/kg*
Sample Identification:	**Sample Date:**			
SL0064	11/05/2018	8.3	340 J	510 J
SL0065	11/05/2018	14	430 J	600 J
SL0084	11/05/2018	1.7 J	33 J	130 J

These results show that the TPH at the site is primarily in the heavier carbon ranges (nC12-nC28 and nC25-nC36) which is not considered volatile, with only minor amounts (<1.4 %) in the nC6 to nC12 range.

GHD also recommends the bulk composite sampling method because the purpose of the data collection is waste characterization confirmation. Collecting a composite sample of the entire vertical profile would provide more representative data of the waste material to be excavated and generated for disposal as compared to discrete sampling.

Sampling procedure Method SW846-5035 is not warranted for the proposed TPH sampling. This sampling collection and preservation method is specified to retain low concentrations of volatiles that could be lost due to the disturbance caused by sampling techniques. The TPH Class1/Class 2 waste criterion that the results will be compared to is 1,500 mg/kg, which is well above the concentration range where losses due to the sampling techniques would affect the data evaluation and interpretation.

Please reach out to me if you have any clarifying questions/comments.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Cobb, Derrick [Derrick.Cobb@WestonSolutions.com]
Sent: 11/23/2022 5:16:38 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]; Wells Richard [Wells.Richard@ghd.com]
CC: Charles Munce [charles.munce@ghd.com]; Willie Beal [Willie.Beal@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Bingham, Cody [Cody.Bingham@WestonSolutions.com]
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

I am available at that time.

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, November 23, 2022 11:13 AM
To: Wells Richard <Wells.Richard@ghd.com>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Cobb, Derrick <Derrick.Cobb@WestonSolutions.com>; Bingham, Cody <Cody.Bingham@WestonSolutions.com>
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

*** External Message *** -- PROBE message before clicking links or opening attachments.

I can make that

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Wednesday, November 23, 2022 11:02 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Cobb, Derrick <derrick.cobb@westonsolutions.com>; Bingham, Cody <Cody.Bingham@WestonSolutions.com>
Subject: Re: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Lauren,

Does 1130 work for y'all today?

Wells Richard
225-454-4363

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, November 23, 2022 9:55:42 AM
To: Wells Richard <Wells.Richard@ghd.com>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Cobb, Derrick <derrick.cobb@westonsolutions.com>; Bingham, Cody <Cody.Bingham@WestonSolutions.com>
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Hi Wells,

I just left you a couple voicemails on your desk and mobile lines and wanted to follow up via email as well. Can we have a Teams discussion about this topic today, preferably this morning? EPA has a few questions and concerns with the approach as outlined below, and it would be great to go over everything and hopefully reach a resolution today as the sampling is scheduled to start on Mon 11/28.

Also, on that topic, is the sampling still on schedule with the recent and expected rain on-site? Can you please provide an update on that?

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, November 22, 2022 1:34 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Good afternoon Lauren,

Please see the following clarification following our 11/21/2022 call regarding TPH sample collection for the upcoming waste confirmation sampling at the site beginning 11/28/2022:

GHD Services, Inc. (GHD) proposes to collect samples from 26 grid areas across the removal limits as descried in the Field Sampling Plan (FSP). Three borings will be completed within each grid area. A sample from each boring will be collected from the entire vertical profile of material that will be removed for disposal. The three samples will then be homogenized into a single composite sample for each one of the 26 grid areas.

EPA requested in the November 17, 2022, email that any samples for VOCs be collected as discrete samples rather than composites. GHD does not plan to collect samples for VOCs. However, the samples will be analysed for TPH by Method 1005, which does include the volatile hydrocarbon fractions in the nC6 to nC12 range. TX Method 1005 also specifies using Method SW846-5035 sampling procedures when collecting solid samples for volatile analysis (nC6 to nC12 range).
After review of TX Method 1005 and the proposed sampling procedures, GHD concludes that the composite bulk sampling that is currently proposed in the FSP is appropriate for characterizing the material to be excavated and generated. Three samples were previously collected for waste characterization and analysed for TPH and the results are summarized below:

		TPH (C6-C12)	*TPH (C12-C28)*	*TPH (C25-C36)*
		mg/kg	*mg/kg*	*mg/kg*
Sample Identification:	**Sample Date:**			
SL0064	11/05/2018	8.3	340 J	510 J
SL0065	11/05/2018	14	430 J	600 J
SL0084	11/05/2018	1.7 J	33 J	130 J

These results show that the TPH at the site is primarily in the heavier carbon ranges (nC12-nC28 and nC25-nC36) which is not considered volatile, with only minor amounts (<1.4 %) in the nC6 to nC12 range.

GHD also recommends the bulk composite sampling method because the purpose of the data collection is waste characterization confirmation. Collecting a composite sample of the entire vertical profile would provide more representative data of the waste material to be excavated and generated for disposal as compared to discrete sampling.

Sampling procedure Method SW846-5035 is not warranted for the proposed TPH sampling. This sampling collection and preservation method is specified to retain low concentrations of volatiles that could be lost due to the disturbance caused by sampling techniques. The TPH Class1/Class 2 waste criterion that the results will be compared to is 1,500 mg/kg, which is well above the concentration range where losses due to the sampling techniques would affect the data evaluation and interpretation.

Please reach out to me if you have any clarifying questions/comments.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment
Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

CAUTION: This email originated outside of the organization. **DO NOT CLICK** links or open attachments unless you recognize the sender and know the content is safe.

CONFIDENTIALITY: This email and attachments may contain information which is confidential and proprietary. Disclosure or use of any such confidential or proprietary information without the written permission of Weston Solutions, Inc. is strictly prohibited. If you received this email in error, please notify the sender by return e-mail and delete this email from your system. Thank you.

Message

From: Poulos, Lauren [poulos.lauren@epa.gov]
Sent: 11/17/2022 5:56:19 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]
Subject: FW: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Flag: Follow up

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Thursday, November 17, 2022 11:56 AM
To: 'Wells Richard' <Wells.Richard@ghd.com>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

I spoke with Charles this week and understand that GHD has scheduled sampling to take place starting Mon 11/28 as per the disposal facility requirements and to prepare for upcoming waste management from the site as work progresses. While comments on the updated Supplemental Deliverables are still under development and will be provided soon, I wanted to resolve a few more time sensitive issues prior to 11/28. Charles and I spoke this morning, and I wanted to follow up with an email about the following:

- Any VOC soil samples taken will be discrete (i.e., not composite).
- Waste codes do not match between the two disposal facilities for the project. Can you please clarify why this might be?
- Should any result from a sampling grid area exceed the limits listed in Table 3.2 of the FSP, please coordinate with EPA regarding further characterization.

As I mentioned, there are going to be additional comments forthcoming, but for the sake of not holding up the field work, I wanted to get to these items first. Let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide

Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/2/2021 4:02:19 PM
To: Meagan Willis [Meagan.Willis@ghd.com]
CC: Charles Munce [charles.munce@ghd.com]
Subject: RE: SJRWP Southern Impoundment RAWP Discussion Follow Up

Thanks, Meagan. I will discuss and get back to you. I appreciate you following up on this.

Lauren Poulos
214-665-8371

From: Meagan Willis <Meagan.Willis@ghd.com>
Sent: Monday, November 01, 2021 10:22 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>
Subject: SJRWP Southern Impoundment RAWP Discussion Follow Up

Good morning Lauren,

We wanted to follow up regarding our call last week regarding potential TCEQ comments to the work plan as our team has had time to review further.

- Three TCLP D/F samples were collected from the Southern Impoundment in 2019 as part of the Treatability Study and Waste Characterization activities detailed in Section 3.3.1 and Table 6 of the 100% Remedial Design. Sample locations were selected based upon data collected during the RI and PDI-1 indicating that those locations had dioxin and furan concentrations greater than 240 ng/kg $TEQ_{DF,M}$ DWA.

- As detailed in Section 2.3.3 of the RAWP, prior to the RA excavation the Respondent will coordinate with the receiving off-site disposal facility to ensure that the waste profile is developed for the waste being transported to the disposal facility. Prior to initiating the RA construction, some volume-based frequency of waste characterization sampling will be agreed upon between the Respondent and the facility to verify that different truckloads of waste will be consistent with those profiles.

If it would helpful, we could participate in a call with the EPA and TCEQ to further discuss TCEQ comments to ensure they are expeditiously addressed to maintain the project schedule.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/4/2021 4:33:57 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
Subject: FW: SJRWP Southern Impoundment RAWP Discussion Follow Up

Lauren Poulos
214-665-8371

From: Meagan Willis <Meagan.Willis@ghd.com>
Sent: Monday, November 01, 2021 10:22 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>
Subject: SJRWP Southern Impoundment RAWP Discussion Follow Up

Good morning Lauren,

We wanted to follow up regarding our call last week regarding potential TCEQ comments to the work plan as our team has had time to review further.

- Three TCLP D/F samples were collected from the Southern Impoundment in 2019 as part of the Treatability Study and Waste Characterization activities detailed in Section 3.3.1 and Table 6 of the 100% Remedial Design. Sample locations were selected based upon data collected during the RI and PDI-1 indicating that those locations had dioxin and furan concentrations greater than 240 ng/kg $TEQ_{DF,M}$ DWA.

- As detailed in Section 2.3.3 of the RAWP, prior to the RA excavation the Respondent will coordinate with the receiving off-site disposal facility to ensure that the waste profile is developed for the waste being transported to the disposal facility. Prior to initiating the RA construction, some volume-based frequency of waste characterization sampling will be agreed upon between the Respondent and the facility to verify that different truckloads of waste will be consistent with those profiles.

If it would helpful, we could participate in a call with the EPA and TCEQ to further discuss TCEQ comments to ensure they are expeditiously addressed to maintain the project schedule.

Kind regards,
Meagan

MEAGAN WILLIS

GHD
Proudly employee owned | ghd.com
11451 Katy Freeway Suite 400 Houston TX 77079 USA
D 713-907-3710 **E** Meagan.Willis@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/8/2021 10:34:41 PM
To: latrice.babin@pcs.hctx.net; Wyatt, Janal (PCS) [Janal.Wyatt@pcs.hctx.net]
Subject: FW: EPA Approval with Modifications to San Jacinto Southern Impoundment RA Work Plan
Attachments: 2021 11 05 EPA SJRWP SI RAWP Signed Approval with Modifications.pdf

FYI

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Friday, November 05, 2021 4:17 PM
To: Charles Munce <charles.munce@ghd.com>
Cc: Meagan Willis <Meagan.Willis@ghd.com>; Philip J Slowiak <Philip.Slowiak@ipaper.com>; Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Subject: EPA Approval with Modifications to San Jacinto Southern Impoundment RA Work Plan

Hi Charles,

Attached is EPA's signed approval with modifications to the San Jacinto River Waste Pits Southern Impoundment Remedial Action Work Plan. Let me know if you have any questions, and thanks for coordinating.

Have a great weekend,

Lauren Poulos
Remedial Project Manager
Arkansas/Texas Section (SEDRA)
Superfund Division
U.S. EPA Region 6
214-665-8371

11451 Katy Freeway, Suite 400
Houston, Texas 77079
United States
www.GHD.com

Our Ref.: 11215131-Poulos-1

October 14, 2021

Ms. Lauren Poulos
Remedial Project Manager
United States Environmental Protection Agency - 6SF RL
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

San Jacinto River Waste Pits Superfund Site
Southern Impoundment, Harris County, Texas
Remedial Action Work Plan
Unilateral Administrative Order for Remedial Action of the Southern Impoundment,
USEPA Region 6, CERCLA Docket No. 06 05 21

Dear Ms. Poulos

GHD Services Inc. (GHD), on behalf of International Paper Company, submits to the United States Environmental Protection Agency the attached *Remedial Action Work Plan Southern Impoundment* (RAWP) for the San Jacinto River Waste Pits Site in Harris County, Texas, prepared pursuant to the requirements of the Unilateral Administrative Order for Remedial Action of the Southern Impoundment, Docket No. 06 05 21.

Should you have any questions or require additional information regarding this submittal, please contact GHD at (713) 734-3090.

Regards,

GHD

Charles W. Munce, P.E.
Project Coordinator

(225) 773-5770
Charles.Munce@GHD.com

MW/jlf/1

cc: Katie Delbecq, TCEQ
Phil Slowiak, IPC
Brent Sasser, IPC

Remedial Action Work Plan

Southern Impoundment

San Jacinto River Waste Pits Superfund Site

International Paper Company

October 14, 2021

→ The Power of Commitment

Contents

1. **Introduction** 1
   - 1.1 Objective 1
   - 1.2 Background 1
   - 1.3 Document Organization 2
   - 1.4 Basis for Remedial Action 2
     - 1.4.1 Summary of PDI-1 Results 3
       - 1.4.1.1 PDI-1 Chemistry Results 3
       - 1.4.1.2 PDI-1 Geotechnical Results 3
       - 1.4.1.3 PDI-1 Waste Characterization Results 3
     - 1.4.2 Summary of PDI-2 Results 3
       - 1.4.2.1 PDI-2 Chemistry Results 3
       - 1.4.2.2 PDI-2 Geotechnical Results 4
       - 1.4.2.3 Topographic and Utility Survey 4
       - 1.4.2.4 Treatability Study 4
       - 1.4.2.5 Waste Characterization 4
     - 1.4.3 Pre-Design Investigations Conclusions 4
   - 1.5 Remedial Design Deliverables 5
2. **Remedial Design** 6
   - 2.1 Remedial Action Objectives 6
   - 2.2 Applicable or Relevant and Appropriate Requirements 6
   - 2.3 ARAR Compliance 6
     - 2.3.1 Water Management Compliance 6
       - 2.3.1.1 Texas Surface Water Quality Standard (TSWQS) 7
       - 2.3.1.2 NPDES and TPDES Requirements 7
     - 2.3.2 Dredge/Fill Material Compliance 7
     - 2.3.3 Waste Management 8
     - 2.3.4 Air Compliance 8
     - 2.3.5 Noise Compliance 9
   - 2.4 Remedial Design Elements 9
     - 2.4.1 Excavation of Impacted Soil 9
     - 2.4.2 Pre-Construction Field Sampling 10
       - 2.4.2.1 Confirmation Sampling 10
       - 2.4.2.2 Waste Characterization Sampling 11
       - 2.4.2.3 Pre-Construction Assessment of Water Volumes 11
     - 2.4.3 Structural Design of Bulkhead 11
     - 2.4.4 Transportation and Disposal 11
     - 2.4.5 Water Management 12
       - 2.4.5.1 Contact Water 12
       - 2.4.5.2 Treatment System 13
       - 2.4.5.3 Treatment System Monitoring 13
     - 2.4.6 Design Drawings 13
     - 2.4.7 Technical Specifications 15
3. **Remedial Action Preparations** 15
   - 3.1 Landowner Coordination and Notifications 16
     - 3.1.1 Institutional Controls (IC) 16

ED_014247_00001508-00003

Contents

3.2 Design Drawings and Technical Specifications Updates 16
3.3 Contractor Selection 16

4. Remedial Action Construction 16

4.1 Fieldwork Preparation Activities 17
4.1.1 Pre-Construction Meeting 17
4.1.2 Health and Safety 17
4.1.3 Utility Clearance 17
4.1.4 Permitting and Compliance 17
4.1.5 Imported Backfill Sampling 17
4.2 Site Preparation 17
4.2.1 Survey 17
4.2.2 BMPs and SWPPP 18
4.2.3 Fencing 18
4.2.4 General Site Layout 18
4.2.4.1 Excavation 18
4.2.4.2 Water Treatment 18
4.2.4.3 Support Features 19
4.2.5 Building Demolition 19
4.3 Air Monitoring 19
4.3.1 Control of Dust and Emissions 19
4.3.2 Odors 20
4.4 Water Management 20
4.5 Bulkhead Wall Installation 21
4.6 Excavation 21
4.7 Off-Site Transportation 22
4.8 Backfill 23
4.9 Restoration and Demobilization 23
4.10 Remedial Action Completion 24
4.10.1 Remedial Action Completion Inspections 24
4.10.2 Remedial Action Completion Report 24

5. Supporting Deliverables 24

5.1 Health and Safety Plan 24
5.2 Emergency Response Plan 25
5.3 Pre-Construction Field Sampling Plan 25
5.4 Field Sampling Plan 25
5.5 Quality Assurance Project Plan 25
5.6 Site Wide Monitoring Plan 25
5.7 Construction Quality Assurance/Quality Control Plan 25
5.8 Transportation and Off-Site Disposal Plan 25
5.9 Operation and Maintenance Plan 26
5.10 Institutional Controls Implementation and Assurance Plan 26

Contents

6. Project Schedule **26**

6.1 Pre-Construction Field Sampling Event Schedule 26

6.2 Projected RA Construction Schedule 26

6.3 Supporting Deliverables Update Schedule 27

7. References **28**

Table index

Table 4.1 Monitoring Frequencies and Sample Type 21

Table 4.2 Proposed RA Excavation Volumes 22

Table 6.1 Projected RA Construction Schedule 26

Table 6.2 Supporting Deliverables Update Schedule 27

Table 1 Applicable or Relevant and Appropriate Requirements

Figure index

Figure 1 Vicinity Map

Figure 2 Site Plan

Figure 3 Southern Impoundment Layout

Figure 4 Thiessen Polygons

Appendices

Appendix A Pre-Construction Field Sampling Plan

Appendix B Pre-Construction Field Sampling Health and Safety Plan

Appendix C Pre-Construction Field Sampling Emergency Response Plan

Appendix D Microsoft Project Projected RA Construction Schedule
Microsoft Project Projected Dates Related to RA Construction

List of Acronyms

AOC	-	Administrative Settlement Agreement and Order on Consent for Remedial Design
Anchor QEA	-	Anchor Quality Engineering Associates
ARAR	-	Applicable or Relevant and Appropriate Requirements
BHHRA	-	Baseline Human Health Risk Assessment
BMP	-	Best Management Practice
CFR	-	Code of Federal Regulations
COPC	-	Constituent of Potential Concern
CQA/CCP	-	Construction Quality Assurance/Quality Control Plan
CAA	-	Clean Air Act
CWA	-	Clean Water Act
cy	-	Cubic Yard
dBA	-	Decibels
DWA	-	Depth-Weighted Average
EPA	-	Environmental Protection Agency
ERC	-	Environmental Restrictive Covenant
ERP	-	Emergency Response Plan
FSP	-	Field Sampling Plan
ft bgs	-	Feet Below Ground Surface
GAC	-	Granulated Activated Carbon
GHD	-	GHD Services Inc.
gpm	-	Gallons per Minute
GPS	-	Global Positioning System
HASP	-	Health and Safety Plan
I-10	-	Interstate Highway 10
IC	-	Institutional Controls
ICIAP	-	Institutional Controls Implementation and Assurance Plan
IDW	-	Investigation-Derived Waste
IFB	-	Issue for Bid
in^3/ft	-	Cubic Inches Per Foot
IPC	-	International Paper Company
JSA	-	Job Safety Analysis
Kirby	-	Kirby Inland Marine
lb/hr	-	Pounds per Hour
mg/m^3	-	Milligram per Cubic Meter
MGD	-	Million Gallons per Day
ML	-	Minimum Level
Musgrove	-	Musgrove Towing Service, Inc.
NAAQS	-	National Ambient Air Quality Standards
NAVD88	-	North American Vertical Datum of 1988
NPDES	-	National Pollutant Discharge Elimination System
ng/kg	-	Nanograms per Kilogram
NOAA	-	National Oceanic and Atmospheric Administration
NPL	-	National Priorities List
NRR	-	Noise Reduction Rating
NWP 38	-	Nationwide Permit 38
O&M	-	Operation and Maintenance Plan
OSHA	-	Occupational Safety and Health Administration

ED_014247_00001508-00006

P&ID	-	Piping and instrumentation diagram
PBR	-	Permit by Rule
PCBs	-	Polychlorinated Biphenyls
PCFSP	-	Pre-Construction Field Sampling Plan
PCFSE	-	Pre-Construction Field Sampling Event
PDI	-	Pre-Design Investigation
PDI-1	-	First Phase Pre-Design Investigation
PDI-2	-	Second Phase Pre-Design Investigation
pg/L	-	picograms per liter
PM_{10}	-	Particulate Matter with diameters 10 micrometers and smaller
POTW	-	Publicly owned treatment works
QAPP	-	Quality Assurance Project Plan
RA	-	Remedial Action
RAO	-	Remedial Action Objective
RAWP	-	Remedial Action Work Plan
RC	-	Remedial Contractor
RCRA	-	Resource Conservation and Recovery Act
RD	-	Remedial Design
RDWP	-	Remedial Design Work Plan
RI	-	Remedial Investigation
RFI	-	Request for Information
RFP	-	Request for Proposal
ROD	-	Record of Decision
SM	-	Standard Method
SOW	-	Statement of Work
SVOC	-	Semi-Volatile Organic Compound
SWMP	-	Site-Wide Monitoring Plan
SWPPP	-	Stormwater Pollution Prevention Plan
SW-846	-	Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium
TAC	-	Texas Administrative Code
TAT	-	Turnaround Time
TCDD	-	2,3,7,8-tetrachlorinated dibenzo-p-dioxin
TCEQ	-	Texas Commission on Environmental Quality
TCLP	-	Toxicity Characteristic Leaching Procedure
$TEQ_{DF,M}$	-	TCDD Toxicity Equivalent for Mammals
TexTox	-	Texas Toxicity
TODP	-	Transportation and Off-Site Disposal Plan
ton/yr	-	Tons per Year
TPDES	-	Texas Pollutant Discharge Elimination System
TPH	-	Total Petroleum Hydrocarbons
TSS	-	Total Suspended Solids
TSWP	-	Treatability Study Work Plan
TSWQS	-	Texas Surface Water Quality Standards
TWG	-	Technical Working Group
U.S.	-	United States
USACE	-	United States Army Corps of Engineers
VOC	-	Volatile Organic Compound
WQBEL	-	Water Quality-Based Effluent Limits
TS	-	Water Treatment System

ED_014247_00001508-00007

1. Introduction

GHD Services Inc. (GHD), on behalf of International Paper Company (IPC), submits to the United States Environmental Protection Agency (EPA) this Remedial Action Work Plan (RAWP) for the Southern Impoundment of the San Jacinto River Waste Pits Site Superfund Site in Harris County, Texas (Site). This RAWP was prepared pursuant to the requirements of the Unilateral Administrative Order, Docket No. 06-05-21 (Order), with an effective date of September 2, 2021 (EPA, 2021c), including those contained in Section 3, Subsection 3.1 of the Statement of Work (SOW) that is attached to the Order.

1.1 Objective

This RAWP's objective is to present the primary design elements and plans for implementing the Southern Impoundment remedial action (Southern Impoundment RA), consistent with the requirements contained in Section 3, Subsection 3.1 of the SOW. In addition to describing the primary design elements and plans for implementing the Southern Impoundment RA, this RAWP includes the following:

- A proposed RA Construction Schedule as required by Subsection 3.1(a) of the SOW.
- A Pre-Construction Field Sampling Plan (PCFSP) which updates the plan that was included in the *100% Remedial Design - Southern Impoundment (Amended April 2021) (*100% Southern Impoundment RD*)* as a Supporting Deliverable and also contains a schedule for its implementation.
- Updated versions of two additional Supporting Deliverables, the Health and Safety Plan (HASP) and Emergency Response Plan (ERP), and a schedule for updating of these and other plans, as required by Subsection 3.1(f) of the SOW.
- A plan for satisfying permit requirements as required by Subsection 3.1(d) of the SOW.

1.2 Background

The Site is located in Harris County, Texas, east of the City of Houston, between two unincorporated areas known as Channelview and Highlands. The Southern Impoundment is approximately 20 acres in size and is located on a small peninsula that extends south of the Interstate Highway 10 (I-10) bridge (subject of this RAWP). The Northern Impoundment is located immediately north of the I-10 bridge over the San Jacinto River. A vicinity map is shown on Figure 1, the Site is depicted on Figure 2, and the Southern Impoundment is shown on Figure 3.

The Southern Impoundment consists of an impoundment built in the mid-1960s and used in that time period for disposal of solid and liquid pulp and paper mill material. The primary hazardous substances identified within the Southern Impoundment are polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans. The entire peninsula south of I-10 was subject to continuous and significant modification from the early 1970s through the 1980s.

There are several active businesses operating on the peninsula, including Kirby Inland Marine (Kirby), Glendale Boat Works, and Southwest Shipyards. The current work site, as that term is used in this RAWP, is located on property owned by Musgrove Towing Service, Inc. (Musgrove) and leased to Kirby. Market Street bounds the work site to the east.

The primary hazardous substances identified within the Southern Impoundment are polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans. Additional background information regarding the Southern Impoundment is contained in the *Remedial Investigation Report* (Integral and Anchor QEA, 2013b).

The remedy selected by the EPA for the Southern Impoundment is described in the *Record of Decision* (ROD) (EPA, 2017) as follows:

ED_014247_00001508-00008

– This RA involves excavation and replacement of soil in the Southern Impoundment that is greater than the clean-up level. Soil would be removed within these areas to a depth of 10 feet below grade. Implementation of this RA would require dewatering (groundwater lowering) to allow excavation of impacted soil in relatively dry conditions and may need to be timed to try to avoid high water and periods when storms are most likely. Excavated soil would be further dewatered, as necessary, and potentially treated to eliminate free liquids prior to transporting it for disposal. Effluent from excavation and subsequent dewatering would need to be handled appropriately, potentially including treatment prior to disposal. Excavated soil would be disposed of at an existing permitted landfill, the excavation would be backfilled with imported soil, and vegetation would be re-established. An existing building (an elevated frame structure) and a concrete slab would need to be demolished and removed prior to excavating the underlying soil. These features would be replaced as necessary.

The risk-based clean-up level for the Southern Impoundment set forth in the ROD is listed below:

– Dioxin in paper mill waste material and soil in the Southern Impoundment - 240 nanograms per kilogram (ng/kg) 2,3,7,8-tetrachlorinated dibenzo-*p*-dioxin (TCDD) toxicity equivalents for mammals ($TEQ_{DF,M}$) (Southern Impoundment construction worker).

This risk-based clean-up standard was based on exposure of a future construction worker to constituents of potential concern (COPCs) in surface and subsurface soils, as detailed in the *Baseline Human Health Risk Assessment* (BHHRA; Integral and Anchor QEA, 2013a), using a depth-weighted average (DWA) of the COPCs.

1.3 Document Organization

The remaining sections of this RAWP are organized as follows:

– Section 2 of this RAWP identifies the Remedial Action Objectives (RAOs), outlines the Applicable or Relevant and Appropriate Requirements (ARARs) identified as applicable to the Southern Impoundment RA and includes a plan for addressing permit requirements as set forth in Subsection 3.1(d), and contains a summary of the elements of the Southern Impoundment remedial design (RD).
– Section 3 of this RAWP includes a summary of activities anticipated to take place concurrently with the PCFSE and other activities. This section also details the process for updates to the Design Drawings and Technical Specifications based on the results of the PCFSE.
– Section 4 of this RAWP outlines the components of the RA Construction and sequence.
– Section 5 of this RAWP addresses the updating, as required by the SOW, of the following: HASP, ERP, PCFSP, Quality Assurance Project Plan (QAPP), Site-Wide Monitoring Plan (SWMP), Construction Quality Assurance/Quality Control Plan (CQA/QCP), Transportation and Off-Site Disposal Plan (TODP), Operation and Maintenance Plan (O&M), and Institutional Controls Implementation and Assurance Plan (ICIAP). It describes the updates made to the Supporting Deliverables being submitted with this RAWP (the HASP, ERP and PCFSP) and contains a proposed schedule for updating or further updating of all of the plans.
– Section 6 of this RAWP addresses the schedule for the Southern Impoundment RA and for updating of the plans addressed in Section 5.
– Section 7 of this RAWP includes references to cited reports, correspondence, etc.

This RAWP also includes supporting figures, tables, and the following appendices: PCFSP (Appendix A), HASP (Appendix B); ERP (Appendix C); and the Microsoft Project Proposed RA Construction Schedule and PCFSP Schedule (Appendix D).

1.4 Basis for Remedial Action

Initial subsurface investigations of the Southern Impoundment were completed in March 2011 and May 2012 as part of the remedial investigation (RI) to characterize soil chemistry for dioxins and furans. A summary and results of these investigations are included in the Remedial Investigation Report (Integral and Anchor QEA, 2013b) that was submitted to the EPA on May 23, 2013. These investigations were completed prior to the EPA setting the clean-up level for

ED_014247_00001508-00009

Southern Impoundment soil of 240 ng/kg ($TEQ_{DF,M}$). Pre-design investigations (PDI) were completed after the ROD to delineate and refine the areas and volume of Southern Impoundment soil waste material requiring excavation based on the EPA's soil clean-up level.

The PDI for the Southern Impoundment was conducted in two phases and a summary is provided below. The full results are included in the 100% Southern Impoundment RD.

1.4.1 Summary of PDI-1 Results

First Phase Pre-Design Investigation (PDI-1) activities in the Southern Impoundment were completed from November 1 through 19, 2018, in accordance with the *First Phase Pre-Design Investigation Work Plan (*Integral and Anchor QEA, 2018b), dated August 24, 2018, and approved by the EPA on September 12, 2018 (EPA, 2018a), and the *Addendum to the First Phase Pre-Design Investigation Work Plan*, dated October 18, 2018 (Integral and Anchor QEA, 2018d).

1.4.1.1 PDI-1 Chemistry Results

Of the 39 soil subsurface borings analyzed, 23 had DWAs greater than 240 ng/kg $TEQ_{DF,M}$ and 16 had DWAs less than 240 ng/kg $TEQ_{DF,M}$.

1.4.1.2 PDI-1 Geotechnical Results

The PDI-1 geotechnical results showed interbedded clay, silt, and sand in the areas of the Southern Impoundment in which the geotechnical samples were collected. Soils were shown to have moderate moisture content. Atterberg classification of clay soils indicated that they contained a mix of clays and sands, with an approximately even mix of high plasticity, fat clays and low plasticity, lean clays. Interspersed within these clays were samples with a high sand content.

1.4.1.3 PDI-1 Waste Characterization Results

Based upon the results of waste characterization samples, material to be excavated for off-site disposal from the Southern Impoundment did not exhibit any of the four characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity), as defined in Title 40 of the Code of Federal Regulations (CFR) Part 261, Subpart C. Analytical results for asbestos were non-detect, indicating that the material analyzed would not require any special handling.

Analytical results for total petroleum hydrocarbons (TPH) for boring SJSB012-N1-Composite were elevated, bordering on the limit between Class 1 versus Class 2 under the regulations governing classification of non-hazardous industrial solid waste in Texas (30 Texas Administrative Code [TAC] §335.505, 335.506, and 335.508).

1.4.2 Summary of PDI-2 Results

Second Phase PDI (PDI-2) fieldwork on the Southern Impoundment took place from September 3 through December 11, 2019, in accordance with the *Final Second Phase Pre-Design Investigation Work Plan (*GHD, 2019d), dated June 3, 2019, and approved by the EPA on August 8, 2019 (EPA, 2019c). PDI-2 activities included the collection of chemistry and geotechnical samples, topographic and utility survey, treatability study, and waste characterization.

1.4.2.1 PDI-2 Chemistry Results

Of the 21 chemistry sample borings installed during the PDI-2, 20 were analyzed. Of these 20 PDI-2 chemistry samples, eight had DWAs greater than 240 ng/kg $TEQ_{DF,M}$ and 12 had DWAs below 240 ng/kg $TEQ_{DF,M}$.

ED_014247_00001508-00010

1.4.2.2 PDI-2 Geotechnical Results

Two geotechnical borings (SJGB028 and SJGB029) were completed during PDI-2 to support the design of the bulkhead along the shoreline of the river. The near surface soils encountered at these two locations were mostly alternating layers of silt, sand, and clay up to -10 feet North American Vertical Datum of 1988 (NAVD88). A layer of very loose to loose-granular deposits was encountered between -10 feet and -40 feet NAVD88. Below this interval was a fat clay that grades into a sandy clay deposit that extends to the termination depth of the borings at approximately -69 feet NAVD88.

1.4.2.3 Topographic and Utility Survey

To support RA elements related to access, staging, and excavation, a topographic survey was conducted on the Southern Impoundment. Field data was collected using conventional surveying equipment, including a Trimble R10 global positioning system (GPS), and Trimble S6 robotic total station with supporting accessories. Surveying was completed on a 50 foot grid over the Southern Impoundment boundaries. Above ground utilities were also noted during survey activities. Survey data was utilized to develop a topographical digital elevation map of the Southern Impoundment. This surface and all identified above ground utilities from this survey were incorporated into the drawings included in the 100% Southern Impoundment RD.

1.4.2.4 Treatability Study

Pursuant to the ROD, excavated Southern Impoundment soil may need to be solidified to eliminate free liquids prior to transport for off-site disposal and contact water generated in the excavation through seepage and/or stormwater accumulation that may need to be treated prior to discharge.

As part of the PDI-2 field activities, a robust field pilot test which involved on-site clarification and filtration was performed as part of the treatability studies on contact water generated from the Northern Impoundment. Laboratory particle size analysis was also performed on the Northern Impoundment samples to evaluate the effectiveness of filtration micron size at removing dioxins and furans. A further evaluation was performed that concluded that these results were representative of contact water from the Southern Impoundment. The testing was completed in accordance with the Treatability Study Work Plan (TSWP) (GHD, 2019c) submitted to the EPA on May 20, 2019, and approved on August 27, 2019 (EPA, 2019d).

1.4.2.5 Waste Characterization

To supplement previous waste characterization results, three composite samples were collected from locations in the Southern Impoundment with concentrations of dioxin and furans greater than 240 ng/kg $TEQ_{DF,M}$ DWA. These samples were also evaluated for the need for solidification prior to disposal.

Samples were analyzed to evaluate whether they exhibited any characteristics of hazardous waste under Resource Conservation and Recovery Act (RCRA) and to determine whether they would meet 30 TAC 335 Subchapter R for Class 1 or Class 2 non-hazardous landfill disposal requirements.

Baseline characterization results for the Southern Impoundment waste characterization samples were consistent with results obtained during PDI-1, indicating that the material is a non-hazardous waste under RCRA.

1.4.3 Pre-Design Investigations Conclusions

PDI-1 results showed dioxins and furans concentrations greater than 240 ng/kg $TEQ_{DF,M}$ DWA at 23 boring locations and the PDI-2 results showed concentrations greater than 240 ng/kg $TEQ_{DF,M}$ DWA at eight boring locations. The data from PDI-1 and PDI-2 were combined with the data from the RI to generate Thiessen polygons to determine the approximate vertical and horizontal extent of the dioxins and furans concentrations in the subsurface greater than 240 ng/kg $TEQ_{DF,M}$ DWA. These Thiessen polygons are shown on Figure 4.

Based on the results from the RI and PDI events, there are four main areas in which excavation is proposed, as shown on Figure 4. The Thiessen polygons developed from these results provided the basis for the RA excavation

ED_014247_00001508-00011

area and volume for the Southern Impoundment of approximately 47,500 cubic yards (cy), of which, approximately 24,600 cy of material will be transported off-site for disposal at a landfill. As addressed in the discussion of the PCFSP, the limits of the excavations and associated volumes will be updated based on the results of the PCFSE.

1.5 Remedial Design Deliverables

A summary of the deliverables associated with the Southern Impoundment RD are listed below:

- On June 8, 2018, the *Draft First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018a) was submitted to the EPA. The EPA provided comments and the *First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018b) was submitted to the EPA on August 24, 2018. It was approved by the EPA on September 12, 2018 (EPA, 2018a). An *Addendum to the First Phase Pre-Design Investigation Work Plan* (Integral and Anchor QEA, 2018d) was submitted on October 18, 2018.
- On September 10, 2018, the *Draft Remedial Design Work Plan* (RDWP, Integral and Anchor QEA, 2018c) was submitted to the EPA and outlined plans for implementing the RD activities identified in the SOW. The EPA provided comments on the Draft RDWP on October 24, 2018. The *Remedial Design Work Plan* (Integral and Anchor QEA, 2018e) was submitted to the EPA on December 24, 2018, and approved by the EPA on November 6, 2020 (EPA, 2020b).
- On December 7, 2018, a letter was submitted to the EPA (GHD, 2018) requesting a 48-day schedule extension to the deadline for submittal of the *Draft Second Phase Pre-Design Investigation Work Plan* to allow time for the results from the First Phase Pre-Design Investigation (PDI-1) to be received and incorporated. This extension request was approved by the EPA on December 18, 2018 (EPA, 2018b), effectively extending the date for all subsequent RD submittals.
- On February 11, 2019, the *Draft Second Phase Pre-Design Investigation Work Plan* (GHD, 2019a) was submitted to the EPA. The EPA provided comments to the work plan on April 18, 2019 (EPA, 2019a). On June 3, 2019, the *Final Second Phase Pre-Design Investigation Work Plan* (GHD, 2019d) was submitted to the EPA and approved by the EPA in written correspondence dated August 8, 2019 (EPA, 2019c).
- On February 11, 2019, the *Draft Treatability Study Work Plan* (TSWP; GHD, 2019b) was submitted to the EPA. The EPA provided comments to the TSWP on April 18, 2019 (EPA, 2019b). On May 20, 2019, the *Final Treatability Study Work Plan,* (GHD, 2019c) was submitted to the EPA and approved in written correspondence dated August 27, 2019 (EPA, 2019d).
- On September 27, 2019, a letter was submitted to the EPA (GHD, 2019e) requesting an extension to the deadlines for the Preliminary 30% RD for the Northern and Southern Impoundments in response to a force majeure event caused by Tropical Storm Imelda, which caused significant flooding at the Site and the surrounding area in September 2019 and delayed the completion of fieldwork related to Second Phase PDI (PDI-2). In a letter dated October 30, 2019 (EPA, 2019e), the EPA approved a 24-day delay due to the force majeure event and an extension to the deadlines for submittal of the Preliminary 30% RD for both the Northern and Southern Impoundments.
- On April 13, 2020, the Southern Impoundment 30% RD (GHD, 2020a) was submitted to the EPA. The EPA provided comments on June 26, 2020 (EPA, 2020a). Those comments were addressed in the *Southern Impoundment 90% RD*, submitted to the EPA on September 24, 2020 (GHD, 2020b). The EPA provided the Comments in response to the Southern Impoundment 90% RD on November 18, 2020 (EPA, 2020c).
- On December 18, 2020, the Southern Impoundment 100% RD (GHD, 2020c) was submitted to the EPA. The EPA provided comments on March 15, 2021 (EPA, 2021a). The Comments were addressed throughout the *Southern Impoundment 100% RD (Amended April 2021)* (GHD, 2021) and approved in written correspondence dated May 7, 2021 (EPA, 2021b).

ED_014247_00001508-00012

2. Remedial Design

2.1 Remedial Action Objectives

The RAOs for the Site, as identified in the ROD, include:

RAO 1: Prevent releases of dioxins and furans above soil clean-up levels from the former waste impoundments to sediments and surface water of the San Jacinto River.

RAO 2: Reduce human exposure to dioxins and furans from ingestion of fish by remediating sediments to appropriate clean-up levels.

RAO 3: Reduce human exposure to dioxins and furans from direct contact with or ingestion of paper mill waste, soil, and sediment by remediating affected media to appropriate clean-up levels.

RAO 4: Reduce exposures of benthic invertebrates, birds, and mammals to paper mill waste derived dioxins and furans by remediating affected media to appropriate clean-up levels.

2.2 Applicable or Relevant and Appropriate Requirements

Compliance with ARARs does not include formal submission of permit applications to the agencies to provide permits or approvals. Instead, information sufficient to demonstrate compliance will be presented to the EPA, in coordination with other agencies with jurisdiction with respect to the applicable ARARs.

The EPA recognizes the following three types of ARARs:

- ***Chemical-Specific ARARs:*** Chemical-specific ARARs include health- or risk-based numeric limits or methods that establish the acceptable amount or concentration of a chemical that may be found in or discharged to the environment.
- ***Location-Specific ARARs:*** Location-specific ARARs include limits on allowable concentrations or on activities associated with hazardous substances solely because they occur in special locations.
- ***Action-Specific ARARs:*** Action-specific ARARs include technology- or activity-based requirements or limitations on actions involving the management of hazardous substances.

The applicable statutory and regulatory requirements along with project-specific comments that explain how these statues and regulations apply to and would be met during the Southern Impoundment RA are summarized in Table 1 and addressed below.

2.3 ARAR Compliance

ARARs applicable to the Southern Impoundment RA as determined during the Southern Impoundment RD are related to water, dredge/fill material, waste, air, and noise regulations, standards, or requirements. The following sections provide a summary of the different media/topics as to which compliance with the substantive (i.e., non-administrative) requirements of ARARs is anticipated to be required and a plan, as required by Subsection 3.1(d) of the SOW, for demonstrating compliance with them.

2.3.1 Water Management Compliance

With respect to treated surface water discharge from the work site, compliance with the Clean Water Act (CWA), Texas Surface Water Quality Standards (TSWQS), and the National and Texas Pollutant Discharge Elimination System (NPDES and TPDES) will be required.

Water that is generated during RA Construction (i.e., pore water, perched surface runoff, stormwater accumulation, equipment decontamination water, and water within the bulkhead that comes into contact with waste material) will be

ED_014247_00001508-00013

treated and discharged to the San Jacinto River (Segment, 1005) from a discharge point to be located west of the Water Treatment System (WTS) on the work site. Texas Commission on Environmental Quality (TCEQ) water quality-based effluent limits (WQBEL) using TCEQ TexTox menu # 5 for bay or wide tidal river were calculated and considered for the water treatment design to ensure compliance with the ARARs.

2.3.1.1 Texas Surface Water Quality Standard (TSWQS)

The EPA has made the determination regarding the ARAR for compliance with the TSWQS based on the substantive requirements of the state's regulation for surface water discharge. As detailed in e-mail correspondence dated February 18, 2020 (EPA, 2020a), and set forth in the 100% Southern Impoundment RD, "EPA has determined that compliance with the TSWQS ARAR will be attained as follows:

- *The state surface water quality standard for Dioxins/Furans is 7.97 x 10-8 µg/L [0.0797 picograms per liter {pg/L}] (as TCDD equivalents).*
- *Compliance with the TSWQS will be determined using the minimum level of the EPA-approved Method (1613B), cited in 40 CFR Part 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants), in sampling of surface water discharges during the Site remedial action.*
- *If an effluent sample analyzed for dioxin is below the minimum level using the EPA-approved method, the sample result would be identified as non-detect and the discharge would be determined to be in compliance with the ARAR.*
    - The Minimum Level (ML) for each analyte is defined as the level at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and clean-up procedures have been employed. This approach is consistent with the state's guidance and other permits issued by the TCEQ."

Following receipt of PCFSE data and after updating of water treatment calculations, discussions and coordination will take place with TCEQ regarding plans for treated water discharge during RA Construction, including the location of the discharge point.

2.3.1.2 NPDES and TPDES Requirements

After notice to the EPA of the selected RC, the RC will be required to develop and implement during RA Construction activities a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP will use best management practices (BMPs) to minimize erosion and entrainment of sediments in stormwater runoff to ensure compliance with the TPDES and NPDES ARARs, The SWMP included in the 100% Southern Impoundment RD described the required in the SWPPP, including the following components.

- BMPs.
- Preventative devices.
- Stormwater monitoring and maintenance procedures.
- Stormwater inspections by a qualified person.
- Documenting changing conditions.
- Recordkeeping.

2.3.2 Dredge/Fill Material Compliance

Section 401 of the CWA requires Water Quality Certification of projects that involve discharge of dredge/fill that would impact waters of the United States (U.S.) or wetland. Additionally, Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the U.S. regulated under this program include fill for development, water resource projects (such as, dams and levees), infrastructure development (such as, highways and airports) and mining projects.

ED_014247_00001508-00014

The bulkhead to be installed in the Southern Impoundment is considered "fill material"; therefore, Sections 401 and 404 apply to the project. Bulkhead installation will be required to comply with substantive requirements of Sections 401 and 404 including U.S. Army Corp of Engineers (USACE) Nationwide Permit 38 (NWP 38) for Clean-Up of Hazardous and Toxic Waste. Nationwide Permit No. 38 (NWP 38), authorizes hazardous or toxic waste clean-up activities that are performed, ordered, or sponsored by a legal or regulatory authority.

A Desktop Biological Assessment is being completed for the Southern Impoundment to provide a technical basis to determine to what extent (if any) the proposed RA Construction may affect threatened, endangered, proposed, or candidate species, as a basis for communications with the USACE regarding compliance with the substantive requirements of NWP 38.

2.3.3 Waste Management

The applicable requirements for waste management activities at the work site are contained in the RCRA Hazardous Waste Management regulations and the Texas Industrial Solid Waste and Municipal Hazardous Waste regulations. Based on PDI-1 and PDI-2 sample results, the Southern Impoundment waste/soils are not listed hazardous waste, do not contain listed hazardous waste above RCRA thresholds, and are not classified as characteristic hazardous waste.

During the PCFSE and as described in Appendix A, additional samples of the waste material will be collected and analyzed for RCRA parameters to confirm previous waste characterization determinations and to establish waste profiles. These samples will be analyzed for the four RCRA hazardous waste characteristics per EPA-required test methodology in 40 Code of Federal Regulations (CFR) Part 261.

To further refine the non-hazardous waste classification (Class 1 or Class 2), several composite samples of the waste material will be collected during the PCFSE in accordance with Texas non-hazardous industrial solid waste regulations (Texas Administrative Code [TAC] 335.505-506). One composite sample will be collected from the investigation-derived waste (IDW) from each of the four excavation areas and analyzed for the Class 2 disposal parameters, as described in Appendix A.

In preparation for the RA Construction, an Engineering and Compliance Desktop Document Review and On-Site Facility Audit has been completed for potential Subtitle D permitted solid waste disposal landfills. The intent of the desktop and onsite audits was to review available engineering, operations, and compliance records of the disposal facilities to facilitate the selection of a landfill (or multiple landfills) to receive excavated material from the RA Construction activities. No issues were identified that would disqualify any of the facilities as a disposal location for waste generated from the work site.

Prior to the commencement of RA Construction, one or more of the off-site disposal facilities will be selected to receive the excavated impacted material from the Southern Impoundment. Each disposal facility will require an initial waste profile be developed for the waste being transported to the disposal facility in addition to some volume-based frequency of waste characterization sampling to verify that different truckloads of waste will be consistent with those profiles. The RC TODP will include the specifics of the agreed-to profile sampling during RA construction. The RC will be required to develop procedures to address any free liquids observed after loading, such as the addition of solidification agents.

Any other type of waste material that may be encountered during excavation activities will be segregated from the excavated material and characterized and profiled separately. If any of that material is characterized as being hazardous waste, as defined in 40 CFR Part 261, it will be managed and disposed of in accordance with RCRA regulations.

2.3.4 Air Compliance

With respect to RA Construction activities that potentially generate air emissions at the work site, compliance with the Clean Air Act (CAA) and Texas Air quality regulations will be required. The SWMP included in the 100% Southern Impoundment RD describes the framework for monitoring to be performed by the RC to prevent the potential spread of dust and particulates generated during RA Construction.

ED_014247_00001508-00015

The SWMP will be supported by a site-wide Air Monitoring Plan which will detail how dust will be monitored and as needed, suppressed. The RC will be required to prepare an Air Monitoring Plan to address the following components and ensure proper implementation and compliance.

- Monitoring procedures and data collection.
- Monitoring instruments and calibration.
- Monitoring frequency.
- Establish action levels.
- Suppression and Mitigation Measures.
- Documenting changing conditions.
- Recordkeeping.

The TCEQ is the designated regulatory authority in Texas with respect to air emissions. Emissions generated from equipment used to extract, handle, process, condition, reclaim or destroy contaminants for the purpose of remediation are covered by a TCEQ permit by rule (PBR), as long as emissions are limited to 5 tons per year (ton/yr) or 1 pound per hour (lb/hr) for the work site activities (30 TAC 106.533). Prior to commencing RA construction and once the RC has provided the equipment manufacturer specifications, emission calculations will be performed with respect to compliance with the PBR.

2.3.5 Noise Compliance

For any PCFSE and RA Construction activities that may potentially generate noise, compliance with the Noise Control Act and Texas noise regulations. The Texas Penal Code Chapter 42 regulates any noise that exceeds 85 decibels (dBA) after the noise is identified as a public nuisance.

It is expected that the majority of PCFSE and RA Construction activities will not exceed the 85 decibel level beyond the immediate work area. With the exception of soil boring drilling and pile driving for the bulkhead, the activities are not anticipated to potentially constitute a public nuisance due to the isolation of the work, its location adjacent to a freeway with high volumes of traffic during normal working hours, and the industrial nature of activities on the Southern Impoundment. Drilling and pile driving activities will be limited to normal working hours, to the extent possible, to minimize impacts.

Construction activities that include working in close proximity to heavy equipment and/or drilling operations or using power tools that generate noise levels exceeding the decibel range of 85 dBA, should require the use of hearing protection with a Noise Reduction Rating (NRR) of at least 20. Hearing protection (earplugs/muffs) will be available to work site personnel and visitors requiring entry into these areas. Noise monitoring will be conducted in accordance with each contractor's Health and Safety Plan (Contractor HASP).

2.4 Remedial Design Elements

The following sections provide a summary of the design criteria assumptions that were used as the basis for design for the excavation, bulkhead installation, transportation and disposal, and water treatment process elements of the Southern Impoundment RD. Refer to the 100% Southern Impoundment RD for the comprehensive basis of design.

2.4.1 Excavation of Impacted Soil

The sample results for all borings from the RI, PDI-1, and PDI-2 were evaluated against the soil clean-up level of 240 ng/kg $TEQ_{DF,M}$ DWA. Based on these results, specific 2-foot interval vertical soil horizons were identified for excavation such that, following their removal, the resulting soil would be below the 240 ng/kg $TEQ_{DF,M}$ DWA. A zone of impact was then defined for each polygon, consisting of one or more 2-ft vertical intervals, to be removed during excavation. This results in total excavation volume of approximately 47,500 cy, of which approximately 22,900 cy will be overburden that will be temporarily stockpiled and then used as backfill (because it does not require off-site

ED_014247_00001508-00016

disposal) and an estimated 24,600 cy will be transported off-site for disposal. These excavation limits and volumes will be further refined following the PCFSE (described in Section 2.4.2).

In each polygon, overburden material will be excavated and temporarily stockpiled to access the zone of impact for that particular polygon. Any material that will be transported off-site for disposal will be replaced with a mixture of overburden soils removed from above the zone of impact and imported, clean backfill.

The vertical intervals requiring excavation (along with the horizontal extents) were based on the combined results from the RI, PDI-1, and PDI-2 to generate Thiessen polygons. These polygons are represented by approximate areas of one-half-acre or less, each corresponding to data from one boring, as shown on Figure 4. The polygon areas have been grouped into four distinct areas within the Southern Impoundment and the groups have been given the following designations - Northeast (NE), North Central (NC), South Central (SC), and Southwest (SW).

It is currently anticipated that all excavation activities will occur on the Musgrove property. For the areas requiring excavation near Market Street and the Glendale Boat Works property, the lateral limits of the excavation will extend up to the boundary of Market Street and the Glendale Boat Works property but not beyond, with the excavation being sloped down at 2:1 from either the west edge of the street pavement or the southern boundary of the Glendale Boat Works property.

For the areas requiring excavation in the SW portion of the Southern Impoundment, a bulkhead will be installed along the shoreline adjacent to the San Jacinto River. Upon installation of the bulkhead, the excavation will be completed to the required depth up to the lateral limit of this bulkhead.

To reduce the risk of flooding of any work areas within the Southern Impoundment, excavation activities are planned to occur between the months of November and May, when water levels in the San Jacinto River and rainfall amounts in the area are historically lower resulting in a reduced likelihood of flooding of open excavations.

2.4.2 Pre-Construction Field Sampling

The PCFSE will be initiated following final EPA approval of the PCFSP to provide additional data to refine and update the 100% Southern Impoundment RD. The PCFSE activities will include soil confirmation sampling, waste characterization sampling, and water sampling, as described in the PCFSP presented in Appendix A and summarized below.

2.4.2.1 Confirmation Sampling

Pre-construction borings will be completed before RA excavation activities take place in order to fully delineate the vertical extent of overburden located above the zone of impact and the horizontal and vertical extent of such soils. The polygons in each of the excavation areas described in Section 2.4.1 have been further divided into smaller sampling grids and additional samples will be collected from within each of these sampling grids during the PCFSE.

Data from this investigation will be used to define the vertical and horizontal extents of impacted material (the bottom and sidewall of the excavations) and will provide refined delineation of the volume of overburden available for reuse.

There are three different types of pre-construction confirmation sampling to be performed as part of the PCFSE:

- Overburden soils that are to be placed back in the excavations will be sampled to ensure that dioxin concentrations after replacement of the overburden meet the established 240 ng/kg $TEQ_{DF,M}$ soil clean-up level on a DWA.
- Sidewall samples will be collected to confirm that the lateral extent of material requiring excavation has been defined.
- Bottom of excavation samples will be collected to confirm the vertical extent of impact has been defined (down to the maximum 10-ft bgs).

ED_014247_00001508-00017

2.4.2.2 Waste Characterization Sampling

Several waste characterization samples will be collected, as described in the PCFSP. Several of these samples will be analyzed for the four RCRA hazardous waste characteristics per EPA-required test methodology in 40 CFR Part 261 to supplement existing data. Other samples will be analyzed for the constituents listed in the Texas non-hazardous industrial solid waste regulations (Texas Administrative Code [TAC] 335.505-506) to further define the non-hazardous waste classification (Class 1 or Class 2).

2.4.2.3 Pre-Construction Assessment of Water Volumes

Highly conservative estimates for infiltration rates were used as the basis of design for water storage and treatment for the Southern Impoundment RD and the data from the PCFSE will be used in refining the volume of wastewater to be treated by the wastewater treatment system for the Southern Impoundment RA. To obtain a more accurate assessment of the expected water volumes to be managed during the Southern Impoundment RA, the following will be completed:

- Four temporary piezometers will be installed and sampled, one within each proposed excavation area at the planned deepest point of excavation.
- Field tests will be conducted, including slug (rising or falling head) testing, specific capacity testing, etc. to provide more specific numbers for hydraulic conductivity, transmissivity, and sustainable pumping rates within each excavation area to better understand the expected infiltration rates of both perched water and groundwater that could be encountered during excavation activities.
- Upon completion of all aquifer and analytical testing the temporary piezometers, as well as the three existing monitoring wells on the Southern Impoundment, will be plugged and abandoned.

Results from this sampling event will be incorporated into updated design drawings and technical specifications submitted to the EPA for review and final approval. The EPA-approved updated design drawings, technical specifications, and a detailed cut/fill plan will be provided to the RC. Additionally, the waste characterization results from the PCFSE and previous investigations will be utilized to generate waste profiles with the selected disposal facility(ies) in advance of the RA Construction.

2.4.3 Structural Design of Bulkhead

Excavation activities will be required to extend to the shoreline in a section of the SW excavation area. In this area, a steel sheet-pile bulkhead approximately 210 feet in length will be installed directly adjacent to the San Jacinto River. The sheet-pile bulkhead will allow the excavation to be performed in polygon SJSB065-C1 (which is immediately adjacent to the river) in relatively dry conditions.

As the installation of sheet-piles will be limited to the low-water months of the year (approximately November to May) to minimize the risk of overtopping and/or flooding during sheet-pile installation or excavation activities, flood load was not considered in the design of the sheet-pile wall.

2.4.4 Transportation and Disposal

It is anticipated that the following waste categories may be generated during the Southern Impoundment RA:

- ***Impacted Material*** - Material that is excavated (other than Potentially-Impacted Remediation Debris, described below) and determined to not be suitable for reuse will be solidified, as necessary, and transported to an off-site Disposal Facility.
- ***Potentially Impacted Remediation Debris*** - Excavated Materials could include debris, including miscellaneous wood, concrete, metal, and trash that, because of contact with other materials, may have to be characterized for disposal. This also may include tarps, plastic, wood, discarded treatment filters, discarded personal protective equipment (PPE), and other spent construction materials that may have come into contact with excavated materials.

ED_014247_00001508-00018

- ***Non-Impacted Remediation Debris*** - Non-impacted remediation debris could include any cleared vegetation, demolition debris, and/or other debris encountered at the surface. These materials may be managed as Class 3 non-hazardous waste under the regulations governing classification of non-hazardous industrial solid waste in Texas (30 Texas Administrative Code [TAC] §335.505, 335.506, and 335.508), or can be managed with the excavated materials as Class 2 non-hazardous waste.
- ***Spent Media from WTS*** - The spent carbon and other spent media from the WTS may be transferred to a vendor for recycling or regeneration. If the spent carbon or other spent media cannot be recycled/regenerated for other uses, the material would be characterized and transported off-site for disposal. The media will need to be characterized at the time it is generated but is expected to be a Class 2 non-hazardous waste.
- ***General Trash and Sanitary Sewage*** - General trash and sanitary sewage will need to be handled through service companies that specialize and are licensed for these activities or through some other means adopted by the RC.

The additional waste characterization sampling completed during the PCFSE will be taken into consideration when updating the TODP included in the 100% Southern Impoundment RD. The RC will be required to further refine the plan to include the following elements:

- Define Characterization Procedures to be used to profile waste, based on the RCRA guidance referenced in Section 3.1(f) of the SOW.
- Transportation Truck and Container Requirements.
- Truck Staging and Loading Requirements.
- Control and Mitigation of Tracking Waste Beyond Work Areas.
- Transportation.
- Documentation and Reporting.

2.4.5 Water Management

2.4.5.1 Contact Water

For the Southern Impoundment RA, contact water may be generated by:

1. Porewater which remains after waste material is excavated.
2. Infiltration through the soil matrix (perched surface runoff).
3. Stormwater accumulating in the excavation.
4. Equipment decontamination water.
5. Water within the bulkhead following installation of the sheet pile wall that has come into contact with waste material.

Contact water will be collected, stored, and treated. During the RA, the maximum expected excavation size that will be open at one time is estimated to be three cells with an area of approximately 25 ft by 25 ft each. A maximum daily storage volume was calculated using the following method for each of the three potential sources of water for an excavation area of 3 ft by 25 ft by 25 ft (1,875 ft^2 total):

1. Porewater volume is equal to the average depth of water multiplied by the cell area multiplied by a porosity of 0.4.
2. Rainfall is based on the area of the excavation multiplied by the 100-year storm event of 18 inches.
3. Infiltration volume was calculated based on the estimated infiltration rate for a 24-hour period. For a 10 ft deep excavation, the highest calculated level of water infiltration for a 25 ft wide excavation was approximately 40 gallons per minute (gpm). This was a highly conservative estimate, and that rate of infiltration should decline once the perched zone water is depleted in the surrounding soil. The maximum storage volume for a 24-hour period is estimated to be 260,000 gallons.

ED_014247_00001508-00019

Management of this volume of water will be necessary to maintain excavation activities. The calculations assume that an excavation is open for 24-hours while material is removed and then backfilled. Additional information on infiltration will be collected as part of the PCFSE, described in the PCFSP (Appendix A), and will be used to refine the volumes of water to be managed during RA Construction. If the refined water management volumes are less than previously estimated, alternate treatment methods (i.e., containerize and transport collected water offsite for treatment at a POTW) may be evaluated.

2.4.5.2 Treatment System

Discharge criteria were calculated assuming the receiving stream is the San Jacinto River. Treated and untreated contact water for the Northern Impoundment were compared to estimated discharge criteria as detailed within Table 7 of the 100% Southern Impoundment RD. Dioxins and several metals were present in untreated contact water above estimated discharge criteria (in addition to suspended solids). For the Southern Impoundment, the parameters requiring treatment are assumed to be the same as the Northern Impoundment and include suspended solids, metals, and dioxins and furans. A treatment train with multiple processes will be employed to reduce concentrations of suspended solids, dioxins and furans, and metals in the contact water. Design details including treatment rates and storage volumes will be refined upon receipt of data from the PCFSE.

The WTS (as well as other facilities) in the Southern Impoundment will require electricity for operation. The RC will be responsible for installing the WTS and providing the necessary electrical service.

The operation of the WTS will result in the generation of a number of residuals. The management and disposal of these residuals will be addressed in the RC TODP.

2.4.5.3 Treatment System Monitoring

Routine effluent compliance monitoring requirements associated with the WTS are expected to include pH, total suspended solids (TSS), metals, and dioxins/furans.

During pilot testing, clarifier effluent and filter effluent turbidity were measured to evaluate performance of the system and adjust chemical dosage rates. Real-time turbidity readings will be used as an indicator for operational performance as related to TSS and dioxin/furans. In addition, process monitoring samples will be collected within the treatment process (e.g., influent, post clarifier, post filtration, post lead granular activated carbon [GAC] column) to inform necessary operational adjustments, such as chemical dose refinement and GAC change out.

The operator of the treatment system (the RC) will be required to prepare a detailed treatment system monitoring plan, which will be submitted to the EPA for review.

2.4.6 Design Drawings

The 100% Southern Impoundment RD design drawings include those listed below. Specific drawings will be updated, as necessary, following receipt of validated data from the PCFSE and to reflect additional information relevant to specific design elements. The design drawings are:

- Drawing C-01 - Overall Plan
- Drawing C-02 - Existing Conditions
- Drawing C-03 - Site Works
- Drawing C-04 - Soil Erosion and Sediment Control Plan
- Drawing C-05 - Soil Erosion and Sediment Control Details
- Drawing C-06 - Project Traffic Control Plan
- Drawing C-07 - Northeast Excavation Area Overburden Sampling Plan
- Drawing C-08 - Northeast Excavation Area Sidewall Sampling Plan
- Drawing C-09 - Northeast Excavation Area Bottom of Excavation Sampling Plan

ED_014247_00001508-00020

- Drawing C-10 - Northeast Excavation Area Overburden Excavation Plan
- Drawing C-11 - Northeast Excavation Area Final Excavation Plan
- Drawing C-12 - Northeast Excavation Area Excavation Sections 1 of 2
- Drawing C-13 - Northeast Excavation Area Excavation Sections 2 of 2
- Drawing C-14 - Northeast Excavation Area Restoration Plan
- Drawing C-15 - North Central Excavation Area Overburden Sampling Plan
- Drawing C-16 - North Central Excavation Area Sidewall Sampling Plan
- Drawing C-17 - North Central Excavation Area Bottom of Excavation Sampling Plan
- Drawing C-18 - North Central Excavation Area Overburden Excavation Plan
- Drawing C-19 - North Central Excavation Area Final Excavation Plan
- Drawing C-20 - North Central Excavation Area Excavation Sections 1 of 2
- Drawing C-21 - North Central Excavation Area Excavation Sections 2 of 2
- Drawing C-22 - North Central Excavation Area Restoration Plan
- Drawing C-23 - South Central Excavation Area Overburden Sampling Plan
- Drawing C-24 - South Central Excavation Area Sidewall Sampling Plan
- Drawing C-25 - South Central Excavation Area Bottom of Excavation Sampling Plan
- Drawing C-26 - South Central Excavation Area Overburden Excavation Plan
- Drawing C-27 - South Central Excavation Area Final Excavation Plan
- Drawing C-28 - South Central Excavation Area Excavation Sections 1 of 2
- Drawing C-29 - South Central Excavation Area Excavation Sections 2 of 2
- Drawing C-30 - South Central Excavation Area Restoration Plan
- Drawing C-31 - Southwest Excavation Area Overburden Sampling Plan
- Drawing C-32 - Southwest Excavation Area Sidewall Sampling Plan
- Drawing C-33 - Southwest Excavation Area Bottom of Excavation Sampling Plan
- Drawing C-34 - Southwest Excavation Area Overburden Excavation Plan
- Drawing C-35 - Southwest Excavation Area Final Excavation Plan
- Drawing C-36 - Southwest Excavation Area Sheet Pile Wall Excavation Plan
- Drawing C-37 - Southwest Excavation Area Excavation Sections 1 of 2
- Drawing C-38 - Southwest Excavation Area Excavation Sections 2 of 2
- Drawing C-39 - Southwest Excavation Area Restoration Plan
- Drawing C-40 - Sheet Pile Plan and Profile
- Drawing C-41 - Sheet Pile Sections and Details
- Drawing C-42 - Typical Details 1 of 3
- Drawing C-43 - Typical Details 2 of 3
- Drawing C-44 - Typical Details 3 of 3
- Drawing P-01 - Water Treatment System Process Flow Diagram/Mass Balance
- Drawing P-02 - Water Treatment System P&ID (1 of 2)
- Drawing P-03 - Water Treatment System P&ID (2 of 2)
- Drawing P-04 - Water Treatment System Site Plan

ED_014247_00001508-00021

2.4.7 Technical Specifications

To supplement the 100% Southern Impoundment RD design drawings, the technical specifications listed below were developed. Individual technical specifications will be updated, as necessary, following receipt of validated data from the PCFSE and to reflect additional information relevant to specific design elements. The technical specifications are:

- Section 01 10 00 - Summary
- Section 01 30 00 - Administrative Requirements
- Section 01 33 00 - Submittal Procedures
- Section 01 35 00 - Temporary Traffic Controls
- Section 01 35 29 - Health and Safety
- Section 01 40 00 - Quality Requirements
- Section 01 50 00 - Temporary Facilities and Controls
- Section 01 57 13 - Temporary Soil Erosion and Sediment Control
- Section 01 57 19 - Temporary Environmental Controls
- Section 01 60 00 - Product Requirements
- Section 01 70 00 - Execution and Closeout Requirements
- Section 01 91 00 - Water Treatment Consumables
- Section 01 91 20 - Facility Testing and Commissioning
- Section 02 61 14 - Material Handling and Transportation
- Section 02 61 16 - Off-Site Transportation and Disposal
- Section 22 05 03 - Pipe Data Sheet - PVDF Tubing and Carrier Piping
- Section 23 05 53 - Identification for Piping and Equipment
- Section 31 10 10 - Site Clearing
- Section 31 23 16 - Excavation
- Section 31 23 19 - Dewatering
- Section 31 23 23 - Fill
- Section 31 41 16 - Sheet Piles
- Section 32 31 13 - Chain Link Fences and Gates
- Section 32 92 19 - Seeding
- Section 35 49 25 - Turbidity Curtain
- Section 40 05 13 - Common Work Results for Process Piping
- Section 40 05 51 - Common Requirements for Process Valves
- Section 40 70 00 - Instrumentation for Process Systems
- Section 46 07 01 - Water Treatment System

3. Remedial Action Preparations

Concurrent with the PCFSE, updating of the design drawings and technical specifications and selection of a RC, the following steps will be taken to facilitate the start and execution of the RA Construction.

ED_014247_00001508-00022

3.1 Landowner Coordination and Notifications

Efforts will continue to obtain property access rights required in connection with implementing the Southern Impoundment RA. For RA Construction, access agreements will be needed with respect to the Musgrove property, the adjoining Kirby property, and the parcel on which Market Street, the private road that borders the east side of the Southern Impoundment, is located. If appropriate, the EPA may assist with landowner coordination.

Logistical coordination with all property owners and businesses regarding the use of Market Street will be necessary. Sequencing of the excavation work and other scheduling steps will be taken to minimize adverse impacts on adjacent businesses to the greatest extent practicable. To the extent required, notifications will be provided to the EPA, TCEQ, and landowners prior to commencing PCFSE and RA Construction activities.

3.1.1 Institutional Controls (IC)

IPC proposes to update the ICIAP that is part of the 100% Southern Impoundment RD following the completion of the PCFSE. Discussions would continue with the appropriate landowners regarding the proposed form of applicable ICs. An environmental restrictive covenant (ERC) is proposed with respect to the Musgrove Property and the Market Street Property and will be proposed for additional properties, pending results from the PCFSE event.

3.2 Design Drawings and Technical Specifications Updates

Following receipt of validated data from the PCFSE, the design drawings (including civil and piping and instrumentation diagrams [P&ID]) and technical specifications outlined in Sections 2.4.6 and 2.4.7, respectively, will be updated to refine the extents of the excavation, volume of material for reuse, water storage and treatment assumptions, and waste management. Additionally, a summary of the PCFSE results will be included.

3.3 Contractor Selection

Following the receipt of the PCFSE data and updating of design drawings and specifications, the RC will be selected. It is anticipated that the initial steps in the procurement process will utilize the 100% Southern Impoundment RD, with updated design drawings and technical specifications which will be provided to prospective RCs to refine their bids. It is anticipated that the procurement process prior to notification to EPA of the selection of an RC may include the following:

- Contractor Pre-Qualification.
- Preparation of request for proposal (RFP).
- Bid Walk.
- Respond to requests for information (RFI) by prospective RCs.
- Review of contractor proposals.
- Interviews, as needed.

4. Remedial Action Construction

RA Construction will be completed in accordance with the 100% Southern Impoundment RD, as updated following receipt of validated data from the PCFSE, and as required by the SOW. The specific activities to be performed by the RC during RA Construction, as described below, may change based on the results of the PCFSE and input from the RC.

ED_014247_00001508-00023

4.1 Fieldwork Preparation Activities

This section describes the fieldwork preparation activities that the RC will complete prior to the initiation of construction activities.

4.1.1 Pre-Construction Meeting

In accordance with Section 6.2 of the SOW, at least 14 days prior to commencing the RA Construction fieldwork, a Pre-Construction meeting will be held.

4.1.2 Health and Safety

Each contractor will be responsible for development of a site-specific Contractor HASP to protect the safety of its employees following procedures consistent with Occupational Safety and Health Administration (OSHA) 1910.120 (Hazardous Waste Operations and Emergency Response) and OSHA 1926 (Safety & Health Standards for Construction.). Each Contractor HASP will be required to be in full compliance with IPC's Contractor Safety Management policies and requirements. At the beginning of each day during field activities, a brief joint meeting will be held. During this meeting, the field team will describe the activities to be implemented that day, identify the safety hazards, remind employees of important safety procedures, and comment on safety issues identified during previous work activity.

4.1.3 Utility Clearance

All existing utilities will be protected, relocated, or removed (if abandoned) as necessary to complete excavation and other construction work safely. Further evaluation of how to address specific utilities will be conducted as the project nears implementation. The RC will be responsible for obtaining the necessary utility clearances prior to commencing excavation work. This includes contacting the Texas "One-Call 811" service for a public utility locate, as well as retaining the services of a private utility locator to mark private on-site utilities.

4.1.4 Permitting and Compliance

The RC will be required to ensure that RA Construction activities are completed in compliance with ARARs discussed in Sections 2.2 and 2.3.

4.1.5 Imported Backfill Sampling

It is anticipated that during RA Construction, approximately 25,000 cubic yards of imported fill from an off-site source will be combined with excavated overburden soils to backfill excavations, as described in the 100% Southern Impoundment RD. This volume may be updated based on the PCFSE. Prior to importing backfill to the Southern Impoundment, the material to be used as imported fill will be required to be representatively sampled by the RC to confirm that it does not contain unacceptable concentrations of constituents of potential concern (COPCs).

4.2 Site Preparation

The RC will prepare the work site in accordance with Drawing C-03 and the applicable technical specifications which provides the proposed layout and requirements of the work site. The RC will make the final determination on the exact placement and work site layout to complete the RA Construction.

4.2.1 Survey

Prior to commencing RA Construction activities, a complete topographic survey of each excavation area will be conducted to establish a pre-excavation topographic surface. The recorded topographic information (coordinates and

ED_014247_00001508-00024

elevations) will be used by the design engineer to create final electronic files to be used by the RC's grade-controlled excavation equipment. Prior to commencing excavation activities, the design limits of each excavation area will be identified in the field by the RC's surveyor. As each excavation is completed, surveying will be performed to verify the extent of excavation (both vertical and horizontal) and to clearly mark the boundaries of the excavation for the subsequent area.

4.2.2 BMPs and SWPPP

Prior to initiating any work related to excavation activities in the Southern Impoundment, environmental controls (e.g., silt fencing, surface water diversions, and air monitoring) will be implemented by the RC. These environmental controls, or BMPs, may include silt fence or construction fencing around all excavations to properly delineate the active work areas and to minimize the potential for soil erosion of the areas directly adjacent to the excavations. These controls also may also include surface water diversions (e.g., soil berms and/or other type of structures) constructed along the edge of excavations to minimize entry of surface water into the excavations. For excavations near Market Street, straw bale or rock check dams may be required to prevent erosion within the roadside ditch itself. A detailed plan for such BMPs will be included as part of the construction SWPPP, to be developed by the RC for the Southern Impoundment RA.

Stormwater control will be an essential part of the excavation program, both with regards to run-on and runoff during rain events. The RC will be required to manage stormwater run-off to the extent possible diverted from open excavations in order to reduce the volume of water requiring treatment and to prevent sloughing of the excavation faces. Also, during large rain events that might overwhelm open excavations, the RC will be required to take steps (which may include pumping, as necessary) to ensure that accumulated stormwater does not overflow from the excavation. Detailed plans for soil erosion and sediment controls can be found on design Drawings C-04 and C-05 of the 100% Southern Impoundment RD.

In order to reduce the volume of stormwater that would require management, the RC will be required to limit the area of open excavation to minimize contact water volumes in excavations.

4.2.3 Fencing

Prior to RA Construction activities, existing fencing will be removed and replaced upon completion of the RA. A temporary construction fence will be installed along Market Street.

4.2.4 General Site Layout

4.2.4.1 Excavation

Soil loadout and stockpile areas will be constructed by the RC prior to the initiation of excavation activities. These areas are necessary to effectively hold excavated soils for temporary staging before being loaded for off-site disposal. All loadout and stockpile areas will be designed with containment features to prevent migration of excavated materials prior to loadout. The exact location and number of the loadout areas will be determined by the RC. Prior to excavation of an area, the RC will install temporary equipment decontamination pads near the area.

4.2.4.2 Water Treatment

Drawing C-03 stages the WTS on an area approximately 200 ft by 100 ft located southwest of the SC excavation, in close proximity to the San Jacinto River. The WTS will be located within an impermeable berm surrounded containment area so that in the event of a release or overflow from the system, contact water will be contained, captured, and treated. The WTS associated with remediation of the Southern Impoundment will operate intermittently based on the need to treat contact water.

ED_014247_00001508-00025

4.2.4.3 Support Features

Temporary facilities including, but not limited to, office trailers, restrooms and hand wash stations, and storage containers, will be staged on-site through the duration of RA Construction at a location determined by the RC. Any vessels containing hydrocarbon materials will be placed within secondary containment.

The WTS, as well as other facilities will require electricity for operation. The RC will be responsible for providing power to the work site for the WTS and other activities.

4.2.5 Building Demolition

On the south end of the Musgrove property, in the vicinity of the southwest excavation area, an existing building (elevated frame structure) and a concrete slab are present that will need to be demolished and removed prior to excavation work in those locations. It is not currently anticipated that the elevated structure will need to be replaced after the Southern Impoundment RA is completed.

4.3 Air Monitoring

The RC will prepare and implement an Air Monitoring Plan, or equivalent, which will provide air monitoring procedures for particulate matter and action levels when air quality data approaches or exceeds the criteria established by that plan. If criteria levels are exceeded, work would then only continue after steps required by the Air Monitoring Plan have been implemented.

4.3.1 Control of Dust and Emissions

The RC will be required to use methods that minimize raising dust from construction operations. If required, the RC will use potable water for potential misting operations to provide positive means to prevent airborne dust from dispersing into the atmosphere.

Real-time air monitoring for dust and particulates may be performed using dust monitors placed at the perimeter of the work site, typically upwind and downwind of Southern Impoundment RA activities, and programmed to monitor particulate concentrations. All instruments would be calibrated and operated in accordance with the manufacturer's specifications or applicable test/method specifications.

Data from the dust monitors may be collected throughout Southern Impoundment RA ground disturbance activities. If concentrations of dust and PM_{10} exceed the standards included in the Air Monitoring Plan (suggested to be a 24-hour time averaged standard of 0.15 milligram/cubic meter [mg/m^3] standard set forth by the National Ambient Air Quality Standards (NAAQS) for PM_{10}), RC personnel will be required to implement dust suppression measures. The RC will be expected to establish action levels based on real-time monitoring to prevent the exceedance of the 24-hour standard.

The RC will be required to implement dust and particulate suppression and mitigation measures on-site to minimize airborne dust produced from construction activities. Dust suppression measures may include, but would not be limited to:

- Reduction of on-site traffic.
- Reduction in speed of on-site traffic.
- Watering or misting of on-site roads, stockpiles, and/or active excavation areas.
- Use of appropriate truck covers.
- Applying or maintaining aggregate, or similar, for on-site roads.

ED_014247_00001508-00026

4.3.2 Odors

There is the potential that Southern Impoundment RA excavation activities may result in odors. Odors are most likely to occur during excavation activities when previously buried material and soils are unearthed and exposed to air. The main concern with respect to odors is the potential impact on adjacent businesses, the neighboring community, and Southern Impoundment RA workers.

If odors are present, the RC will be required to implement on-site measures to counter, suppress, or mask the associated nuisance, as outlined in the RC's Air Monitoring Plan. These measures may include, but are not limited to the following:

- Deployment of odor suppressing foams.
- Perimeter misting systems.
- Perimeter masking desiccants.
- Watering or misting excavations and/or stockpiles.
- Minimization of the number and/or size of stockpiles.
- Minimization of the size and time excavations remain open.

4.4 Water Management

The RC will be required to manage contact water as detailed in Section 2.4.5.1 during the RA Construction and construct the WTS in accordance with the updated design drawings and technical specifications following the PCFSE. The information detailed below is based on the 100% Southern Impoundment RD Design Specifications and specific details maybe subject to change.

Contact water will be directed from the excavation to the contact water holding tanks using transfer pump(s) and provide temporary piping/hose to direct contact water within the work area to the contact water holding tanks and WTS at a rate to be determined by the RC to prevent delay of work.

During the time an excavation is open, it will need to be maintained by the RC to be free of water as much as possible. Measures that may be adopted include requiring that the immediate area surrounding any excavation be graded to drain surface water away from the excavation or that other controls, such as berm construction be used to prevent water from entering the excavation. Those measures may also include requiring that any surface water in areas adjacent to an excavation be directed to existing surface drainage systems together with requirements that existing surface drainage systems be kept open and operational.

In addition to surface water control outside the excavation limits, the RC will provide, operate, and maintain necessary dewatering equipment appropriately sized to maintain an excavation to be free of water, as much as possible, both precipitation landing within the excavation area and inflowing perched water, if present. All water removed from any open excavation is to be contained, collected, and then transferred to staged water storage tanks for eventual treatment and discharge.

The RC will also be responsible for managing any stormwater that may come in contact with temporarily staged and stockpiled excavated material. The dewatering pads and decontamination pads will be maintained by the RC to contain, collect, and transfer contact water to the water storage tanks for treatment. Stormwater that has not been in contact with impacted material would be discharged in accordance with the SWPPP.

Treated effluent samples from the WTS will be collected from the effluent line of the service water storage tank, prior to discharge to the San Jacinto River. In accordance with 30 TAC Part 1 Chapter 319 Subchapter A Rule 319.5, Section A, (30 TAC 319.5 (a)), samples and measurements of the effluent will be taken at a location following the last treatment unit. Monitoring frequencies and sample types from 30 TAC 319.9 (c) Table 4.1 (for treatment units with effluent flow from 0.50 to less than 2.00 million gallons per day [MGD]) are identified below:

ED_014247_00001508-00027

Table 4.1 Monitoring Frequencies and Sample Type

Parameter	Minimum Frequency of Measurement[3,4]	Standard Analytical TAT[5] (business days)	Sample Type
Flow	1 per operating shift	---	Instantaneous
pH	1 per day	---	Grab
TSS	2 per week	10 days	Composite
Metals[1]	1 per week	10 days	Composite
Dioxin/Furans[2]	1 per week	15 days	Composite

Notes:

[1] The most conservative frequency for metals included in 30 TAC 319.9 (c) Table 4.1 (Copper, Lead, Nickel, Silver, Zinc) is twice per week, but based on characterization, dissolved metals in the untreated contact water were significantly less than discharge criteria. Therefore, the collection of weekly samples is proposed.

[2] Dioxin/Furans are not specified in 30 TAC 319.9 (c) Table 4.1.

[3] Samples will be collected only while discharging.

[4] Flow rate and pH data will be collected on-site using real-time in-line monitors.

[5]TAT = Turnaround Time.

Turbidity will be monitored through online instrumentation to evaluate treatment system performance and adjust operations as needed. Operational parameter monitoring that may require a response may be incorporated into a future treatment system monitoring plan.

If analyses at the point of discharge indicate that effluent has not met discharge criteria as defined in Table 7 of the 100% Southern Impoundment RD for a regulated parameter, the EPA will be notified immediately and the system will then be shut down and/or effluent may be recirculated to the contact water storage tank(s), and additional performance checks may be conducted on the treatment system, including but not limited to, checks and appropriate modifications with respect to chemical dose, checking to determine whether GAC and/or filter media and bag filters should be replaced, etc. Contingency measures may also include, but are not limited to, increased monitoring and notifications.

4.5 Bulkhead Wall Installation

Prior to excavation in the southwest corner of the Southern Impoundment, the RC will install a bulkhead along approximately 210 linear feet to enable excavation of impacted material up to the shoreline in accordance with the 100% Southern Impoundment RD design drawings and specifications, as updated following the PCFSE. The sheet pile bulkhead has been designed as a rigid cantilever wall in accordance with USACE Engineer Manual (EM) 1110 2 2504. Stability analysis indicates that the required depth of embedment of the sheet-pile wall will be to a pile tip elevation of -40 ft NAVD88.

A turbidity curtain will be deployed prior to installation of the bulkhead and removed after installation is complete. The turbidity curtain will be routinely inspected to ensure proper placement, maintenance, and confirmation it is being maintained in good working order.

4.6 Excavation

Based on the results of the RI, PDI-1, and PDI-2, specific 2-foot interval vertical horizons were identified for excavation within each polygon such that, following their removal, the resulting soil DWA concentration for that polygon would be less than 240 ng/kg $TEQ_{DF,M}$. This results in an estimated total excavation volume of approximately 47,500 cy distributed in the four excavation areas as shown below. The final excavation limits will be defined and these volumes will be further refined following the PCFSE.

ED_014247_00001508-00028

Table 4.2 Proposed RA Excavation Volumes

Excavation Area	Impacted Material (approximate cubic yards)	Overburden (approximate cubic yards)
Northeast	2,074	3,971
North Central	3,089	12,171
South Central	6,324	4,778
Southwest	10,645	4,423

It is anticipated that the required excavation activities to implement the Southern Impoundment RA will be performed from the ground surface using standard track-mounted and extended-reach excavators. The technical specifications require that the bucket of the excavator be outfitted with GPS indication equipment (i.e., Topcon 3DXi). This will allow for the collection of survey data (elevation and location) accurate to within approximately ±1/10 of an inch, without the necessity for personnel entry into the excavation to collect this data. In addition, the RC will be required to engage a licensed land surveyor to perform data collection from the ground surface outside the limits of the excavation by electronic means for as-constructed documentation of the excavation activities (i.e., vertical and horizontal limits).

As part of the excavation process, sloping will be used and the design drawings will be updated after the PCFSE is completed to establish the required slope based on the final excavation limits. The design drawings assume a 2:1 side slope for the excavations in order to define the outer limits of each excavation area and ensure that the toe of slope is inclusive of the previously defined polygon boundaries. This same 2:1 sloping will be used within each polygon when making adjustments for excavation depths between polygons. Excavation of each polygon is anticipated to be conducted by removing the overburden soils located above the zone of impact in one complete lift within each sampling grid. This approach is required in order to keep track of removed material located above the identified zones of impact, such that these temporarily staged overburden soils can be placed back into the excavation from which they came. This approach will be used so that the resulting DWA within each sampling grid meets the 240 ng/kg $TEQ_{DF,M}$ clean-up level. The vertical interval of material removed will vary between polygons, and therefore the limits of excavation and the required sloping between polygons will be refined after completion of the PCFSE.

Based on treatability studies, the majority of the excavation materials to be disposed of off-site are not expected to require solidification prior to loading into trucks for transport to an approved off-site waste disposal facility. However, in the deeper excavation areas, there is potential for seepage into the excavation (likely starting at 6 to 8 feet below ground surface [ft bgs]) and for stormwater accumulation in the excavation. As an initial step, wet soils will be staged on-site to allow water to decant to a lined sump in a containment area and be treated through the WTS. If stockpiled materials do not pass the paint filter test for landfill acceptance, other methods may be utilized to facilitate drying of such soils, such as solidification by the addition of amendments, in coordination with the disposal facility (e.g., fly ash, lime, or absorbent polymer). Paint filter testing will be performed on-site at the discretion of the RC, in coordination with the selected waste disposal facility. The RC may elect to use solidification agents, depending on the soil conditions and progress of excavation.

4.7 Off-Site Transportation

Based on previous waste characterization sampling and to be confirmed during the PCFSE, the Southern Impoundment waste/soils are not expected to be classified as hazardous waste (because they are not listed hazardous waste, do not contain listed hazardous waste above RCRA thresholds, and are not classified as characteristic hazardous waste).

The TODP included as part of the 100% Southern Impoundment RD will be updated following receipt of validated data from the PCFSE. The RC will have the option of further updating that TODP, but it is assumed that the RC will elect to develop its own off-site transportation plan (RC TODP). The RC TODP will define characterization procedures to be used to ensure excavated material is in accordance with the pre-established waste profiles in accordance with RCRA Hazardous Waste Management and the Texas Industrial Solid Waste and Municipal Hazardous Waste regulations. It will also provide for samples to be collected and analyzed for waste characterization at a frequency specified by the selected off-site disposal facility(ies).

ED_014247_00001508-00029

Any other type of waste material that may be encountered during excavation activities will be segregated from the excavated material, characterized, profiled separately, and managed and disposed of in accordance with RCRA regulations.

Trucks, such as 20-ton end-dump trucks or roll-off containers that will be loaded onto trucks, are expected to be used to transport materials off-site for disposal. The RC TODP will be required to include requirements for inspection of trucks and containers used for this purpose. The truck beds and containers will be required to have a liner. It will also be required to contain procedures to address any free liquids observed after loading, such as the addition of solidification agents. Tarps or other coverings will be required to be placed over the loads and secured prior to trucks leaving the Southern Impoundment.

Procedures will be established in the RC TODP to prevent any tracking of waste or mud beyond the limits of the Southern Impoundment. This may include an inspection/cleaning station at a location where all trucks are required to pass before leaving the loading area, at which trucks will be inspected and if necessary, cleaned. Cleaning techniques may include dry or wet decontamination methods. Prior to implementation of the Southern Impoundment RA, the RC will develop detailed specifications for vehicle decontamination.

4.8 Backfill

For each excavation, once material from the zone of impact has been removed, the excavation will require backfilling to the original ground surface elevations. Stockpiled overburden soils removed from an excavation will generally be returned to the same excavation as part of the process of achieving a DWA concentrations below 240 ng/kg $TEQ_{DF,M}$ (after removal of the materials from the zone of impact). The removed overburden will be placed within the base of the excavations in approximately 12-inch lifts and compacted, with the compaction equipment being used multiple times for each lift (i.e., minimum of two passes of a compaction roller wheel, vibratory plate tamper, or dozer). Upon completion of overburden placement and compaction within each sampling grid/polygon, imported clean common fill and topsoil will be placed to bring the area back up to the previously existing grade.

Imported fill will be periodically monitored by the RC through visual inspections to confirm that no changes in composition have occurred. If the material appears to have altered or changed in physical composition via visual inspection, additional characterization samples may be required.

Upon completion of backfilling, a professional land surveyor will be used to document the final ground surface elevations, with the intent to match the pre-existing ground surface elevations, to the extent possible. The drainage ditch along the east side of the Southern Impoundment (west side of Market Street) will be reconstructed, as needed once the backfilling is completed. Measures will be taken during excavation in this area to manage stormwater from the work site from entering the area of the drainage ditch.

4.9 Restoration and Demobilization

Upon completion of excavation and backfilling, the ground surface of the excavation areas will be restored to its pre-construction condition. Depending on the location of the excavation and current surface characteristics, restoration efforts may include replacement of any existing granular surfaces, such as gravel, placement of six inches of vegetated topsoil, or other measures.

All topsoil material will be imported from an approved source and required to meet specified standards, including that it be a friable loam material (neither of heavy clay nor of very light sandy nature), be capable of supporting growth of grass or other specified vegetative cover, be free of roots, rocks, or lumps larger than a specified size, and noxious weeds, meet minimum and maximum percentages of organic matter, and have a pH in a specified range. Imported topsoil will also be analyzed for the same COPCs as the imported common fill.

All surplus material, temporary facilities, equipment, and controls will be removed from the work site. Subject to the consent of the property owner, it is anticipated the bulkhead will be left in place after completion of the excavation.

ED_014247_00001508-00030

4.10 Remedial Action Completion

4.10.1 Remedial Action Completion Inspections

Pursuant to the SOW Section 6.2, a Pre-Final Inspection will be scheduled within 14 days after completion of construction and a Pre-Final Inspection Report will be submitted to the EPA within 30 days after completion of the Pre-Final Inspection or as requested by the EPA.

In accordance with the SOW Section 3.5 Paragraph a, a RA Completion Inspection will be scheduled within 14 days after submission of the Pre-Final Inspection Report. Attendees will include IPC and EPA and/or their representatives.

4.10.2 Remedial Action Completion Report

Following the RA Completion Inspection, documentation of removal activities will be prepared and submitted to the EPA pursuant to the SOW Section 3.5 Paragraph B. This Remedial Action Completion Report will be prepared in accordance with Chapter 2 (Remedial Action Completion) of EPA's *Close Out Procedures for NPL Sites* guide (May 2011), as supplemented by *Guidance for Management of Superfund Remedies in Post Construction* (February 2017) and will include:

- Certifications by a registered professional engineer and by Respondent's Project Coordinator that the RA is complete.
- As-built drawings signed and stamped by a registered professional engineer.
- Monitoring data to demonstrate that Performance Standards for the excavation and removal response actions have been achieved.
- Final recorded institutional controls.
- Certifications in accordance with the SOW Paragraph 5.5.

5. Supporting Deliverables

Pursuant to the SOW, certain of the supporting deliverables included as part of the 100% Southern Impoundment RD (the HASP, ERP, and PCFSP) have been updated as part of this RAWP. The HASP, ERP, and other plans will be updated as summarized below and in Table 6.2. Most of these plans assume that once the RC approved by the EPA, the RC will be required to update the existing plan or prepare its own plan to detail the means and measures to be implemented to accomplish the objectives of such plans.

5.1 Health and Safety Plan

An updated HASP has been prepared for purposes of the PCFSE (Appendix B). Task-specific Job Safety Analyses (JSAs) for the PCFSE and the HASP will be present on-site at all times during PCFSE fieldwork activities, and they will be updated, as needed.

Each contractor performing work during the PCFSE will be responsible for development of its own site-specific Contractor HASP to protect the safety of its employees following procedures consistent with the site safety requirements.

Following notice to the EPA of the selected RC, the RC will be required to develop a separate site-specific HASP and each subcontractor will be required to develop a Contractor HASP.

ED_014247_00001508-00031

5.2 Emergency Response Plan

An updated ERP has been prepared for purposes of the PCFSE (Appendix C). The ERP complies with the EPA *Remedial Design/Remedial Action Handbook* and OSHA standard for Hazardous Waste Operations and Emergency Response; Final Rule 29 CFR §1910.120(1)(2) to plan for potential emergencies prior to the commencement of hazardous waste operations. Following notice to the EPA of the selected RC, the RC will be required to update the existing plan or develop its own ERP.

5.3 Pre-Construction Field Sampling Plan

An updated PCFSP has been prepared for purposes of the PCFSE (Appendix A). The PCFSP details the sample locations and describe the protocol for sample handling and analysis for the PCFSE.

5.4 Field Sampling Plan

As part of the 100% Southern Impoundment RD. a FSP was developed to outline procedures for collecting samples of treated water from the WTS, the imported backfill, and IDW generated during the RA Construction. The FSP will be updated following receipt of validated data from the PCFSE. Following notice to the EPA of the selected RC, the RC will either further update the FSP or develop its own plan to address the components outlined in the updated FSP.

5.5 Quality Assurance Project Plan

The QAPP included as part of the 100% Southern Impoundment RD provides an explanation of the quality assurance and quality control procedures and chain-of-custody procedures for all sampling completed at the work site. The QAPP addresses quality assurance during data generation and acquisition and during data validation and review. It will be used for purposes of the PCFSE. Changes to the QAPP as a result of the data collected during the PCFSE are not anticipated. Following notice to the EPA of the selected RC, the RC will be required to either adhere to the existing QAPP or to develop a separate plan that include the relevant components.

5.6 Site Wide Monitoring Plan

The SWMP describes the procedures to obtain information on the contamination levels at the work site throughout the remedial process and to demonstrate whether performance standards for the Southern Impoundment are achieved. The SWMP will be updated following receipt of all validated data from the PCFSE. Following notice to the EPA of the selected RC, the RC will either further update the SWMP or develop its own plan to address the components outlined in the SWMP.

5.7 Construction Quality Assurance/Quality Control Plan

The CQA/QCP describes the planned and systemic activities to verify that clean-up goals have been achieved. No changes to the CQA/QCP are expected to be required following the PCFSE. Following notice to the EPA of the selected RC, the RC will either update the CQA/QCP (including identifying the project team for RA Construction) or develop its own plan to address the components outlined in the CQA/QCP.

5.8 Transportation and Off-Site Disposal Plan

The TODP included in the 100% Southern Impoundment RD will be updated following receipt of validated waste characterization samples collected during the PCFSE. Following notice to the EPA of the selected RC, the RC would have the option of further updating that plan, but as noted above, it is assumed that the RC will develop its own RC TODP.

ED_014247_00001508-00032

5.9 Operation and Maintenance Plan

An Operation and Maintenance Plan was not required as part of the 100% Southern Impoundment RD.

5.10 Institutional Controls Implementation and Assurance Plan

The ICIAP included in the 100% Southern Impoundment RD described ICs applicable to the Southern Impoundment. The ICIAP will be updated within 30 days of receipt of validated PCFSE data to reflect which properties are affected by the extent of excavation and then or subsequently, may be updated to address procedures to implement, maintain, and enforce ICs.

6. Project Schedule

6.1 Pre-Construction Field Sampling Event Schedule

The PCFSE Schedule is included in the PCFSP (Appendix A). The PCFSE will be initiated within 30 days following final EPA approval of the PCFSP, barring delays for reasons identified in the PCFSE Schedule.

6.2 Projected RA Construction Schedule

The projected RA Construction Schedule is presented below in Table 6.1 in accordance with the SOW Section 3, Subsection 3.1(a). It incorporates deadlines from the separate PCFSE Schedule. The projected RA Construction Schedule is presented in Microsoft Project format in Appendix D.

Table 6.1 Projected RA Construction Schedule

Task	Description of Deliverable / Task	SOW Ref.	Deadline
1	Submit RAWP including PCFSP to EPA	3.1	30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order.
2	Pre-Construction Sampling Conference	3.2 (a)	14 days after final EPA approval of PCFSP.
3	Start of Pre-Construction Sampling		30 days after final EPA approval of PCFSP.
4	Submit updated Design Drawings and Specifications to EPA		60 days after receipt of all validated data from PCFSE.
5	RA Project Bidding and selection of RC, Notice to EPA of selected RC		90 days after final EPA approval of updated Design Drawings and Specifications.
6	RA Pre-Construction Conference	3.2 (a)	14 days prior to Start of RA Construction.
7	Start of RA Construction		60 days after notice to EPA of selected RC.
8	RA Construction		RA Construction schedule to be provided by RC within 30 days following RC selection notice to EPA.
9	Pre-Final Inspection	3.5 (a)	14 days after completion of RA Construction.
10	Pre-Final Inspection Report		30 days after completion of pre-final Inspection or as requested by EPA.
11	Final Inspection	3.5 (a)	14 days after submission of Pre-Final Inspection Report.
12	RA Report	3.5 (b)	90 days after Final Inspection.
13	Periodic Review Support Plan	3.6	5 years after Start of RA Construction.

The dates contained in the above schedule for commencing field work assume no delays due to circumstances, such as obtaining required access, weather conditions, or contractor availability and the ability to procure materials and equipment (due to supply chain challenges or the COVID-19 pandemic).

ED_014247_00001508-00033

Also included in Appendix D, in Microsoft Project format and as requested by EPA, is a Microsoft Project document that contain projected dates related to RA Construction. This document, which is not the RA Construction Schedule, incorporates deadlines from the projected RA Construction Schedule in Table 6.1, and also identifies and assigns estimated duration to certain other events. All of the dates in this document, other than the date for submission of the RAWP, are conditional. In that regard:

- The dates in the document for commencing field work assume no delays based on the circumstances noted above. Any delay in commencing field work, particularly with respect to the PCFSE, would directly impact and change other projected dates.
- The PCFSE has been estimated to require 50 days to complete. The actual time necessary to complete the PCFSE once it commences could be longer than 50 days depending on the number of step-out borings required to define the extent of excavation areas or if delays are encountered related to circumstances, such as access, weather, and the availability of contractors or equipment. If the PCFSE takes longer than 50 days to complete, it will have a direct impact on subsequent dates (Including the date under the RA Construction Schedule in Table 6.1 to submit updated plans and specifications following receipt of validated data from the PCFSE).
- Estimates as to time periods for EPA review and approval of deliverables are included. The actual time periods may be shorter or longer, which will directly impact and change subsequent dates.
- The projected dates in this document are also based on PCFSE and RA Construction commencing and occurring only between November to April, as provided in the approved 100% Southern Impoundment RD.

6.3 Supporting Deliverables Update Schedule

The proposed schedule to provide updated supporting deliverables is presented below in Table 6.2 in accordance with the SOW Section 3, Subsection 3.1(f).

Table 6.2 Supporting Deliverables Update Schedule

Task	Description of Deliverable / Task	Deadline
1	Health and Safety Plan	First update being submitted as part of this RAWP for the PCFSE. Second update for RA Construction to be submitted following notice to the EPA of the selected RC. The RC and any subcontractors will be required to complete a HASP.
2	Emergency Response Plan	First update being submitted as part of this RAWP for the PCFSE. Second update for RA Construction to be submitted following notice to the EPA of the selected RC. The RC will be required to update the ERP included in Appendix C or develop its own plan.
3	Pre-Construction Field Sampling Plan	Being submitted as part of this RAWP.
4	Field Sampling Plan (wastewater treatment, imported backfill, and IDW)	Will be updated within 90 days after receipt of all validated data from the PCFSE. Following notice to the EPA of the selected RC, the RC will be required to further update the FSP or develop its own plan.
5	Quality Assurance Project Plan	QAPP from the 100% Southern Impoundment RD will be utilized in implementing the PCFSE. Following notice to the EPA of the selected RC, the RC will have to adhere to the existing QAPP or develop its own plan.
6	Site Wide Monitoring Plan	Will be updated within 90 days after receipt of all validated data from PCFSE. Following notice to the EPA of the selected RC, the RC will be required to further update the SWMP or develop its own plan.
7	Construction Quality Assurance/Quality Control Plan	Following notice to the EPA of the selected RC, the RC will be required to adopt or update the CQA/QCP.

ED_014247_00001508-00034

Task	Description of Deliverable / Task	Deadline
8	Transportation and Off-Site Disposal Plan	Will be updated within 90 days after receipt of all validated data from PCFSE. Following notice to the EPA of the selected RC, the RC will be required to further update the TODP or develop its own plan.
9	O&M Plan	Not required.
10	Institutional Controls Implementation and Assurance Plan	Will be updated 30 days after receipt of validated data from the PCFSE. It is expected that the ICIAP will require additional updating at or before the conclusion of the RA Construction.

7. References

EPA, 2017. Record of Decision, San Jacinto River Waste Pits. Harris County, Texas. EPA ID: TXN000606611. U.S. Environmental Protection Agency, Region 6. Dallas, Texas. October 2017.

EPA. 2018a. Letter to C. Patmont, Anchor QEA, regarding approval of First Phase Pre-Design Investigation Work Plan, dated September 12, 2018. U.S. Environmental Protection Agency.

EPA, 2018b. Letter to Charles W. Munce, GHD Services Inc., regarding approval of Submission Date for Draft Second Phase Pre-Design Investigation Work Plan and Draft Treatability Study Work Plan, dated December 18, 2018. U.S. Environmental Protection Agency.

EPA, 2019a. Letter to Charles W. Munce, GHD Services Inc., regarding comments on the Draft Second Phase Pre-Design Investigation Work Plan, dated April 18, 2019. U.S. Environmental Protection Agency.

EPA, 2019b. Letter to Charles W. Munce, GHD Services Inc., regarding comments on the Draft Treatability Study Work Plan, dated April 18, 2019. U.S. Environmental Protection Agency.

EPA, 2019c. Letter to Charles W. Munce, GHD Services Inc., regarding approval of Final Second Phase Pre-Design Investigation Work Plan, dated August 8, 2019. U.S. Environmental Protection Agency.

EPA, 2019d. Letter to Charles W. Munce, GHD Services Inc., regarding approval of Final Treatability Study Work Plan, dated August 27, 2019. U.S. Environmental Protection Agency.

EPA, 2019e. Letter to Charles W. Munce, GHD Services Inc., regarding approval of Force Majeure Event, dated October 30, 2019. U.S. Environmental Protection Agency.

EPA, 2020a. Letter to Charles W. Munce, GHD Services Inc. regarding comments on the Preliminary 30% Remedial Design - Southern Impoundment, dated June 26, 2020. U.S. Environmental Protection Agency.

EPA, 2020b. Letter to Charles W. Munce, GHD Services Inc. regarding approval of Remedial Design Work Plan, dated November 6, 2020. U.S. Environmental Protection Agency.

EPA, 2020c. Letter to Charles W. Munce, GHD Services Inc. regarding comments on the Pre-Final 90% Remedial Design - Southern Impoundment, dated November 18, 2020. U.S. Environmental Protection Agency.

EPA, 2021a. Letter to Charles W. Munce, GHD Services Inc. regarding comments on the Final 100% Remedial Design - Southern Impoundment, dated March 15, 2021. U.S. Environmental Protection Agency.

EPA, 2021b. Letter to Charles W. Munce, GHD Services Inc. regarding approval of Final 100% Remedial Design - Southern Impoundment (Amended April 2021), dated May 7, 2021. U.S. Environmental Protection Agency.

EPA, 2021c. Unilateral Administrative Order for Remedial Action. U.S. EPA Region 6, CERCLA Docket. No. 06 05 21. In the matter of: San Jacinto Waste Pits Superfund Site Southern Impoundment, Harris County, Texas. International Paper Company, Respondent. August 2021.

ED_014247_00001508-00035

Integral and Anchor QEA, 2013a. *Baseline Human Health Risk Assessment*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 2013.

Integral and Anchor QEA, 2013b. *Remedial Investigation Report*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 2013.

Integral and Anchor QEA, 2018a. *Draft First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. June 2018.

Integral and Anchor QEA, 2018b. *First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. August 2018.

Integral and Anchor QEA, 2018c. *Draft Remedial Design Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. September 2018.

Integral and Anchor QEA, 2018d. *Addendum to the First Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. October 2018.

Integral and Anchor QEA, 2018e. *Remedial Design Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. December 2018.

GHD, 2018. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Schedule Extension and Approval of Submission Date - Draft Treatability Study Work Plan and Draft Second Phase Pre-Design Investigation Work Plan, dated December 7, 2018. GHD Services Inc.

GHD, 2019a. *Draft Second Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. February 11, 2019.

GHD, 2019b. *Draft Treatability Study Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. February 11, 2019.

GHD, 2019c. *Final Treatability Study Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. May 20, 2019.

GHD, 2019d. *Final Second Phase Pre-Design Investigation Work Plan*, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. June 3, 2019.

GHD, 2019e. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding Written Notification of Force Majeure Event, dated September 27, 2019. GHD Services Inc.

GHD, 2020a. *Preliminary 30% Remedial Design - Southern Impoundment*, San Jacinto River Waste Pits Superfund Site. Prepared for International Paper Company and U.S. Environmental Protection Agency, Region 6. April 13, 2020.

GHD, 2020b. *Pre- Final 90% Remedial Design - Southern Impoundment*, San Jacinto River Waste Pits Superfund Site. Prepared for International Paper Company and U.S. Environmental Protection Agency, Region 6. September 24, 2020.

ED_014247_00001508-00036

GHD, 2020c. *Final 100% Remedial Design - Southern Impoundment,* San Jacinto River Waste Pits Superfund Site. Prepared for International Paper Company and U.S. Environmental Protection Agency, Region 6. December 18, 2020.

GHD, 2021. *Final 100% Remedial Design - Southern Impoundment (Amended April 2021)*, San Jacinto River Waste Pits Superfund Site. Prepared for International Paper Company and U.S. Environmental Protection Agency, Region 6. April 19, 2021.

ED_014247_00001508-00037

Table 1

ARAR Requirements
Remedial Action Work Plan
San Jacinto River Waste Pits Superfund Site
Southern Impoundment
Harris, County, Texas

Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
Surface Water	Clean Water Act (CWA): Criteria and standards for imposing technology- based treatment requirements under § 402	33 U.S.C. §1342; 40 CFR Part 125 Subpart A	Both on-Site and off-Site discharges from CERCLA sites to surface waters are required to meet the substantive CWA (National Pollutant Discharge Elimination System) NPDES requirements (USEPA 1988).	On-Site discharges to surface water must comply with the substantive technical requirements of the CWA but do not require a permit (USEPA 1988). Off-Site discharges to a Publicly Owned Treatment Work (POTW) would be regulated under the conditions of a NPDES permit (USEPA 1988). Water that is generated during removal activities in the Southern Impoundment will be treated and discharged to the San Jacinto River (Segment 1005), unless a determination is made later in the design process to connect to a POTW. The discharge location will be on-Site, so only the substantive requirements of an NPDES permit, but not an NPDES permit, will be required. Water quality-based effluent limitations using TexTox menu # 5 for bay or wide tidal river were calculated and considered for the water treatment design. Development of the treatment system discharge limits are discussed further below.
Surface Water	CWA: Sections 303 and 304: Federal Water Quality Criteria	33 U.S.C. §1313 and 1314 (304(a) list at date of ROD)	Under §303 (33 U.S.C. §1313), individual states have established water quality standards to protect existing and attainable uses (USEPA 1988). CWA §301(b)(1)(C) requires that pollutants contained in direct discharges be controlled beyond BCT/BAT equivalents (USEPA 1988).CERCLA §121(d)(2)(B)(i) establishes conditions under which water quality criteria, which were developed by USEPA as guidance for states to establish location-specific water quality standards, are to be considered relevant and appropriate. Two kinds of water quality criteria have been developed under CWA §304 (33 U.S.C. §1314): one for protection of human health, and another for protection of aquatic life. These requirements include establishment of total maximum daily loads (TMDL).	Per the 2020 Texas Integrated Report - Texas 303(d) list, San Jacinto River Segment 1005 is classified as impaired body of water for dioxin and PCBs in edible tissues as category 5; therefore it is suitable for development of a TMDL. A TMDL for dioxin and PCBs in edible tissues for San Jacinto River Segment 1005 has not been developed yet.The Texas Surface Water Quality Standard (TSWQS) for dioxins is applicable for surface water discharge from the Southern Impoundment, in accordance with EPA's February 18, 2020, e-mail which states that: *"EPA has determined that compliance with the TSWQS ARAR will be attained as follows:* *- The state surface water quality standard for Dioxins/Furans is 7.97 x 10-8 µg/L [0.0797 pg/L] (as TCDD equivalents).* *- Compliance with the TSWQS will be determined by using minimum level of the EPA approved method (1613B), cited in 40 CFR Part 136 (GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS), in sampling of surface water discharges during the Site remedial action.* *- If an effluent sample analyzed for dioxin is below the minimum level using the EPA approved method, the sample result would be identified as non-detect and the discharge would be determined to be in compliance with the ARAR.* *This approach is consistent with the state's guidance and other permits issued by TCEQ. EPA's determination is contingent on the water treatment facility using a 1 micron final filtration step in the water treatment process."*
Surface Water	Clean Water Act (CWA): Section 307(b): Pretreatment standards	33 U.S.C. §1317(b)	CERCLA §121(e) states that no federal, state, or local permit for direct discharges is required for the portion of any removal or remedial action conducted entirely on-Site (the aerial extent of contamination and all suitable areas in close proximity to the contamination necessary for implementation of the response action) (USEPA 1988).	If off-Site discharges from a CERCLA response activity were to enter receiving waters directly or indirectly, through treatment at a POTW, they must comply with applicable federal, state, and local substantive requirements and formal administrative permitting requirements (USEPA 1988).If a determination is made to discharge to a POTW, the off-Site discharges to a POTW will need to comply with pretreatment effluent standards and will require a pretreatment permit.
Surface Water	Clean Water Act (CWA)	Section 401: Water Quality Certification 33 U.S.C. §1341 30 TAC Chapter 279	Requires applicants to apply for federal permits for projects that involve a discharge into navigable waters of the U.S. to obtain certification from state or regional regulatory agencies that the proposed discharge will comply with CWA Sections 301, 302, 303, 306, and 307.	Water Quality Certification is a requirement of projects that involve discharge of dredge/fill or would impact waters of the U.S. or wetland. The bulkhead to be installed in the Southern Impoundment is considered "fill material"; therefore, Section 401 would apply to the project. The project will comply with substantive requirements of Section 401.
Surface Water	Clean Water Act (CWA)	CWA Section 404 and 404(b)(1): Dredge and Fill; 33 U.S.C. §1344 (b)(1); 33 CFR 320 and 330; 40 CFR 230)	Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects.	The work must comply with substantive requirements of the Section 404. Under Section 404, "Fill material" is identified as any material used to create any structure in waters of the U.S. The bulkhead to be installed in the Southern Impoundment is considered "fill material"; therefore, Section 404 would apply to the project. The work will follow the substantive requirements of a Nationwide Permit 38 for Clean-Up of Hazardous and Toxic Waste.
Surface Water	Stormwater Discharge from Construction Activities	40 CFR 450; 30 TAC Chapter 205	Requires new construction project that will disturb 5 or more acres to request coverage under a Texas Commission on Environmental Quality (TCEQ) construction general permit (TX15000) and develop a stormwater pollution prevention plan (SWPPP) to control discharges of stormwater associated with construction activities in accordance with the NPDES program.	The work must comply with the substantive technical requirements of these regulations. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and implemented using best management practices (BMPs) to minimize erosion and entrainment of sediments in stormwater runoff.

Table 1

ARAR Requirements
Remedial Action Work Plan
San Jacinto River Waste Pits Superfund Site
Southern Impoundment
Harris, County, Texas

Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
Surface Water	Texas Surface Water Quality Standards	30 TAC §307.4-7, 10	These state regulations provide: • General narrative criteria • Anti-degradation Policy • Numerical criteria for pollutants • Numerical and narrative criteria for water-quality related uses (e.g., human use) • Site specific criteria for San Jacinto basin	The Texas Surface Water Quality Standard (TSWQS) for dioxins is applicable for surface water discharge from the Southern Impoundment and the EPA's February 18, 2020, e-mail states as follows: *"EPA has determined that compliance with the TSWQS ARAR will be attained as follows:* *- The state surface water quality standard for Dioxins/Furans is 7.97 x 10-8 µg/L [0.0797 pg/L] (as TCDD equivalents).* *- Compliance with the TSWQS will be determined by using minimum level of the EPA approved method (1613B), cited in 40 CFR Part 136 (GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS), in sampling of surface water discharges during the Site remedial action."* *- If an effluent sample analyzed for dioxin is below the minimum level using the EPA approved method, the sample result would be identified as non-detect and the discharge would be determined to be in compliance with the ARAR.* *This approach is consistent with the state's guidance and other permits issued by TCEQ. EPA's determination is contingent on the water treatment facility using a 1 micron final filtration step in the water treatment process."*
Surface Water	Texas Water Quality: Pollutant Discharge Elimination System (TPDES)	30 TAC §279.10	These state regulations require stormwater discharge permits for either industrial discharge or construction-related discharge. The State of Texas was authorized by USEPA to administer the NPDES program in Texas on September 14, 1998 (Texas Commission on Environmental Quality 2009).	No permit is required for on-Site activities. A SWPPP will be developed and implemented using BMPs to minimize erosion and entrainment of sediments in stormwater runoff.
Surface Water	Texas Water Quality: Water Quality Certification	30 TAC §279.10	These state regulations establish procedures and criteria for applying for, processing, and reviewing state certifications under CWA, §401. It is the purpose of this chapter, consistent with the Texas Water Code and the federal CWA, to maintain the chemical, physical, and biological integrity of the state's waters.	Water Quality Certification is a requirement of projects that involve discharge of dredge/fill or would impact waters of the U.S. or wetland. The bulkhead to be installed in the Southern Impoundment is considered "fill material"; therefore, Section 401 would apply to the project. The project will comply with substantive requirements of Section 401.
Waste	Resource Conservation And Recovery Act (RCRA): Hazardous Waste Management	42 U.S.C. §6921, et seq.; 40 CFR Parts 260 - 268	RCRA Subtitle C and its implementing regulations contain the federal requirements for the management of hazardous wastes.	This requirement would apply to certain activities if the waste materials or affected soils contain RCRA listed hazardous waste or exhibit a hazardous waste characteristic The waste management in the Southern Impoundment will be required to comply with these regulations. Based on the results of the pre-design investigation for the remedial design (PDI), the Southern Impoundment waste/soils sampled to date are not listed hazardous waste, do not contain listed hazardous waste above RCRA-thresholds, and are not classified as characteristic hazardous waste. If hazardous waste, as defined in 40 CFR Part 261, is identified, it will be managed and disposed of in accordance with RCRA regulations.
Waste	Toxic Substances Control Act (TSCA)	15 USC §2601, et. seq.; 40 CFR 761.61 (c)	40 CFR 761.61 provides TSCA clean-up and disposal options for PCB remediation waste, which includes PCB- contaminated soil, sediment, sewage or industrial sludge, and building material. 761.61(c) is the risk- based option for PCB remediation waste.	Total PCB concentrations in the Southern Impoundment are below the regulatory threshold of 50 mg/kg, calculated as specified in 40 CFR 761 that could require management of any waste/soils as a TSCA waste.
Waste	RCRA: General Requirements for Solid Waste Management	42 U.S.C. §6941, et seq.; 40 CFR 258)	Requirements for construction for municipal solid waste landfills that receive RCRA Subtitle D wastes, including industrial solid waste. Requirements for run- on/run-off control systems, groundwater monitoring systems, surface water requirements, etc.	The Southern Impoundment remedial activities do not involve the construction of a municipal landfill; therefore, this regulation does not apply.
Waste	30 Texas Administrative Code (TAC) Part 1: Industrial Solid Waste and Municipal Hazardous Waste General Terms	30 TAC §335.1 - 335.15	Substantive requirements for the transportation of industrial solid and hazardous wastes; requirements for the location, design, construction, operation, and closure of solid waste management facilities.	Guidelines to promote the proper collection, handling, storage, processing, and disposal of industrial solid waste or municipal hazardous waste in a manner consistent with the purposes of Texas Health and Safety Code, Chapter 361. These regulations also define the classification of the Industrial Solid Waste from the Site. They are applicable and will be followed for waste/soils from the Southern Impoundment that are transported to off-Site landfills.
Waste	30 TAC Part 1: Industrial Solid Waste and Municipal Hazardous Waste: Notification	30 TAC Chapter 335 Subchapter P	Requires placement of warning signs in contaminated and hazardous areas if a determination is made by the executive director of the Texas Water Commission a potential hazard to public health and safety exists which will be eliminated or reduced by placing a warning sign on the contaminated property.	It is not expected that warning signs will be necessary based on this regulation. The Southern Impoundment will be protected with appropriate signage and other Site controls per Health and Safety Plan.
Waste	30 TAC Part 1: Industrial Solid Waste and Municipal Hazardous Waste: Generators	30 TAC Chapter 335, Subchapter C	Standards for hazardous waste generators either disposing of waste on-Site or shipping off-Site with the exception of conditionally exempt small quantity generators. The definition of hazardous involves state and federal standards.	The waste management activities for the Southern Impoundment will be required to comply with these regulations. Based on the results of the PDI, the Southern Impoundment waste/soils sampled to date are not listed hazardous waste, do not contain listed hazardous waste above RCRA-thresholds, and are not classified as characteristic hazardous waste. If hazardous waste was identified as defined in 40 CFR Part 261, the disposal of any hazardous material would be in managed in accordance with RCRA regulations.

Table 1

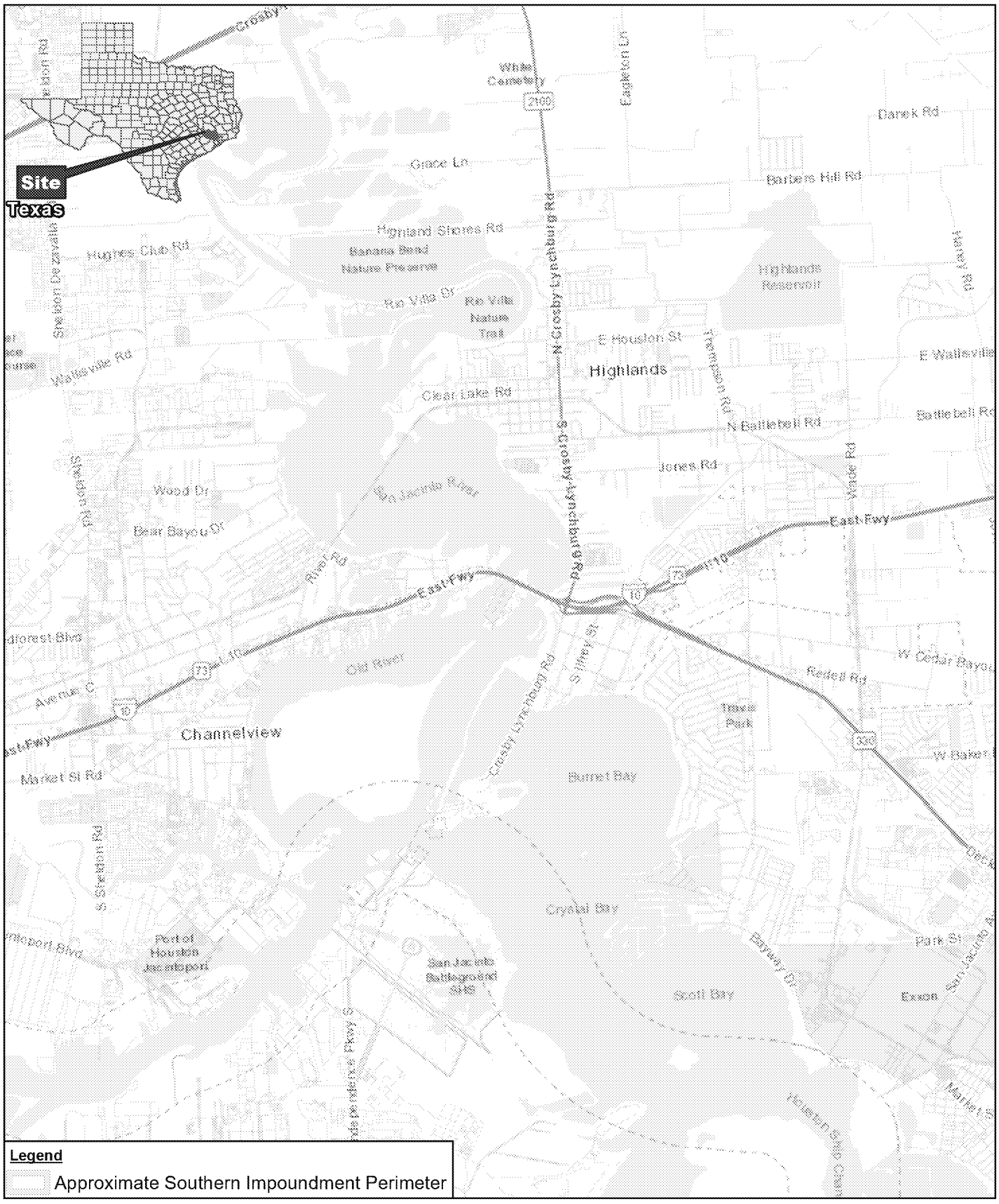
ARAR Requirements
Remedial Action Work Plan
San Jacinto River Waste Pits Superfund Site
Southern Impoundment
Harris, County, Texas

Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
Waste	Hazardous Materials Transportation Act	49 U.S.C. §1801, et seq.; 49 CFR Subchapter C	Establishes standards for packaging, documenting, and transporting hazardous materials.	These requirements will apply to all hazardous material transported to and from the Southern Impoundment work Site. Based on the results of the PDI, it is not expected that the waste/soils transported off-Site will be classified as hazardous material and these requirements will not apply to them. If hazardous waste was identified as defined in 40 CFR Part 261, the disposal of any hazardous material would be in managed in accordance with RCRA regulations.
Air	Clean Air Act (CAA)	42 U.S.C. §7401, et seq.	Authorization of potential emissions of dust, VOCs, and/or HAP resulting from the excavation and solidification and stabilization of the soil in the Southern Impoundment.	Any air discharges must comply with the substantive technical requirements of the CAA and the work will be required to comply with any applicable TCEQ requirements regarding such emissions.
Air	Texas Air Quality Rules	30 TAC Chapter 116	Authorization of potential emissions of dust, VOCs, and/or HAP resulting from the excavation and solidification and stabilization of the soil in the Southern Impoundment. Authorization is not required for remedial action, but project should comply with regulation.	TCEQ is the designated regulatory authority in Texas. Emissions generated from equipment used to extract, handle, process, condition, reclaim or destroy contaminants for the purpose of remediation are covered by a TCEQ's permit by rule (PBR) as long as emissions are limited to 5 ton per year or 1 pound per hour for the Site activities (30 TAC 106.533). Prior to commencing construction, emission calculations would be performed with respect to compliance with the PBR.
Dredging/Floodplain	Rivers And Harbors Act of 1899: Obstruction of navigable waters (generally, wharves; piers, etc.); excavation and fill	33 U.S.C. §401	Controls the alteration of navigable waters (i.e., waters subject to ebb and flow of the tide shoreward to the mean high water mark). Activities controlled include construction of structures such as piers, berms, and installation of pilings as well as excavation and fill. Section 10 may be applicable for any action that may obstruct or alter a navigable waterway. No permit is required for on-Site activities. However, substantive requirements might limit in-water construction activities.	The bulkhead to be installed in the Southern Impoundment is considered "fill material"; therefore, Section 10 of the Rivers and Harbors Act of 1899 would apply to the project and will comply with substantive requirements of the Section 10.
Dredging/Floodplain	Coastal Zone Management Act	16 USC §1451, et seq.; 15 CFR 930	Federal activities must be consistent with, to the maximum extent practicable, state coastal zone management programs. Federal agencies must supply the state with a consistency determination (USEPA 1989).	The San Jacinto River lies within the Coastal Zone Boundary according to the Texas Coastal Management Plan (TCMP) prepared by the General Land Office (GLO). The EPA is required to determine whether the Southern Impoundment remedial activities will be consistent with the state's CZMP (USEPA 1989).
Dredging/Floodplain	FEMA (Federal Emergency Management Agency), Department of Homeland Security (Operating Regulations)	42 U.S.C. 4001, et seq.; 44 CFR Chapter 1	Prohibits alterations to river or floodplains that may increase potential for flooding.	The FEMA flood insurance rate map ID 48201C074M, effective on January 6, 2017, indicates that the Southern Impoundment is located within a designed coastal zone (Zone VE) and a special flood hazard area or 1 percent annual chance of flooding (Zone AE). The project is not expected to alter floodplain.
Dredging/Floodplain	National Flood Insurance Program (NFIP) Regulations	42 U.S.C. Subchapter III, §4101, et seq.	Provides federal flood insurance to local authorities and requires that the local authorities not allow fill in the river that would cause an increase in water levels associated with floods.	Floodplain will not be altered during the implementation of the Southern Impoundment remedy.
Dredging/Floodplain	Floodplain Management and Wetlands Protection	Executive Orders (EO) 11988 and 11990	Requires federal agencies to conduct their activities to avoid, if possible, adverse impacts associated with the destruction or modification of wetlands and occupation or modification of floodplains. Executive Orders 11988 and 11990 require federal projects to avoid adverse effects and minimize potential harm to wetlands and within flood plains. The EO 11990 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative (USEPA 1994).	A Desktop Biological Assessment is being completed for the Southern Impoundment to provide a technical basis to determine to what extent (if any) the proposed RA Construction may affect wetlands. The floodplain is not expected to be altered during the implementation of the Southern Impoundment remedy.
Dredging/Floodplain	Texas Coastal Coordination Council Policies for Development in Critical Areas	31 TAC §501.23	Dredging in critical areas is prohibited if activities have adverse effects or degradation on shellfish and/or jeopardize the continued existence of endangered species or results in an adverse effect on a coastal natural resource area (CNRA); prohibit the location of facilities in coastal natural resource areas unless adverse effects are prevented and/or no practicable alternative. Specifies compensatory mitigation.	Dredging is not planned for the Southern Impoundment; therefore, this regulation does not apply.
Dredging/Floodplain	Texas Coastal Management Plan (CMP) Consistency	31 TAC, §506.12	Specifies federal actions within the CMP boundary that may adversely affect CNRAs; specifically, selection of remedial actions.	The San Jacinto River lies within the Coastal Zone Boundary (GLO TCMP). During the RI/FS, an evaluation was made as to whether remedial alternatives may affect (adversely or not) the coastal zone and provides a technical basis for the lead agency to determine whether the activity will be consistent with the state's CMP. These requirements will be incorporated into the design as applicable.
Dredging/Floodplain	Texas State Code - obstructions to navigation	Natural Resources Code §51.302 Prohibition and Penalty	Prohibits construction or maintenance of any structure or facility on land owned by the state without an easement, lease, permit, or other instrument from the state.	Dredging is not planned for the Southern Impoundment; therefore, this regulation does not apply.

Table 1

ARAR Requirements
Remedial Action Work Plan
San Jacinto River Waste Pits Superfund Site
Southern Impoundment
Harris, County, Texas

Media/Topic	Status, Regulations, Standards, or Requirements	Citations or References	Description	Comment
Dredging/Floodplain	Floodplain Management of Harris County, Texas	Texas Code Section 240.901 and TTC Sections 251.001-251.059 and Sections 254.001-254.019	Establishes construction requirements along the segment of the San Jacinto River at or near the Southern Impoundment.	The FEMA flood insurance rate map ID 48201C074M, effective on January 6, 2017, indicates that the Southern Impoundment is located within a designated coastal zone (Zone VE) and a special flood hazard area or 1 percent annual chance of flooding (Zone AE). Harris County's Floodplain Management regulations requires finish floor for any structure on-Site would be about 16 feet above natural ground. Temporary offices such as trailers on wheels would not need to be elevated as long as they can be moved off-Site if needed. These regulations will also require that fuel tanks be engineered with anchoring to secure against flotation and lateral movement.
Wildlife Protection	Endangered Species Act	16 U.S.C. §1531, et seq.	Federal agencies must ensure that actions they authorize, fund, or carry out are not likely to adversely modify or destroy critical habitat of endangered or threatened species. Actions authorized, funded, or carried out by federal agencies may not jeopardize the continued existence of endangered or threatened species as well as adversely modify or destroy their critical habitats.	Based on a 2010 evaluation, as well as a desktop review of photographs and USFWS and NMFS species and habitat maps, no federally listed threatened or endangered (T&E) species or their critical habitat are present on the Southern Impoundment or utilize areas in the vicinity of the Southern Impoundment.
Wildlife Protection	Fish and Wildlife Coordination Act	16 U.S.C. §661, et seq.; 16 U.S.C. §742a; 16 U.S.C. §2901	Requires adequate provision for protection of fish and wildlife resources. This title has been expanded to include requests for consultation with USFWS for water resources development projects (Mueller 1980). Any modifications to rivers and channels require consultation with the USFWS, Department of Interior, and state wildlife resources agency. Project-related losses (including discharge of pollutants to water bodies) may require mitigation or compensation.	The remedy for the Southern Impoundment will not alter any river or channel; therefore, mitigation or compensation would not be required.
Wildlife Protection	Bald and Golden Eagle Protection Act	16 U.S.C. §668a-d	Makes it unlawful to take, import, export, possess, buy, sell, purchase, or barter any bald or golden eagle, nest, or egg. "Take" is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping and collecting, molesting, or disturbing.	No readily available information suggests bald or golden eagles frequent the Southern Impoundment; however, if bald or golden eagles are identified prior to or during construction, activities will be designed to conserve the species and their habitat.
Wildlife Protection	Migratory Bird Treaty Act	16 U.S.C. §703-712; 50 CFR §10.12	Makes it unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. "Take" is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, and trapping and collecting.	The Southern Impoundment remedy will be carried out in a manner to avoid adversely affecting migratory bird species, including individual birds or their nests.
Wildlife Protection	State of Texas Threatened and Endangered (T&E) Species Regulations	31 TAC 65.171 - 65.176	No person may take, possess, propagate, transport, export, sell or offer for sale, or ship any species of fish or wildlife listed as threatened or endangered.	Based on a 2010 evaluation, as well as a desktop review of photographs and USFWS and NMFS species and habitat maps, no state listed T&E species or their critical habitat are present on the Southern Impoundment or utilize areas in the vicinity of the Southern Impoundment. A Desktop Biological Assessment is being completed for the Southern Impoundment to provide a technical basis to determine to what extent (if any) the proposed RA Construction may affect threatened, endangered, proposed, or candidate species.
Historic Preservation	National Historic Preservation Act	16 U.S.C. §470, et seq.; 36 CFR 800	Section 106 of this statute requires federal agencies to consider effects of their undertakings on historic properties. Historic properties may include any district, Site, building, structure, or object included in or eligible for the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property.	According to the San Jacinto River Waste Pits Remedial Investigation/Feasibility Study (RI/FS) cultural resources assessment, "no NRHP-eligible properties are documented in the area of concern. Because of the extensive disturbance to the Site and minimal ground disturbance that will likely occur for the project, it is not likely that NRHP eligible historic properties will be affected by RI/FS or eventual Site remediation activities" (Anchor QEA 2009). This requirement is therefore not applicable.
Historic Preservation	Natural Resources Code, Antiquities Code of Texas	Texas Parks and Wildlife Commission Regulations 191.092-171	Requires that the Texas Historical Commission staff review any action that has the potential to disturb historic and archeological sites on public land. Actions that need review include any construction program that takes place on land owned or controlled by a state agency or a state political subdivision, such as a city or a county. Without local control, this requirement does not apply.	Assessment of historical resources during the RI/FS produced no known eligible properties and determined that disturbance of any archaeological or historic resources is unlikely within the Southern Impoundment. This requirement is therefore not expected to be applicable.
Historic Preservation	Practice and Procedure, Administrative Code of Texas	13 TAC Part 2, Chapter 26	Regulations implementing the Antiquities Code of Texas. Describes criteria for evaluating archaeological sites and permit requirements for archaeological excavation.	This requirement is only applicable if an archaeological Site is found; based on evaluations during the RI/FS, it is unlikely that archaeological resources would be found on the Southern Impoundment. This requirement is therefore not expected to be applicable.
Noise	Noise Control Act	42 U.S.C. §4901, et seq.; 40 CFR Subchapter G §201, et seq.	Noise Control Act remains in effect but unfunded (USEPA 2010).	Noise is regulated at the state level.
Noise	Noise Regulations	Texas Penal Code Chapter 42, Section 42.01	The Texas Penal Code regulates any noise that exceeds 85 decibels after the noise is identified as a public nuisance.	A noise is presumed to be unreasonable if the noise exceeds a decibel level of 85 after the person making the noise receives notice from a magistrate or peace officer that the noise is a public nuisance. An offense under this section is a Class C misdemeanor. Most activities are likely to not exceed the 85 decibel level beyond the immediate work area. With the exception of pile driving for the bulkhead, the activities are not anticipated to constitute a public nuisance due to the isolation of the work, its location adjacent to a freeway with high volumes of traffic during normal working hours, and the industrial nature of activities on the Southern impoundment. Pile driving would be limited to normal working hours, to the extent possible, to minimize impacts.



Source: ESRI World Topographic Maps.

0 0.5 1
Miles

Coordinate System:
NAD 1983 UTM Zone 14N

SAN JACINTO RIVER WASTE PITS
SUPERFUND SITE
SOUTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS
REMEDIAL ACTION WORK PLAN
VICINITY MAP

11215131
Sep 30, 2021

FIGURE 1

GIS File: I:\GIS\GIS\Projects\11200000s\11215131\Layouts\REPORT004\11215131-00(REPORT_004)GIS-BR001.mxd

Source: ESRI World Imagery Basemap Services. 9/9/2017. Assumed limits of the TCRA cap. Extracted from 0557-RP-001 (Buoy Anchors).dwg file extracted from Anchor QEA April 2019.

0 625 1,250
Feet

Coordinate System:
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

SAN JACINTO RIVER WASTE PITS SUPERFUND SITE
SOUTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS
REMEDIAL ACTION WORK PLAN

SITE PLAN

11215131
Oct 13, 2021

FIGURE 2

GIS File: I:\GIS\GIS\Projects\11200000s\11215131\Layouts\REPORT004\11215131-00(REPORT_004)GIS-BR002.mxd

Source: Image ©2021 Google, Imagery date: 10/28/2017

0 70 140
Feet

Coordinate System:
NAD 1983 StatePlane Texas South
Central FIPS 4204 Feet

SAN JACINTO RIVER WASTE PITS SUPERFUND SITE
SOUTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS
REMEDIAL ACTION WORK PLAN

11215131
Sep 30, 2021

SOUTHERN IMPOUNDMENT

FIGURE 3

GIS File: I:\GIS\GIS\Projects\11200000s\11215131\Layouts\REPORT004\11215131-00(REPORT_004)GIS-BR003.mxd

Notes:
ng/kg = nanograms per kilogram
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-doxin
WHO = World Health Organization
TEQ = Toxicity Equivalents
1) DWA = depth weighted average
2) >240 ng/kg represents an exceedance for a boring's dwa.
3) For the areas requiring soil removal near Market Street and the Glendale Boat Works, Inc. property, the lateral limits of the excavation will extend immediately up to Market Street and the Glendale Boat Works, Inc. property limits however; the excavation will not extend into either the street or onto the Glendale Boat Works, Inc. property.
4) For the areas requiring soil removal on the southwest portion of the Southern Impoundment, a bulkhead will be installed adjacent to the San Jacinto River. Excavation will be completed up to the lateral limit of the bulkhead.
5) A survey will be conducted to confirm the boundaries of the Market Street right-of-way, Glendale Boat Works property and other properties necessary to implement the design.
6) All sample results are for 2,3,7,8-tetrachlorodibenzo-p-doxin (TCDD) Total World Health Organization (WHO) dioxin toxicity equivalents (TEQ) for Human/Mammal with ND=0.5.
7) Boring SJSB019-S2 did not exceed the DWA of 240 ng/kg, but due to the sample collected at 0-2 ft bgs having a concentration over 240 ng/kg, this polygon will be excavated to 2 ft bgs.

Northeast Excavation Area
North Central Excavation Area
South Central Excavation Area
Southwest Excavation Area

SJSB012-N2 (0.14)
SJSB012 (0.03)
SJSB012-W2 (0.09)
SJSB012-W1 (0.06)
SJSB061-C1 (0.11)
SJSB008 (0.04)
SJSB008-S1 (0.07)
SJSB060-C1 (0.04)
SJSB039 (0.24)
SJSB061 (0.14)
SJSB008-S2 (0.15)
SJSB040 (0.14)
SJSB060 (0.1)
SJSB041 (0.24)
SJSB019-N2 (0.13)
SJSB019-N1 (0.07)
SJSB019-E2 (0.11)
SJSB019-W1 (0.07)
SJSB019-E1 (0.06)
SJSB019 (0.04)
SJSB019-S1 (0.06)
SJSB019-S2 (0.21)
SJSB023-W1 (0.06)
SJSB023-W2 (0.13)
SJSB023-N1 (0.07)
SJSB023 (0.03)
SJSB023-E1 (0.07)
SJSB065-C1 (0.13)
SJSB065 (0.18)
SJSB023-S1 (0.06)
SJSB023-S2 (0.12)
SJSB066 (0.16)
SJSB067 (0.18)
SJSB025-N2 (0.13)
SJSB025-N1 (0.07)
SJSB025 (0.05)
SJSB025-S1 (0.06)

Legend
- PDI-1 Boring Locations <240 ng/kg DWA
- PDI-1 Boring Locations >240 ng/kg DWA
- RI Soil Boring Location >240 ng/kg DWA
- PDI-2 Sample Locations >240 ng/kg DWA
- (0.41) Thiessen Polygon Acreages
- Southern Impoundment Perimeter

Excavation Depth (Feet below ground surface)
- 2
- 4
- 6
- 8
- 10

Source: Image ©2021 Google, Imagery date: 10/28/2017

0 62.5 125
Feet

Coordinate System:
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

N

GHD

SAN JACINTO RIVER WASTE PITS SUPERFUND SITE
SOUTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS
REMEDIAL ACTION WORK PLAN

THIESSEN POLYGONS

11215131
Sep 30, 2021

FIGURE 4

GIS File: I:\GIS\GIS\Projects\11200000s\11215131\Layouts\REPORT004\11215131-00(REPORT_004)GIS-BR004.mxd

Appendices

Appendix A

Pre-Construction Field Sampling Plan

Pre-Construction Field Sampling Plan

Southern Impoundment

San Jacinto River Waste Pits Superfund Site

Appendix A of Remedial Action Work Plan

International Paper Company

October 14, 2021

→ The Power of Commitment

Contents

1.	**Introduction**		**1**
	1.1	Purpose	1
	1.2	Overview of Pre-Construction Sampling	1
2.	**Pre-Mobilization Activities**		**2**
3.	**Pre-Construction Confirmation Sampling Plan**		**2**
	3.1	Overburden Confirmation Sampling	3
	3.2	Sidewall Confirmation Sampling	3
	3.3	Bottom of Excavation Confirmation Sampling	4
	3.4	Confirmation Sampling Summary	4
4.	**Composite Sample Preparation**		**4**
	4.1	Quality Assurance/Quality Control (QA/QC)	5
5.	**Waste Characterization Sampling**		**5**
6.	**Pre-Construction Assessment of Water Volumes to be Managed During Excavation**		**6**
	6.1	Pre-Construction Field Program	6
	6.2	Pre-Construction Water Sampling	6
	6.3	Piezometers and Monitoring Well Plug and Abandonment	7
7.	**Data Validation, Quality Control, and Reporting**		**7**
8.	**Health and Safety**		**7**
9.	**Investigation Derived Wastes**		**7**
10.	**Proposed Schedule**		**8**
11.	**References**		**9**

Table index

Table 10.1	**Proposed Schedule**	**8**
Table 1	**Northeast Excavation Area Confirmation Composite Samples**	
Table 2	**North Central Excavation Area Confirmation Composite Samples**	
Table 3	**South Central Excavation Area Confirmation Composite Samples**	
Table 4	**Southwest Excavation Area Confirmation Composite Samples**	
Table 5	**Waste Characterization Samples**	
Table 6	**RCRA TCLP Regulatory Levels**	
Table 7	**Class 2 Landfill TCLP Regulatory Levels**	

ED_014247_00001508-00049

Figure index

Figure 1	Overall Site Plan
Figure 2	Northeast Excavation Area Overburden Sampling Plan and Section
Figure 3	Confirmation Sampling Example Cross-Sections
Figure 4	Waste Characterization Sampling Locations

Attachments

Attachment A	Pre-Construction Confirmation Borings Drawings
Attachment B	Microsoft Project Projected PCFSE Schedule Microsoft Project Projected Dates Related to PCFSE

ED_014247_00001508-00050

1. Introduction

1.1 Purpose

This Pre-Construction Field Sampling Plan (PC FSP) was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC), for the Southern Impoundment of the San Jacinto River Waste Pits Site in Harris County, Texas (Site). This PC FSP is an updated version of the plan included as one of the supporting deliverables with respect to the Final 100% Remedial Design - Southern Impoundment (Amended April 2021) (Southern Impoundment 100% RD) to describe planned pre-construction sampling activities as part of the Southern Impoundment remedial action (RA). It is a part of the Southern Impoundment RA Work Plan (RAWP) that is being submitted on behalf of IPC to meet requirements contained in the August 5, 2021, Unilateral Administrative Order for Removal Action for Southern Impoundment (UAO; EPA, 2021).

The Southern Impoundment RA involves excavation and removal of approximately 24,600 cubic yards (cy) of 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (dioxin) Toxicity Equivalent for Mammals ($TEQ_{DF,M}$) impacted material to a maximum depth of 10 feet below ground surface (ft bgs). As part of excavation activities, approximately 22,900 cy of overburden located above the delineated zone of impact within each excavation area will be removed and stockpiled for re-use as backfill after impacted soils beneath the overburden has been excavated. The delineated zone of impact for each polygon or other excavation area consists of one or more 2-ft vertical intervals to be removed during excavation.

Figure 1 depicts the four excavation areas that will be part of the Southern Impoundment RA activities. These four areas have been delineated based upon data from the Remedial Investigation (RI), conducted in 2011 and 2012, and the Pre-Design Investigation (PDI), conducted in 2018 and 2019. Each excavation area has been divided into polygons of one half acre or less which correspond to the results of a boring from the PDI or RI which exceeded the 240 nanogram per kilogram (ng/kg) $TEQ_{DF,M}$ clean-up level based on a depth-weighted average (DWA).

References in this PC FSP to the "work site" are to the Southern Impoundment.

The purpose of the FC FSP is to describe how GHD will; (1) conduct pre-construction confirmation sampling to determine the vertical extent of overburden above each delineated zone of impact and the horizontal and vertical extent of impacted soils in advance of excavation and removal activities; (2) collect additional waste characterization samples to be used in planning for the construction phase of the Southern Impoundment RA (RA Construction); and (3) collect data to be used in refining the volumes of wastewater to be treated during excavation activities.

1.2 Overview of Pre-Construction Sampling

To fully determine the vertical extent of overburden above the delineated zone of impact and the horizontal and vertical extent of impacted soils, GHD will conduct a pre-construction confirmation sampling event in advance of excavation and removal activities.

This PC FSP identifies sample collection procedures, analytical techniques, and handling methods associated with the pre-construction confirmation sampling. A cross-section illustrating the locations of the overburden and sidewall samples relative to each other and to the side slopes is shown on Figure 2. A cross-section illustrating the different types of samples to be collected is shown on Figure 3.

The sample locations for the four excavation areas (Northeast [NE], North Central [NC], South Central [SC], and Southwest [SW]) are presented on the following drawings in Appendix D to the Southern Impoundment 100% RD, copies of which are included as part of this PC FSP as the Pre-Construction Confirmation Borings Drawings (Attachment A):

– Drawing C-07 - NE Excavation Area Overburden Sampling Plan.

ED_014247_00001508-00051

- Drawing C-08 - NE Excavation Area Sidewall Sampling Plan.
- Drawing C-09 - NE Excavation Bottom of Excavation Sampling Plan.
- Drawing C-15 - NC Excavation Area Overburden Sampling Plan.
- Drawing C-16 - NC Excavation Area Sidewall Sampling Plan.
- Drawing C-17 - NC Excavation Bottom of Excavation Sampling Plan.
- Drawing C-23 - SC Excavation Area Overburden Sampling Plan.
- Drawing C-24 - SC Excavation Area Sidewall Sampling Plan.
- Drawing C-25 - SC Excavation Bottom of Excavation Sampling Plan.
- Drawing C-31 - SW Excavation Area Overburden Sampling Plan.
- Drawing C-32 - SW Excavation Area Sidewall Sampling Plan.
- Drawing C-33 - SW Excavation Bottom of Excavation Sampling Plan.

In addition to the pre-construction confirmation sampling, samples of the waste material will also be collected and analyzed for off-site disposal waste characterization. In addition, data will be also collected to be used in refining the volume of wastewater to be treated by the wastewater treatment system for the Southern Impoundment RA.
Four temporary piezometers will be installed to assess the hydraulic conductivity of materials within the Southern Impoundment to better understand the expected infiltration rates of both perched water and groundwater that could be encountered during excavation activities. Data obtained will be used to refine the water volume estimates used for both temporary storage capacity and treatment rates for purposes of RA Construction.

2. Pre-Mobilization Activities

Prior to the commencement of sampling activities, any notifications required under access agreements entered into by IPC related to the Southern Impoundment RA will be given. Any required notifications would also be provided to the United States Environmental Protection Agency (EPA) prior to the planned field event.

The Texas 811 call before you dig system will be initiated three days prior to drilling activities and a thorough work site reconnaissance will be completed prior to commencing field activities. The drilling locations will be evaluated for underground and overhead utilities, as well as any other obstructions. All work will be performed in a manner compliant with IPC Contractor Safety Management policy.

3. Pre-Construction Confirmation Sampling Plan

Three different types of confirmation samples will be collected pursuant to this PC FSP:

- Overburden soils that are to be placed back in the excavations will be sampled to ensure that dioxin concentrations after replacement of the overburden will meet the established 240 ng/kg $TEQ_{DF,M}$ clean-up level on a DWA.
- Sidewall samples will be collected to confirm that the lateral extent of impacted soils have been defined for purposes of removal.
- Bottom of excavation samples will be collected to confirm the vertical extent of impact has been defined (down to the maximum 10-foot depth bgs).

ED_014247_00001508-00052

The Pre-Construction Confirmation Borings Drawings included in Attachment A focus on each of the four excavation areas. The area shaded in green is where excavation is required, based upon PDI and RI data. The bold lines outline the excavation polygons defined by the associated PDI or RI soil boring. The hashed lines indicate the overlain sampling grids of approximately 500 cy of volume to be used for overburden sampling.

3.1 Overburden Confirmation Sampling

Overburden samples will be collected during the pre-construction confirmation sampling event based upon the expected extent of overburden, as defined by RI and PDI data. Each polygon that is defined by a PDI or RI sample boring has been divided into approximately 500 cy confirmation sampling grids. The intent is to collect a five-point (or more) composite sample from each grid for analysis, with individual samples to be collected over the vertical and horizontal extent of the 500 cy volume. This approach will allow for full delineation of the location and the volume of reusable overburden prior to construction, so that the designated overburden can be immediately replaced in an excavation after the material from the delineated zone of impact has been removed.

The depth and/or thickness of the overburden in each sampling grid will determine how many borings are installed in that grid to provide a representative sample. As the overburden thickness can range from 0 to 8 feet above the zone of impact, the following bullets describe how each of these 2-ft depth intervals will be sampled and composited:

- In sampling grids where the depth of overburden is 2 ft, five individual borings would be installed, with the composite sample consisting of soils collected from 0 to 2 ft bgs at each boring resulting in a five-point composite.
- In sampling grids where the depth of overburden is 4 ft deep, three borings would be installed, with the composite sample consisting of both 0 to 2 ft bgs and 2 to 4 ft bgs at each boring resulting in a six-point composite.
- In sampling grids where the depth of overburden is 6 ft deep, two borings would be installed, with the composite sample consisting of 0 to 2 ft bgs, 2 to 4 ft bgs, and 4 to 6 ft bgs at each boring resulting in a six-point composite.
- In sampling grids where the depth of overburden is 8 ft deep, two borings would be installed, with the composite sample consisting of 0 to 2 ft bgs, 2 to 4 ft bgs, 4 to 6 ft bgs, and 6 to 8 ft bgs at each boring resulting in an eight-point composite.

The samples required to create the overburden confirmation composite samples for each of the four excavation areas are detailed in Tables 1 through 4, respectively. The overburden pre-construction confirmation sample locations are shown in the design drawings (C-07, C-15, C-23, and C-31), included in Attachment A. The depth intervals in the tables are denoted as ‘a' for 0 to 2-ft bgs, ‘b’ for 2 to 4-ft bgs, ‘c’ for 4 to 6-ft bgs, 'd' for 6 to 8-ft bgs, and 'e' for 8 to 10-ft bgs.

3.2 Sidewall Confirmation Sampling

Sidewall samples will also be collected during the pre-construction sampling event. All planned borings around the perimeter of the excavation area will be sampled for sidewall confirmation in the same locations at which overburden confirmation samples will be collected (as discussed in the previous section). Each sidewall composite sample will be sampled at 2-ft depth intervals and composited into one vertical composite sample. It is anticipated that sidewall borings around the perimeter of the four excavation areas will be installed first and the samples will be put on a rush turnaround time with an EPA-accredited laboratory (Approved Laboratory). Results from these samples will determine if step-out locations need to be added to fully delineate the horizontal extent of material for excavation.

For sidewall composite sampling, each of the borings located at the outer edges of the excavated polygons within the various sampling grids will be sampled at 2-ft bgs intervals to a total depth of 10 ft bgs, with the five 2-ft samples composited into one sample for each boring. Using the same sample nomenclature as previously described for overburden sampling, a composite sidewall sample would consist of individual soil samples labeled as A1a, A1b, A1c, A1d, and A1e (for a five-point composite that would be collected over the entire 10-ft depth of the boring). Where the individual 2-ft sample intervals for sidewall sampling are the same as those identified for overburden sampling, the 2-ft sample core would be split in advance of compositing in accordance with the procedure for doing so in Section 4.

ED_014247_00001508-00053

The samples required to create the sidewall confirmation composite samples for each of the four excavation areas (NE, NC, SC, and SW) are detailed in Tables 1 through 4, respectively. The locations of the samples are shown in the design drawings (C-08, C-16, C-24, and C-32), included in Attachment A.

3.3 Bottom of Excavation Confirmation Sampling

For bottom of excavation pre-construction confirmation sampling, many of the same borings as used for overburden confirmation would be extended to collect samples at depths below the impacted zone. Where the bottom of excavation is less than 10 feet, samples would be collected from the 2-ft depth interval directly below the bottom depth of the zone of impact to verify that the soils below the bottom depth of the excavation have dioxin concentrations below 240 ng/kg $TEQ_{DF,M}$ DWA. At least one five-point composite sample will be taken from every polygon.

The samples required to create the bottom of excavation confirmation composite samples for each of the four excavation areas (NE, NC, SC, and SW) are detailed in Tables 1 through 4, respectively. The locations of the samples are shown in the design drawings (C-09, C-17, C-25, and C-33), included in Attachment A.

3.4 Confirmation Sampling Summary

Pre-construction confirmation sampling is required as part of the Southern Impoundment RA and prior to the commencement of excavation activities at the Southern Impoundment to better understand the following:

- The volume and extent of overburden available for reuse.
- The horizontal extent of the impacted material.
- The vertical extent of the impacted material (to a maximum depth of 10 ft bgs).

The pre-construction confirmation sampling plan includes a total of 202 confirmation boring locations, 26 borings in the NE excavation area, 62 borings in the NC excavation area, 51 borings in the SC excavation area, and 63 borings in the SW excavation area.

Tables 1 through 4 detail the pre-construction confirmation composite samples (overburden, sidewall, and bottom of excavation) for each of the four excavation areas. These tables identify a total of 160 composite samples to be analyzed, 25 samples in the NE excavation area, 49 samples in the NC excavation area, 37 samples in the SC excavation area, and 49 samples in the SW excavation area.

The majority of the submitted composite samples will be five-point composites, but there are circumstances where the composites may be four-point, or as many as nine-point composites.

4. Composite Sample Preparation

The pre-construction confirmation soil borings will be installed using direct-push drilling methodology. The collection of composite samples from the various installed borings within each polygon/sampling grid could potentially use the same 2-ft bgs depth interval for both horizontal compositing (overburden or bottom of excavation) and vertical compositing (sidewall sampling). To ensure that the sample collected from a specific depth interval is properly divided for both horizontal and vertical compositing, the following procedure will be followed:

- Place each 2-foot soil sample in separate stainless-steel bowl.
- Break up the 2-foot long soil core and create a homogenous mix.
- Separate the homogenous soil mixture into two distinct halves.
- Half of each bowl will be designated for the horizontal (overburden or bottom) composite.
- The other half will be designated for the vertical (sidewall) composite.
- Five (or more) half mixtures will be combined for a horizontal composite.

ED_014247_00001508-00054

– Five (or more) half mixtures will be combined for a vertical composite.

Where there is no need to split a sample, the remainder of the collected material would be containerized and properly disposed of.

All samples will be placed into laboratory-supplied containers on ice and sealed and labeled under chain-of-custody (COC) documentation for subsequent delivery to an Approved Laboratory for analysis using EPA approved methods. The sampling and analytical testing program is detailed in the Quality Assurance Project Plan (QAPP). Pre-construction confirmation composite samples will be analyzed for dioxins and furans utilizing EPA Method 1613B.

4.1 Quality Assurance/Quality Control (QA/QC)

Quality control samples will be collected in accordance with the QAPP. One field duplicate (FD) and one matrix spike/matrix spike duplicate (MS/MSD) sample will be collected at a frequency of one for each set of 20 samples.

Trip blanks will be prepared by the Approved Laboratory under the QAPP and will accompany sampling containers containing volatile constituents throughout the sample collection and transport operations. All trip blanks will also be labeled and dated with the same date as the collected samples for the corresponding cooler.

Field blanks will be collected during sampling at a frequency of one for each set of 20 composite samples. Field blanks will be prepared by pouring laboratory purified water into appropriate sample containers. Laboratory supplied temperature blanks will accompany sample coolers, per the QAPP.

Container labels will show a unique sample location and sample date and time to facilitate the COC cross-referencing. Field and laboratory duplicate containers will be numbered in the same manner, with the field duplicate receiving the "FD" designation and the laboratory duplicate the "MS/MSD" designation.

Any samples with suspected high levels of constituents (based on visual or field screening observations) will be annotated on the COC so that the Approved Laboratory can take necessary measures to implement appropriate dilution procedures to ensure acceptable results. Any conditions that may have negative effects on the quality of results, including inclement weather, will be reported to the Approved Laboratory.

Once shipped, the Approved Laboratory will be alerted of the shipment and the number of coolers. Label tracking information will be used to ensure that all coolers were received by the Approved Laboratory in a timely manner.

5. Waste Characterization Sampling

To implement the Southern Impoundment RA, an off-site disposal facility will be selected to receive the approximately 24,600 cy of excavated impacted material from the Southern Impoundment. This disposal facility will require some volume-based frequency of waste characterization sampling to establish profiles for the waste being transported to the disposal facility and verify that different truckloads of waste will be consistent with those profiles. The selected Remedial Contractor (RC) for the construction phase of the RA will update the Transportation and Off-Site Disposal Plan (TODP) with the specifics of the agreed-to profile sampling prior to RA construction. Any other type of waste material that may be encountered during excavation activities will be segregated from the excavated material and characterized and profiled separately.

To supplement the current waste characterization, several additional samples for waste characterization will be collected during the pre-construction sampling event. Figure 4 shows the locations of waste characterization samples to be collected from planned analytical borings (NE-D1 [6 to 8 ft bgs], NE-G4 [4 to 6 ft bgs], NC-E2 [8 to 10 ft bgs], NC-Y2 [6 to 8 ft bgs], SC-B4 [2 to 4 ft bgs], and SW-B4 [2 to 4 ft bgs]). These locations target intervals of known high dioxins concentrations (see Figure 4 and Table 5). These samples will be analyzed for the four RCRA hazardous

ED_014247_00001508-00055

waste characteristics per EPA-required test methodology in 40 Code of Federal Regulations (CFR) Part 261. The list of parameters is provided in Table 6.

As summarized in a letter to the EPA dated November 5, 2020 (GHD, 2020), and approved by the EPA November 19, 2020 (EPA, 2020), historic waste characterization data indicates that the waste material is not a RCRA hazardous waste. To further refine the non-hazardous waste classification (Class 1 or Class 2), several composite samples of the waste will be collected, in accordance with Texas non-hazardous industrial solid waste regulations (Texas Administrative Code [TAC] 335.505-506). One composite sample will be collected from the investigation-derived material (IDW) from each of the four excavation areas and analyzed for the Class 2 disposal parameters listed in Table 7.

6. Pre-Construction Assessment of Water Volumes to be Managed During Excavation

Data from boring logs and a transducer installed in a monitoring well in the Southern Impoundment indicate that perched water will likely be encountered during excavation activities at depths ranging from 2 to 6 ft bgs. Limited hydrogeological information is available to predict the rate of infiltration of encountered water into an excavation. Highly conservative estimates for infiltration rates were used as the basis of design for water storage and treatment for the Southern Impoundment RD, as described in the Southern Impoundment 100% RD.

6.1 Pre-Construction Field Program

To obtain a more accurate assessment of the expected water volumes to be managed during the Southern Impoundment RA, four temporary piezometers will be installed, one within each proposed excavation area at the planned deepest point of excavation. Each piezometer will be constructed of PVC well screen and casing over the 10-ft depth using the same drilling equipment that will be utilized for the pre-construction sampling event.

Upon completion of the four temporary piezometers, field tests will be conducted, including slug (rising or falling head) testing, specific capacity testing, etc. to provide more specific numbers for hydraulic conductivity, transmissivity, and sustainable pumping rates within each excavation area. The information provided by this pre-construction sampling will refine the assumptions in the Southern Impoundment RD for water storage and treatment prior to the start of construction activities.

6.2 Pre-Construction Water Sampling

One water sample will be collected from each of the four temporary piezometers and submitted for analyses of the parameters identified below that were detected in water samples from the Southern Impoundment and/or Northern Impoundment during the 2019 Treatability Study. The analytical results will be reviewed to confirm the parameters requiring treatment. Sampling will include the following parameters:

- Total and Dissolved Dioxins and Furans - EPA 1613B.
- Total and Dissolved Metals - EPA 6010C.
- Total and Dissolved Mercury - EPA 7470A.
- Alkalinity - SM 2320B.
- Ammonia Nitrogen - EPA 350.1.
- Anions (bromide, chloride, fluoride, nitrate, nitrite, sulfate) - EPA 300.0.
- Biochemical Oxygen Demand (BOD) - SM 5210B.
- Chemical Oxygen Demand (COD) - EPA 410.4.

ED_014247_00001508-00056

- pH - EPA 9040C.
- Phosphorus - EPA-SW846-6010D/3050B/7471B.
- Sulfide - EPA-SW846-9034.
- Total Dissolved Solids (TDS) - Standard Methods SM2540C.
- Total Organic Carbon (TOC) - Standard Methods SM5310C.
- Total Suspended Solids (TSS) - SM 2540D.

Dissolved metals and dioxins will be filtered using a 0.45 micron filter. If sufficient volume is not available for all analyses listed above, the parameter list will be revised.

6.3 Piezometers and Monitoring Well Plug and Abandonment

Upon completion of all aquifer and analytical testing and prior to Southern Impoundment RA excavation activities, the temporary piezometers, as well as the three existing monitoring wells on the Southern Impoundment, will be plugged and abandoned by a licensed Texas driller in accordance with regulatory guidelines (TAC, Title 16, Section 76.104a).

7. Data Validation, Quality Control, and Reporting

All laboratory analytical data will be reviewed and validated. The validation of laboratory data will follow the guidance presented in the QAPP and will result in a completed data validation report that will be submitted to the EPA.

At the completion of data validation activities, all validated data will be provided to the EPA.

8. Health and Safety

Consistent with the requirements outlined in the Southern Impoundment RA Health and Safety Plan (HASP), safety meetings will be conducted at least once per day. During these meetings, the field team will describe the activities to be completed that day, identify safety hazards, review lessons learned, and remind employees of important safety procedures.

Ambient air will be monitored during sampling using a hand-held photoionization detector (PID) to detect the potential presence of gases in the breathing zone. If a measurement exceeds any of the air quality criteria established in the HASP, the field team will stop work and evaluate the path forward.

9. Investigation Derived Wastes

Consistent with the Southern Impoundment RD TODP, IDW from sampling and decontamination activities will be containerized and temporarily stored on the Southern Impoundment. Liquid waste (e.g., decontamination water) and dry waste (e.g., soil) will be segregated and transferred into United States Department of Transportation-approved 55-gallon drums, or other approved containers, and temporarily stored at the Southern Impoundment pending analytical results.

ED_014247_00001508-00057

All disposable materials used for sample collection and processing, such as paper towels and gloves, will be placed in heavyweight garbage bags or other appropriate containers. Disposable supplies that do not contain impacted material will be removed from the Southern Impoundment by sampling personnel and placed in a normal refuse container for disposal at a solid waste landfill.

All IDW will be disposed of in accordance with all applicable regulations and guidelines, as further specified in the TODP.

10. Proposed Schedule

The PCFSE will be initiated within 30 days following final EPA approval of the PCFSP, barring delays for reasons identified below. The proposed schedule is presented in the below Table 10.1, in accordance with the Order Statement of Work (SOW) Section 3, Subsection 3.1 (e) and is provided in Microsoft Project format in Attachment B.

Table 10.1 Proposed PCFSE Schedule

Task	Description of Deliverable / Task	SOW Ref.	Deadline
1	Submit RAWP including PCFSP to EPA	3.1	30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order.
2	Pre-Construction Sampling Conference	3.2 (a)	14 days after final EPA approval of PCFSP.
3	Start of Pre-Construction Sampling		30 days after final EPA approval of PCFSP.
4	Submit updated Design Drawings and Specifications to EPA		60 days after receipt of all validated data from PCFSE.

The dates contained in the above schedule for commencing PCFSE field work assume no delays due to circumstances, such as obtaining required access, weather conditions, or contractor availability and the ability to procure materials and equipment (due to supply chain challenges or the COVID-19 pandemic).

Also included in Attachment B, in Microsoft Project format and as requested by EPA, is a Microsoft Project document that contain projected dates related to the PCFSE. This document, which is not the PCFSE Schedule, incorporates deadlines from the projected PCFSE Schedule in Table 10.1, and also identifies and assigns estimated duration to certain other events. All of the dates in this document, other than the date for submission of the RAWP, are conditional. In that regard:

- The dates in the document for commencing field work assume no delays based on the circumstances noted above. Any delay in commencing field work, particularly with respect to the PCFSE, would directly impact and change other projected dates.
- The PCFSE has been estimated to require 50 days to complete. The actual time necessary to complete the PCFSE once it commences could be longer than 50 days depending on the number of step-out borings required to define the extent of excavation areas or if delays are encountered related to circumstances, such as access, weather, and the availability of contractors or equipment. If the PCFSE takes longer than 50 days to complete, it will have a direct impact on subsequent dates (Including the date under the PCFSE Schedule in Table 10.1 to submit updated plans and specifications following receipt of validated data from the PCFSE).
- Estimates as to time periods for EPA review and approval of deliverables are included. The actual time periods may be shorter or longer, which will directly impact and change subsequent dates.
- The projected dates in this document are also based on PCFSE and RA Construction commencing and occurring only between November to April, as provided in the approved 100% Southern Impoundment RD.

ED_014247_00001508-00058

11. References

- EPA, 2020. Letter to Charles W. Munce, GHD Services Inc. regarding the Waste Characterization Evaluation, dated November 19, 2020. U.S. Environmental Protection Agency.
- EPA, 2021. Unilateral Administrative Order for the Remedial Action of the Southern Impoundment. U.S. EPA Region 6, CERCLA Docket No. 06-05-21. In the matter of: San Jacinto River Waste Pits Superfund Site, Harris County, Texas, Respondent. August 2021.
- GHD, 2020. Letter to G. Baumgarten, U.S. Environmental Protection Agency, regarding the Waste Characterization Evaluation, dated November 5, 2020. GHD Services Inc.

ED_014247_00001508-00059

Table 1

Northeast Excavation Area Confirmation Composite Samples
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

NE Overburden Confirmation Samples														
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**											
SJSB012-N2	6 to 10 ft bgs	NE-O-1	NE-A1a	NE-A1b	NE-A1c	NE-A2a	NE-A2b	NE-A2c						
		NE-O-2	NE-B1a	NE-B1b	NE-B1c	NE-B2a	NE-B2b	NE-B2c	NE-B3a	NE-B3b	NE-B3c			
		NE-O-3	NE-C1a	NE-C1b	NE-C1c	NE-C2a	NE-C2b	NE-C2c	NE-C3a	NE-C3b	NE-C3c	NE-C4a	NE-C4b	NE-C4c
		NE-O-4	NE-D1a	NE-D1b	NE-D1c	NE-D2a	NE-D2b	NE-D2c						
		NE-O-5	NE-E1a	NE-E1b	NE-E1c	NE-E2a	NE-E2b	NE-E2c	NE-E3a	NE-E3b	NE-E3c			
SJSB012-W2	4 to 6 ft bgs	NE-O-6	NE-F1a	NE-F1b	NE-F2a	NE-F2b	NE-F3a	NE-F3b						
		NE-O-7	NE-G1a	NE-G1b	NE-G2a	NE-G2b	NE-G3a	NE-G3b	NE-G4a	NE-G4b				
SJSB012/SJSB012-W1	4 to 8 ft bgs	NE-O-8	NE-H1a	NE-H1b	NE-H2a	NE-H2b	NE-H3a	NE-H3b	NE-H4a	NE-H4b				
		NE-O-9	NE-I1a	NE-I1b	NE-I2a	NE-I2b	NE-I3a	NE-I3b	NE-H2a	NE-H2b				
NE Sidewall Confirmation Samples														
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**											
SJSB012-N2	6 to 10 ft bgs	NE-S-1	NE-A1a	NE-A1b	NE-A1c	NE-A1d	NE-A1e							
		NE-S-2	NE-A2a	NE-A2b	NE-A2c	NE-A2d	NE-A2e							
		NE-S-3	NE-B1a	NE-B1b	NE-B1c	NE-B1d	NE-B1e							
		NE-S-4	NE-C1a	NE-C1b	NE-C1c	NE-C1d	NE-C1e							
		NE-S-5	NE-C3a	NE-C3b	NE-C3c	NE-C3d	NE-C3e							
		NE-S-6	NE-E1a	NE-E1b	NE-E1c	NE-E1d	NE-E1e							
		NE-S-7	NE-E2a	NE-E2b	NE-E2c	NE-E2d	NE-E2e							
SJSB012-W2	4 to 6 ft bgs	NE-S-8	NE-F1a	NE-F1b	NE-F1c	NE-F1d	NE-F1e							
		NE-S-9	NE-G1a	NE-G1b	NE-G1c	NE-G1d	NE-G1e							
		NE-S-10	NE-G2a	NE-G2b	NE-G2c	NE-G2d	NE-G2e							
SJSB012/SJSB012-W1	4 to 8 ft bgs	NE-S-11	NE-H1a	NE-H1b	NE-H1c	NE-H1d	NE-H1e							
		NE-S-12	NE-H3a	NE-H3b	NE-H3c	NE-H3d	NE-H3e							
		NE-S-13	NE-I1a	NE-I1b	NE-I1c	NE-I1d	NE-I1e							
		NE-S-14	NE-I2a	NE-I2b	NE-I2c	NE-I2d	NE-I2e							
NE Bottom of Excavation Confirmation Samples														
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**											
SJSB012-W2	4 to 6 ft bgs	NE-B-1	NE-F1d	NE-F2d	NE-F3d	NE-G1d	NE-G2d	NE-G3d	NE-G4d					
SJSB012/SJSB012-W1	4 to 8 ft bgs	NE-B-2	NE-H1e	NE-H2e	NE-H3e	NE-H4e	NE-I1e	NE-I2e	NE-I3e					

Notes:

The depth intervals are denoted as ‘a’ for 0 to 2 ft bgs, ‘b’ for 2 to 4 ft bgs, ‘c’ for 4 to 6 ft bgs, 'd' for 6 to 8 ft bgs, and 'e' for 8 to 10 ft bgs.
ft bgs = feet below ground surface

Table 2

North Central Excavation Area Confirmation Composite Samples
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

NC Overburden Confirmation Samples															
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**												
SJSB008/SJSB008-S1	6 to 8 ft bgs	NC-O-1	NC-A1a	NC-A1b	NC-A1c	NC-A2b	NC-A2b	NC-A2c	NC-A3a	NC-A3b	NC-A3c	NC-A4a	NC-A4b	NC-A4c
		NC-O-2	NC-B1a	NC-B1b	NC-B1c	NC-B2a	NC-B2b	NC-B2c	NC-B3a	NC-B3b	NC-B3c			
		NC-O-3	NC-C1a	NC-C1b	NC-C1c	NC-C2a	NC-C2b	NC-C2c	NC-C3a	NC-C3b	NC-C3c			
SJSB008-S2	8 to 10 ft bgs	NC-O-4	NC-D1a	NC-D1b	NC-D1c	NC-D1d	NC-D2a	NC-D2b	NC-D2c	NC-D2d				
		NC-O-5	NC-E1a	NC-E1b	NC-E1c	NC-E1d	NC-E2a	NC-E2b	NC-E2c	NC-E2d				
		NC-O-6	NC-F1a	NC-F1b	NC-F1c	NC-F1d	NC-F2a	NC-F2b	NC-F2c	NC-F2d	NC-F3a	NC-F3b	NC-F3c	NC-F3d
		NC-O-7	NC-G1a	NC-G1b	NC-G1c	NC-G1d	NC-G2a	NC-G2b	NC-G2c	NC-G2d				
		NC-O-8	NC-H1a	NC-H1b	NC-H1c	NC-H1d	NC-H2a	NC-H2b	NC-H2c	NC-H2d				
SJSB039	6 to 8 ft bgs	NC-O-9	NC-I1a	NC-I1b	NC-I1c	NC-I2a	NC-I2b	NC-I2c						
		NC-O-10	NC-J1a	NC-J1b	NC-J1c	NC-J2a	NC-J2b	NC-J2c	NC-J3a	NC-J3b	NC-J3c			
		NC-O-11	NC-K1a	NC-K1b	NC-K1c	NC-K2a	NC-K2b	NC-K2c	NC-K3a	NC-K3b	NC-K3c			
		NC-O-12	NC-L1a	NC-L1b	NC-L1c	NC-L2a	NC-L2b	NC-L2c	NC-L3a	NC-L3b	NC-L3c			
		NC-O-13	NC-M1a	NC-M1b	NC-M1c	NC-M2a	NC-M2b	NC-M2c	NC-M3a	NC-M3b	NC-M3c			
		NC-O-14	NC-N1a	NC-N1b	NC-N1c	NC-N2a	NC-N2b	NC-N2c	NC-N3a	NC-N3b	NC-N3c			
SJSB061	6 to 8 ft bgs	NC-O-15	NC-O1a	NC-O1b	NC-O1c	NC-O2a	NC-O2b	NC-O2c						
		NC-O-16	NC-P1a	NC-P1b	NC-P1c	NC-P2a	NC-P2b	NC-P2c	NC-P3a	NC-P3b	NC-P3c			
		NC-O-17	NC-Q1a	NC-Q1b	NC-Q1c	NC-Q2a	NC-Q2b	NC-Q2c						
SJSB040	8 to 10 ft bgs	NC-O-18	NC-R1a	NC-R1b	NC-R1c	NC-R1d	NC-R2a	NC-R2b	NC-R2c	NC-R2d				
		NC-O-19	NC-S1a	NC-S1b	NC-S1c	NC-S1d	NC-S2a	NC-S2b	NC-S2c	NC-S2d				
		NC-O-20	NC-T1a	NC-T1b	NC-T1c	NC-T1d	NC-T2a	NC-T2b	NC-T2c	NC-T2d				
		NC-O-21	NC-U1a	NC-U1b	NC-U1c	NC-U1d	NC-U2a	NC-U2b	NC-U2c	NC-U2d				
		NC-O-22	NC-V1a	NC-V1b	NC-V1c	NC-V1d	NC-V2a	NC-V2b	NC-V2c	NC-V2d				
SJSB061-C1	6 to 8 ft bgs	NC-O-23	NC-W1a	NC-W1b	NC-W1c	NC-W2a	NC-W2b	NC-W2c	NC-W3a	NC-W3b	NC-W3c			
SJSB060/SJSB060-C1	6 to 8 ft bgs	NC-O-24	NC-X1a	NC-X1b	NC-X1c	NC-X2a	NC-X2b	NC-X2c						
		NC-O-25	NC-Y1a	NC-Y1b	NC-Y1c	NC-Y2a	NC-Y2b	NC-Y2c						

NC Sidewall Confirmation Samples														
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**											
SJSB008/SJSB008-S1	6 to 8 ft bgs	NC-S-1	NC-A1a	NC-A1b	NC-A1c	NC-A1d	NC-A1e							
		NC-S-2	NC-A2a	NC-A2b	NC-A2c	NC-A2d	NC-A2e							
		NC-S-3	NC-A3a	NC-A3b	NC-A3c	NC-A3d	NC-A3e							
		NC-S-4	NC-B1a	NC-B1b	NC-B1c	NC-B1d	NC-B1e							
		NC-S-5	NC-C1a	NC-C1b	NC-C1c	NC-C1C	NC-C1e							
SJSB008-S2	8 to 10 ft bgs	NC-S-6	NC-F1a	NC-F1b	NC-F1c	NC-F1d	NC-F1e							
		NC-S-7	NC-F2a	NC-F2b	NC-F2c	NC-F2d	NC-F2e							
		NC-S-8	NC-G1a	NC-G1b	NC-G1c	NC-G1d	NC-G1e							
		NC-S-9	NC-H1a	NC-H1b	NC-H1c	NC-H1d	NC-H1e							
SJSB039	6 to 8 ft bgs	NC-S-10	NC-J1a	NC-J1b	NC-J1c	NC-J1d	NC-J1e							
		NC-S-11	NC-K1a	NC-K1b	NC-K1c	NC-K1d	NC-K1e							
		NC-S-12	NC-L1a	NC-L1b	NC-L1c	NC-L1d	NC-L1e							
		NC-S-13	NC-M1a	NC-M1b	NC-M1c	NC-M1d	NC-M1e							
		NC-S-14	NC-N1a	NC-N1b	NC-N1c	NC-N1d	NC-N1e							
SJSB061	6 to 8 ft bgs	NC-S-15	NC-P1a	NC-P1b	NC-P1c	NC-P1d	NC-P1e							
SJSB040	8 to 10 ft bgs	NC-S-16	NC-T1a	NC-T1b	NC-T1c	NC-T1d	NC-T1e							
		NC-S-17	NC-U1a	NC-U1b	NC-U1c	NC-U1d	NC-U1e							
		NC-S-18	NC-V1a	NC-V1b	NC-V1c	NC-V1d	NC-V1e							
SJSB061-C1	6 to 8 ft bgs	NC-S-19	NC-W1a	NC-W1b	NC-W1c	NC-W1d	NC-W1e							

NC Bottom of Excavation Confirmation Samples														
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**											
SJSB008/SJSB008-S1	6 to 8 ft bgs	NC-B-1	NC-A1e	NC-A2e	NC-A3e	NC-A4e	NC-B1e	NC-B2e	NC-B3e	NC-C1e	NC-C2e	NC-C3e		
SJSB039	6 to 8 ft bgs	NC-B-2	NC-I1e	NC-I2e	NC-J1e	NC-J2e	NC-J3e	NC-K1e	NC-K2e	NC-K3e				
		NC-B-3	NC-L1e	NC-L2e	NC-L3e	NC-M1e	NC-M2e	NC-M3e	NC-N1e	NC-N2e	NC-N3e			
SJSB061	6 to 8 ft bgs	NC-B-4	NC-O1e	NC-O2e	NC-P1e	NC-P2e	NC-P3e	NC-Q1e	NC-Q2e					
SJSB061-C1/SJSB060/ SJSB060-C1	6 to 8 ft bgs	NC-B-5	NC-W1e	NC-W2e	NC-W3e	NC-X1e	NC-X2e	NC-Y1e	NC-Y2e					

Notes:
The depth intervals are denoted as 'a' for 0 to 2 ft bgs, 'b' for 2 to 4 ft bgs, 'c' for 4 to 6 ft bgs, 'd' for 6 to 8 ft bgs, and 'e' for 8 to 10 ft bgs.
ft bgs = feet below ground surface

Table 3

South Central Excavation Area Confirmation Composite Samples
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

SC Overburden Confirmation Samples											
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**								
SJSB041	2 to 6 ft bgs	SC-O-1	SC-A1a	SC-A2a	SC-A3a	SC-A4a	SC-A5a				
		SC-O-2	SC-B1a	SC-B2a	SC-B3a	SC-B4a	SC-B5a				
SJSB019-N1/SJSB019-N2	4 to 8 ft bgs	SC-O-3	SC-C1a	SC-C1b	SC-C2a	SC-C2b	SC-C3a	SC-C3b			
		SC-O-4	SC-D1a	SC-D1b	SC-D2a	SC-D2b	SC-D3a	SC-D3b	SC-D4a	SC-D4b	
		SC-O-5	SC-E1a	SC-E1b	SC-E2a	SC-E2b	SC-E3a	SC-E3b			
SJSB019-W1	2 to 8 ft bgs	SC-O-6	SC-F1a	SC-F2a	SC-F3a	SC-F4a	SC-F5a				
SJSB019	8 to 10 ft bgs	SC-O-7	SC-G1a	SC-G1b	SC-G1c	SC-G1d	SC-G2a	SC-G2b	SC-G2c	SC-G2d	
SJSB019-E1	4 to 10 ft bgs	SC-O-8	SC-H1a	SC-H1b	SC-H2a	SC-H2b	SC-H3a	SC-H3b			
SJSB019-E2	4 to 6 ft bgs	SC-O-9	SC-I1a	SC-I1b	SC-I2a	SC-I2b	SC-I3a	SC-I3b			
		SC-O-10	SC-J1a	SC-J1b	SC-J2a	SC-J2b	SC-J3a	SC-J3b	SC-J4a	SC-J4b	
SJSB019-S1	4 to 6 ft bgs	SC-O-11	SC-K1a	SC-K1b	SC-K2a	SC-K2b	SC-K3a	SC-K3b	SC-K4a	SC-K4b	
SJSB019-S2	0 to 2 ft bgs	SC-O-12	SC-L1a	SC-L2b	SC-L3a	SC-L4b	SC-L5a				
		SC-O-13	SC-M1a	SC-M2b	SC-M3a	SC-M4b	SC-M5a				
SC Sidewall Confirmation Samples											
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**								
SJSB041	2 to 6 ft bgs	SC-S-1	SC-A1a	SC-A1b	SC-A1c	SC-A1d	SC-A1e				
		SC-S-2	SC-A2a	SC-A2b	SC-A2c	SC-A2d	SC-A2e				
		SC-S-3	SC-A3a	SC-A3b	SC-A3c	SC-A3d	SC-A3e				
		SC-S-4	SC-B1a	SC-B1b	SC-B1c	SC-B1d	SC-B1e				
		SC-S-5	SC-B2a	SC-B2b	SC-B2c	SC-B2d	SC-B2e				
		SC-S-6	SC-B3a	SC-B3b	SC-B3c	SC-B3d	SC-B3e				
SJSB019-N1/SJSB019-N2	4 to 8 ft bgs	SC-S-7	SC-C1a	SC-C1b	SC-C1c	SC-C1d	SC-C1e				
		SC-S-8	SC-D1a	SC-D1b	SC-D1c	SC-D1d	SC-D1e				
		SC-S-9	SC-D2a	SC-D2b	SC-D2c	SC-D2d	SC-D2e				
SJSB019-W1	2 to 8 ft bgs	SC-S-10	SC-F1a	SC-F1b	SC-F1c	SC-F1d	SC-F1e				
		SC-S-11	SC-F2a	SC-F2b	SC-F2c	SC-F2d	SC-F2e				
		SC-S-12	SC-F3a	SC-F3b	SC-F3c	SC-F3d	SC-F3e				
SJSB019-E2	4 to 6 ft bgs	SC-S-13	SC-I1a	SC-I1b	SC-I1c	SC-I1d	SC-I1e				
		SC-S-14	SC-J1a	SC-J1b	SC-J1c	SC-J1d	SC-J1e				
		SC-S-15	SC-J2a	SC-J2b	SC-J2c	SC-J2d	SC-J2e				
SJSB019-S1	4 to 6 ft bgs	SC-S-16	SC-K2a	SC-K2b	SC-K2c	SC-K2d	SC-K2e				
		SC-S-17	SC-K3a	SC-K3b	SC-K3c	SC-K3d	SC-K3e				
SC Bottom of Excavation Confirmation Samples											
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**								
SJSB041	2 to 6 ft bgs	SC-B-1	SC-A1d	SC-A2d	SC-A3d	SC-A4d	SC-A5d				
		SC-B-2	SC-B1d	SC-B2d	SC-B3d	SC-B4d	SC-B5d				
SJSB019-N1/SJSB019-N2	4 to 8 ft bgs	SC-B-3	SC-C1e	SC-C2e	SC-C3e	SC-E1e	SC-E2e				
		SC-B-4	SC-D1e	SC-D2e	SC-D3e	SC-D4e	SC-E3e				
SJSB019-W1	2 to 8 ft bgs	SC-B-5	SC-F1e	SC-F2e	SC-F3e	SC-F4e	SC-F5e				
SJSB019-E2	4 to 6 ft bgs	SC-B-6	SC-I1d	SC-I2d	SC-I3d	SC-J1d	SC-J2d	SC-J3d	SC-J4d		
SJSB019-S1	4 to 6 ft bgs	SC-B-7	SC-K1d	SC-K2d	SC-K3d	SC-K4d					

Notes:
The depth intervals are denoted as 'a' for 0 to 2 ft bgs, 'b' for 2 to 4 ft bgs, 'c' for 4 to 6 ft bgs, 'd' for 6 to 8 ft bgs, and 'e' for 8 to 10 ft bgs.
ft bgs = feet below ground surface

ED_014247_00001508-00062

Table 4

Southwest Excavation Area Confirmation Composite Samples
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

SW Overburden Confirmation Samples										
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**							
SJSB065-C1	2 to 8 ft bgs	SW-O-1	SW-A1a	SW-A2a	SW-A3a	SW-A4a	SW-A5a			
SJSB065	2 to 6 ft bgs	SW-O-2	SW-B1a	SW-B2a	SW-B3a	SW-B4a	SW-B5a			
SJSB066	2 to 4 ft bgs	SW-O-3	SW-D1a	SW-D2a	SW-D3a	SW-D4a	SW-D5a			
SJSB023-N1/SJSB023	2 to 6 ft bgs	SW-O-4	SW-E1a	SW-E2a	SW-E3a	SW-E4a	SW-G1a			
SJSB023-E1	4 to 6 ft bgs	SW-O-5	SW-H1a	SW-H1b	SW-H2a	SW-H2b	SW-H3a	SW-H3b	SW-H4b	
SJSB067	2 to 4 ft bgs	SW-O-6	SW-K1a	SW-K2a	SW-K3a	SW-K4a	SW-K5a			
		SW-O-7	SW-L1a	SW-L2a	SW-L3a	SW-L4a	SW-L5a			
SJSB025-N1/SJSB025-N2	2 to 8 ft bgs	SW-O-8	SW-M1a	SW-M2a	SW-M3a	SW-M4a	SW-M5a			
		SW-O-9	SW-N1a	SW-N2a	SW-N3a	SW-N4a	SW-N5a			
SJSB025/SJSB025-S1	2 to 6 ft bgs	SW-O-10	SW-O1a	SW-O2a	SW-O3a	SW-O4a	SW-O5a			
SW Sidewall Confirmation Samples										
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**							
SJSB065-C1	2 to 8 ft bgs	SW-S-1	SW-A1a	SW-A1b	SW-A1c	SW-A1d	SW-A1e			
SJSB065	2 to 6 ft bgs	SW-S-2	SW-A2a	SW-A2b	SW-A2c	SW-A2d	SW-A2e			
		SW-S-3	SW-B1a	SW-B1b	SW-B1c	SW-B1d	SW-B1e			
		SW-S-4	SW-B2a	SW-B2b	SW-B2c	SW-B2d	SW-B2e			
SJSB023-W2	0 to 6 ft bgs	SW-S-5	SW-C1a	SW-C1b	SW-C1c	SW-C1d	SW-C1e			
SJSB066	2 to 4 ft bgs	SW-S-6	SW-D1a	SW-D1b	SW-D1c	SW-D1d				
		SW-S-7	SW-D2a	SW-D2b	SW-D2c	SW-D2d				
SJSB023-N1	2 to 6 ft bgs	SW-S-8	SW-E1a	SW-E1b	SW-E1c	SW-E1d	SW-E1e			
		SW-S-9	SW-E2a	SW-E2b	SW-E2c	SW-E2d	SW-E2e			
		SW-S-10	SW-E3a	SW-E3b	SW-E3c	SW-E3d	SW-E3e			
SJSB023-E1	4 to 6 ft bgs	SW-S-11	SW-H1a	SW-H1b	SW-H1c	SW-H1d	SW-H1e			
		SW-S-12	SW-H2a	SW-H2b	SW-H2c	SW-H2d	SW-H2e			
SJSB023-S1	0 to 6 ft bgs	SW-S-13	SW-I1a	SW-I1b	SW-I1c	SW-I1d	SW-I1e			
SJSB023-S2	0 to 4 ft bgs	SW-S-14	SW-J1a	SW-J1b	SW-J1c	SW-J1d				
SJSB067	2 to 4 ft bgs	SW-S-15	SW-K1a	SW-K1b	SW-K1c	SW-K1d				
		SW-S-16	SW-K2a	SW-K2b	SW-K2c	SW-K2d				
		SW-S-17	SW-L1a	SW-L1b	SW-L1c	SW-L1d				
		SW-S-18	SW-L2a	SW-L2b	SW-L2c	SW-L2d				
		SW-S-19	SW-L3a	SW-L3b	SW-L3c	SW-L3d				
SJSB025-N1/SJSB025-N2	2 to 8 ft bgs	SW-S-20	SW-M1a	SW-M1b	SW-M1c	SW-M1d	SW-M1e			
		SW-S-21	SW-M2a	SW-M2b	SW-M2c	SW-M2d	SW-M2e			
		SW-S-22	SW-M3a	SW-M3b	SW-M3c	SW-M3d	SW-M3e			
		SW-S-23	SW-N1a	SW-N1b	SW-N1c	SW-N1d	SW-N1e			
		SW-S-24	SW-N2a	SW-N2b	SW-N2c	SW-N2d	SW-N2e			
SJSB025/SJSB025-S1	2 to 6 ft bgs	SW-S-25	SW-O1a	SW-O1b	SW-O1c	SW-O1d	SW-O1e			
		SW-S-26	SW-O3a	SW-O3b	SW-O3c	SW-O3d	SW-O3e			
		SW-S-27	SW-O4a	SW-O4b	SW-O4c	SW-O4d	SW-O4e			
SW Bottom of Excavation Confirmation Samples										
Polygon	**Impacted Zone**	**Composite Sample ID**	**Discrete Samples**							
SJSB065-C1	2 to 8 ft bgs	SW-B-1	SW-A1e	SW-A2e	SW-A3e	SW-A4e	SW-A5e			
SJSB065	2 to 6 ft bgs	SW-B-2	SW-B1d	SW-B2d	SW-B3d	SW-B4d	SW-B5d			
SJSB023-W2	0 to 6 ft bgs	SW-B-3	SW-C1d	SW-C2d	SW-C3d	SW-C4d	SW-C5d			
SJSB066	2 to 4 ft bgs	SW-B-4	SW-D1c	SW-D2c	SW-D3c	SW-D4c	SW-D5c			
SJSB023-N1/SJSB023-E1	2/4 to 6 ft bgs	SW-B-5	SW-E1d	SW-E2d	SW-E3d	SW-E4d	SW-H1d	SW-H2d	SW-H3d	SW-H4b
SJSB023-W1/SJSB023/ SJSB023-S1	0/2 to 6 ft bgs	SW-B-6	SW-F1d	SW-F2d	SW-G1d	SW-I1d	SW-I2d			
SJSB023-S2	0 to 4 ft bgs	SW-B-7	SW-J1c	SW-J2c	SW-J3c	SW-J4c	SW-J5c			
SJSB067	2 to 4 ft bgs	SW-B-8	SW-K1c	SW-K2c	SW-K3c	SW-K4c	SW-K5c			
		SW-B-9	SW-L1c	SW-L2c	SW-L3c	SW-L4c	SW-L5c			
SJSB025-N1/SJSB025-N2	2 to 8 ft bgs	SW-B-10	SW-M1e	SW-M2e	SW-M3e	SW-M4e	SW-M5e			
		SW-B-11	SW-N1e	SW-N2e	SW-N3e	SW-N4e	SW-N5e			
SJSB025/SJSB025-S1	2 to 6 ft bgs	SW-B-12	SW-O1d	SW-O2d	SW-O3d	SW-O4d	SW-O5d			

Notes:

The depth intervals are denoted as 'a' for 0 to 2 ft bgs, 'b' for 2 to 4 ft bgs, 'c' for 4 to 6 ft bgs, 'd' for 6 to 8 ft bgs, and 'e' for 8 to 10 ft bgs.
ft bgs = feet below ground surface

ED_014247_00001508-00063

Waste Characterization Samples
Pre-Construction Field Sampling Plan
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

Area	Polygon	Boring	Interval (ft bgs)	Analysis
Northeast	SJSB012-N2	NE-D1	6 - 8	RCRA Hazardous Waste Parameters
Northeast	SJSB012-W2	NE-G4	4 - 6	RCRA Hazardous Waste Parameters
North Central	SJSB008-S2	NC-E2	8 - 10	RCRA Hazardous Waste Parameters
North Central	SJSB060	NC-Y2	6 - 8	RCRA Hazardous Waste Parameters
South Central	SJSB041	SC-B4	2 - 4	RCRA Hazardous Waste Parameters
Southwest	SJSB065	SW-B4	2 - 4	RCRA Hazardous Waste Parameters

Notes:
ft bgs = feet below ground surface
RCRA = Resource Conservation and Recovery Act

RCRA TCLP Regulatory Levels
Pre-Construction Field Sampling Plan
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

Analysis	Units	EPA Regulatory Limits
General Chemistry		
Flash Point	°C	>60
Percent solids	%	--
pH, lab	s.u.	>2 or <12
Reactive cyanide	mg/kg	--
Reactive sulfide	mg/kg	--
Sulfur	mg/kg	--
TCLP-Herbicides		
2,4,5-TP (Silvex)	mg/L	1.0
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	10.0
TCLP-Metals		
Arsenic	mg/L	5.0
Barium	mg/L	100.0
Cadmium	mg/L	1.0
Chromium	mg/L	5.0
Lead	mg/L	5.0
Mercury	mg/L	0.2
Selenium	mg/L	1.0
Silver	mg/L	5.0
TCLP-Pesticides		
Chlordane	mg/L	0.03
Endrin	mg/L	0.02
gamma-BHC (lindane)	mg/L	0.4
Heptachlor	mg/L	0.008
Heptachlor epoxide	mg/L	0.008
Methoxychlor	mg/L	10.0
Toxaphene	mg/L	0.5
TCLP-Semi-Volatile Organic Compounds (SVOCs)		
o-Cresol	mg/L	200.0
m-Cresol	mg/L	200.0
p-Cresol	mg/L	200.0
Total Cresol[1]	mg/L	200.0
2,4,5-Trichlorophenol	mg/L	400.0
2,4,6-Trichlorophenol	mg/L	2.0
2,4-Dinitrotoluene	mg/L	0.13
Hexachlorobenzene	mg/L	0.13
Hexachlorobutadiene	mg/L	0.5
Hexachloroethane	mg/L	3.0
Nitrobenzene	mg/L	2.0
Pentachlorophenol	mg/L	100.0
Pyridine	mg/L	5.0
TCLP-Volatile Organic Compounds (VOCs)		
1,1-Dichloroethylene	mg/L	0.7
1,2-Dichloroethane	mg/L	0.5
1,4-Dichlorobenzene	mg/L	7.5
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	200.0
Benzene	mg/L	0.5
Carbon tetrachloride	mg/L	0.5
Chlorobenzene	mg/L	100.0
Chloroform (Trichloromethane)	mg/L	6.0
Tetrachloroethylene	mg/L	0.7
Trichloroethylene	mg/L	0.5
Vinyl chloride	mg/L	0.2

Notes:
TCLP - Toxicity Characteristic Leaching Procedure
mg/L - milligrams per Liter
mg/kg - milligram per kilogram
Deg F - Degrees in Fahrenheit
s.u. - standard unit
[1] If o, m, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

Class 2 Landfill TCLP Regulatory Levels
Pre-Construction Field Sampling Plan
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

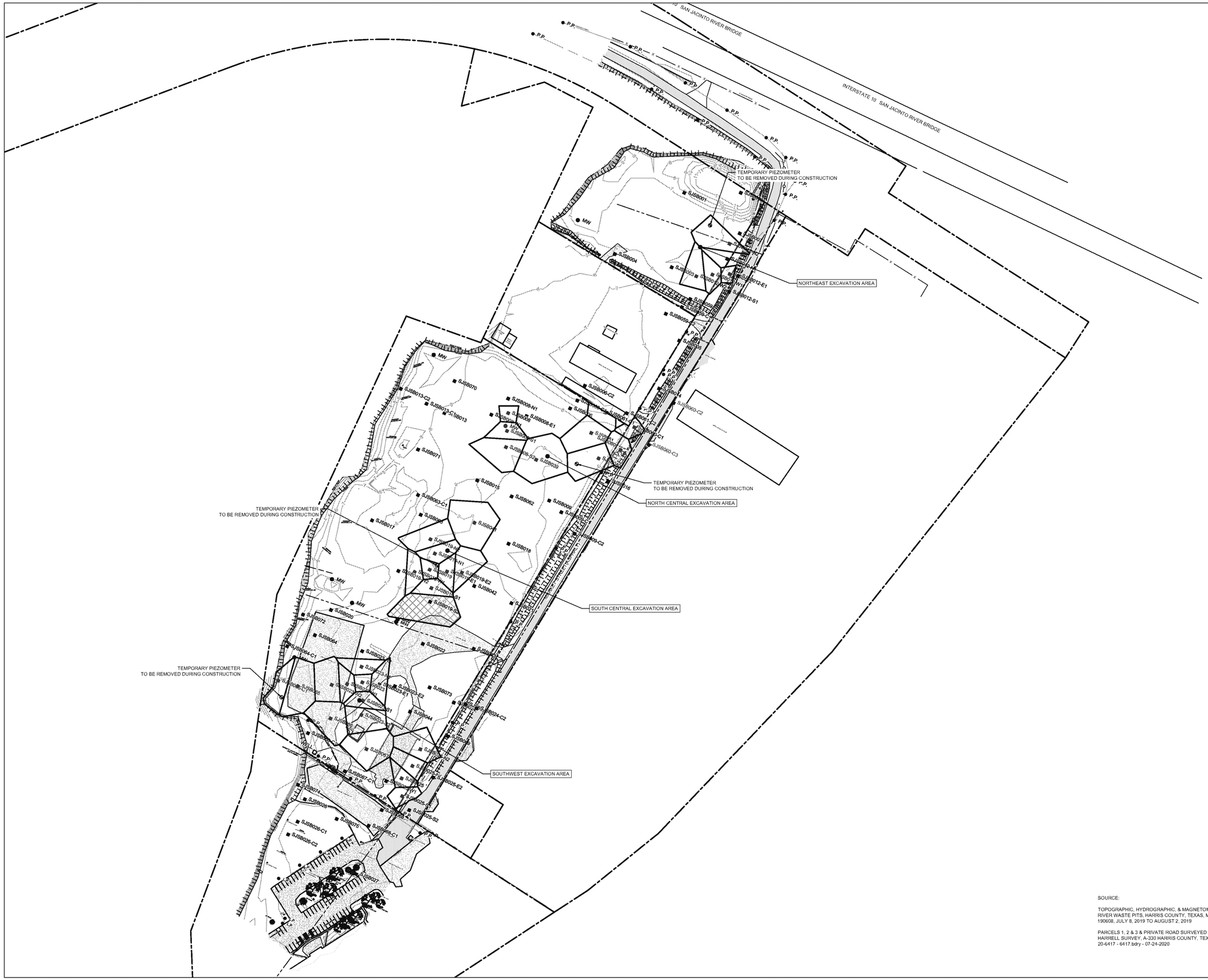
Analyte	Regulatory Level for Class 2 Landfill (mg/L)	Analytical Method Name	Analytical Method Number
Acenaphthene	210	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Acetone	400	TCLP VOC	EPA-SW846-1311/8260D/5030B
Acetonitrile	20	TCLP VOC	EPA-SW846-1311/8260D/5030B
Acetophenone	400	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Acrylamide	0.08	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Acrylonitrile	0.6	TCLP VOC	EPA-SW846-1311/8260D/5030B
Aniline	60	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Anthracene	1050	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Antimony	1	TCLP Metals	EPA-SW846-1311/6010D/3010A
Arsenic	1.8	TCLP Metals	EPA-SW846-1311/6010D/3010A
Barium	100	TCLP Metals	EPA-SW846-1311/6010D/3010A
Benzene	0.5	TCLP VOC	EPA-SW846-1311/8260D/5030B
Benzidine	0.002	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Beryllium	0.08	TCLP Metals	EPA-SW846-1311/6010D/3010A
Bis(2-chloroethyl)ether	0.3	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Bis(2-ethylhexyl)phthalate	30	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Bromodichloromethane	0.3	TCLP VOC	EPA-SW846-1311/8260D/5030B
Bromomethane	5	TCLP VOC	EPA-SW846-1311/8260D/5030B
Butylbenzyl phthalate	700	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Cadmium	0.5	TCLP Metals	EPA-SW846-1311/6010D/3010A
Carbon disulfide	400	TCLP VOC	EPA-SW846-1311/8260D/5030B
Carbon tetrachloride	0.5	TCLP VOC	EPA-SW846-1311/8260D/5030B
Chlordane	0.03	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Chlorobenzene	70	TCLP VOC	EPA-SW846-1311/8260D/5030B
Chloroform	6	TCLP VOC	EPA-SW846-1311/8260D/5030B
Chloro-m-cresol, p	7000	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2-Chlorophenol	20	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Chromium	5	TCLP Metals	EPA-SW846-1311/6010D/3010A
m-Cresol	200*	TCLP SVOC	EPA-SW846-1311/8270E/3510C
o-Cresol	200*	TCLP SVOC	EPA-SW846-1311/8270E/3510C
p-Cresol	200*	TCLP SVOC	EPA-SW846-1311/8270E/3510C
DDD	1	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
DDE	1	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
DDT	1	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Dibutyl Phthalate	400	TCLP SVOC	EPA-SW846-1311/8270E/3510C
1,4-Dichlorobenzene	7.5	TCLP VOC	EPA-SW846-1311/8260D/5030B
3,3-Dichlorobenzidine	0.8	TCLP SVOC	EPA-SW846-1311/8270E/3510C
1,2-Dichloroethane	0.5	TCLP VOC	EPA-SW846-1311/8260D/5030B
Dichlorodifluoromethane	700	TCLP VOC	EPA-SW846-1311/8260D/5030B
1,1-Dichloroethylene	0.6	TCLP VOC	EPA-SW846-1311/8260D/5030B
1,3-Dichloropropene	1	TCLP VOC	EPA-SW846-1311/8260D/5030B
2,4-Dichlorophenol	10	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2,4-Dichlorophenoxy-Acetic Acid (2.4-D)	10	TCLP Herbicides	EPA-SW846-1311/8151A/3510C
Dieldrin	0.02	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Diethyl phthalate	3000	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Dimethoate	70	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2,4-Dimethylphenol	70	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2,6-Dimethylphenol	21	TCLP SVOC	EPA-SW846-1311/8270E/3510C
m-Dinitrobenzene	0.4	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2,4-Dinitrophenol	7	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2,4 -Dinitrotoluene and 2,6-mixture	0.13	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Dinoseb	3.5	TCLP Herbicides	EPA-SW846-1311/8151A/3510C
1,4-Dioxane	30	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Dioxins (Poly chlorinated dibenzo-p-dioxins)			
2,3,7,8-TCDD	0.005	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,7,8-PeCDD	0.01	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,4,7,8-HxCDD	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,6,7,8-HxCDD	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,7,8,9-HxCDD	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
Diphenylamine	90	TCLP SVOC	EPA-SW846-1311/8270E/3510C
1,2-Diphenylhydrazine	0.4	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Disulfoton	0.1	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Endosulfan	0.2	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Endrin	0.02	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
2-Ethoxyethanol	1400	TCLP Nonhalogenated Organic	EPA-SW846-1311/8015
Ethylbenzene	400	TCLP VOC	EPA-SW846-1311/8260D/5030B
Ethylene Dibromide	0.004	TCLP VOC	EPA-SW846-1311/8260D/5030B
Ethylene Glycol	7000	TCLP Nonhalogenated Organic	EPA-SW846-1311/8015
Fluoranthene	140	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Fluorene	140	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Furans (Polychlorinated dibenzo furans)			
2,3,7,8-TCDF	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,7,8-PeCDF	0.1	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific

ED_014247_00001508-00066

Class 2 Landfill TCLP Regulatory Levels
Pre-Construction Field Sampling Plan
Southern Impoundment - San Jacinto River Waste Pits Site
Harris County, Texas

Analyte	Regulatory Level for Class 2 Landfill (mg/L)	Analytical Method Name	Analytical Method Number
2,3,4,7,8-PeCDF	0.01	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,4,7,8-HxCDF	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,6,7,8-HxCDF	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
1,2,3,7,8,9-HxCDF	0.05	TCLP Dioxins/Furans	EPA-1311/1613B/3510C HRMS Specific
Heptachlor and its hydroxide	0.008	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Heptachlor Epoxide	0.04	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Hexachlorobenzene	0.13	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Hexachloro-1,3-butadiene	0.4	TCLP VOC	EPA-SW846-1311/8260D/5030B
Hexachlorocyclopentadiene	20	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Hexachloroethane	3	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Hexachlorophene	1	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Isobutyl alcohol	1000	TCLP VOC	EPA-SW846-1311/8260D/5030B
Isophorone	90	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Lead	1.5	TCLP Metals	EPA-SW846-1311/6010D/3010A
Lindane	0.3	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Mercury	0.2	TCLP Metals	EPA-SW846-1311/6010D/3010A/7470A
Methacrylonitrile	0.4	TCLP VOC	EPA-SW846-1311/8260D/5030B
Methomyl	90	TCLP HPLC/TS/MS or UV	EPA-SW846-1311/8321
Methoxychlor	10	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
2-Methoxyethanol	14	TCLP Nonhalogenated Organic	EPA-SW846-1311/8015
Methyl Ethyl Ketone	200	TCLP VOC	EPA-SW846-1311/8260D/5030B
Methyl Isobutyl Ketone	200	TCLP VOC	EPA-SW846-1311/8260D/5030B
Methylene chloride	50	TCLP VOC	EPA-SW846-1311/8260D/5030B
Methyl parathion	0.9	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Mirex	0.7	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
Nickel	70	TCLP Metals	EPA-SW846-1311/6010D/3010A
Nitrobenzene	2	TCLP SVOC	EPA-SW846-1311/8270E/3510C
N-Nitroso-di-n-butylamine	0.06	TCLP SVOC	EPA-SW846-1311/8270E/3510C
N-Nitrosodiphenylamine	70	TCLP SVOC	EPA-SW846-1311/8270E/3510C
N-Nitrosomethylethylamine	0.02	TCLP SVOC	EPA-SW846-1311/8270E/3510C
N-Nitroso-n-propylamine	0.05	TCLP SVOC	EPA-SW846-1311/8270E/3510C
N-Nitrosopyrrolidine	0.2	TCLP SVOC	EPA-SW846-1311/8270E/3510C
p-Phenylene diamine	20	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Parathion	20	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Pentachlorobenzene	3	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Pentachloronitrobenzene	10	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Pentachlorophenol	100	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Phenol	2000	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Pronamide	300	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Pyrene	5.9	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Pyridine	4	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Selenium	1	TCLP Metals	EPA-SW846-1311/6010D/3010A
Silver	5	TCLP Metals	EPA-SW846-1311/6010D/3010A
Styrene	700	TCLP VOC	EPA-SW846-1311/8260D/5030B
1,1,1,2-Tetrachloroethane	10	TCLP VOC	EPA-SW846-1311/8260D/5030B
1,1,2,2-Tetrachloroethane	2	TCLP VOC	EPA-SW846-1311/8260D/5030B
Tetrachloroethylene	0.7	TCLP VOC	EPA-SW846-1311/8260D/5030B
2,3,4,6-Tetrachlorophenol	100	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Toluene	1000	TCLP VOC	EPA-SW846-1311/8260D/5030B
Total Petroleum Hydrocarbons (TPH	1500	Total TPH	TX1005
Toxaphene	0.3	TCLP Pesticides	EPA-SW846-1311/8081B/3510C
trans-1,3-Dichloro-propene	1	TCLP VOC	EPA-SW846-1311/8260D/5030B
Tribromomethane (bromoform)	70	TCLP VOC	EPA-SW846-1311/8260D/5030B
1,2,4-Trichlorobenzene	70	TCLP SVOC	EPA-SW846-1311/8270E/3510C
1,1,1-Trichloroethane	300	TCLP VOC	EPA-SW846-1311/8260D/5030B
Trichloroethylene	0.5	TCLP VOC	EPA-SW846-1311/8260D/5030B
1,1,2-Trichloroethane	6	TCLP VOC	EPA-SW846-1311/8260D/5030B
Trichlorofluoromethane	1000	TCLP VOC	EPA-SW846-1311/8260D/5030B
2,4,5-Trichlorophenoxy-propionic acid (2.4.5-TP or Silvex)	1	TCLP Herbicides	EPA-SW846-1311/8151A/3510C
1,2,3-Trichloropropane	20	TCLP VOC	EPA-SW846-1311/8260D/5030B
2,4,5-Trichlorophenol	400	TCLP SVOC	EPA-SW846-1311/8270E/3510C
2,4,6-Trichlorophenol	2	TCLP SVOC	EPA-SW846-1311/8270E/3510C
Vanadium Pentoxide	30	TCLP Metals	EPA-SW846-1311/6010D/3010A
Vinyl chloride	0.2	TCLP VOC	EPA-SW846-1311/8260D/5030B
Xylenes (all isomers)	7000	TCLP VOC	EPA-SW846-1311/8260D/5030B

Notes:
TCLP - Toxicity Characteristic Leaching Procedure
VOC - Volatile Organic Carbon
SVOC - Semi-Volatile Organic Carbon
mg/L - milligrams per liter
*If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used. The Maximum Concentration for total cresol is 200.0 mg/L.



GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2020 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- 620 EXISTING CONTOUR INTERVAL
- X FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OHE OVERHEAD ELECTRICAL
- GUARDRAIL
- UE UNDERGROUND CCTV LINE
- SJSB002 PDIRI BORING LOCATION
- MW MONITORING WELL
- P.P. POWER POLE
- L.P. LIGHT POLE
- WELL WELL
- AREA OF IMPACT
- AREA OF POTENTIAL VOLUNTARY EXCAVATION
- ASPHALT
- CONCRETE
- GRAVEL

Client
SAN JACINTO RIVER WASTE PITS

Project
SOUTHERN IMPOUNDMENT PRE-CONSTRUCTION FIELD SAMPLING PLAN HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date

Drawn MW	Designer RH
Drafting Check BP	Design Check LL
Project Coordinator CM	Date Dec 16, 2020
This document shall not be used for construction unless signed and sealed for construction.	Scale 1" = 100'
Original Size Arch D	Bar is one inch on original size drawing 0 1"

Project No. 11215131

Title
OVERALL SITE PLAN

Sheet No.
FIGURE 1

Sheet 1 of 17

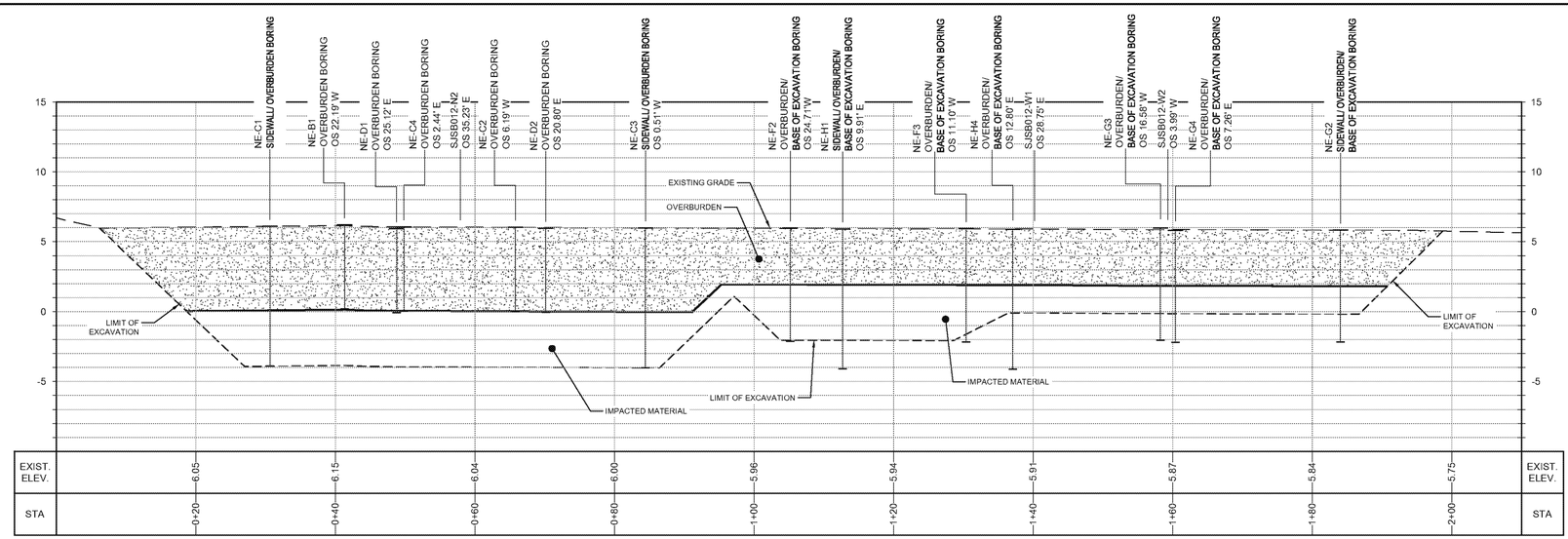
SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

Plot Date: 16 December 2020 - 1:10 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Figures\11215131-02-DWG-G-201.dwg

PLAN
1" = 10'



SECTION A
HORIZ: 1"=10'
VERT: 1"=5'
FIG. 2

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2020 GHD

LEGEND
- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- SJSB012 PDVR/ BORING LOCATION
- MW MONITORING WELL
- P.P. POWER POLE
- L.P. LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- POLYGON LIMITS (WITH ADDITIONAL SIDE SLOPE AREAS)
- SAMPLING GRIDS (~500 CY) WITHIN POLYGONS
- PRE-CONSTRUCTION SIDEWALL/ OVERBURDEN CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION OVERBURDEN CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
SOUTHERN IMPOUNDMENT PRE-CONSTRUCTION FIELD SAMPLING PLAN HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Dec 16, 2020
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 10'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. **11215131**

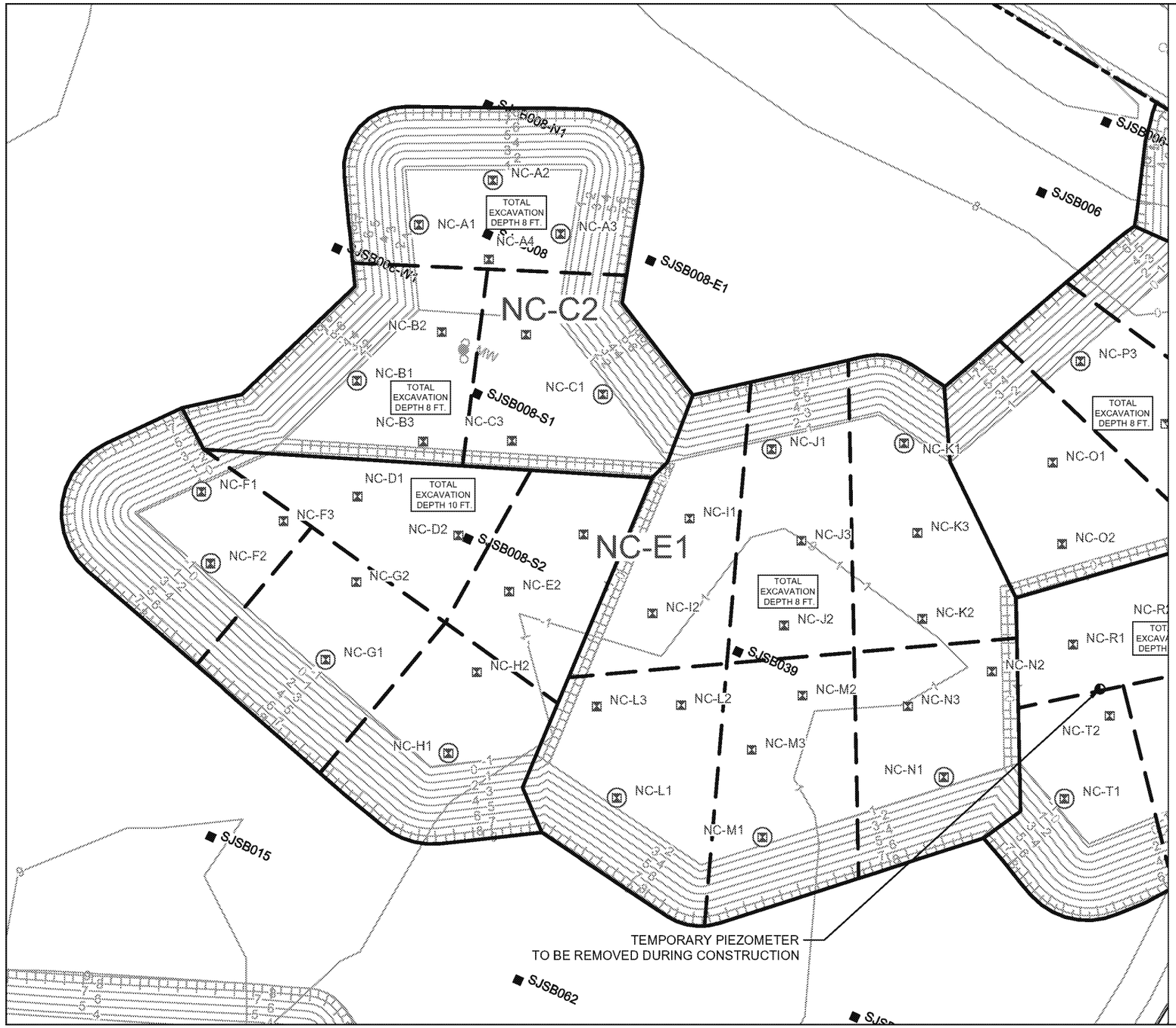
Title
NORTHEAST EXCAVATION AREA OVERBURDEN SAMPLING PLAN AND SECTION

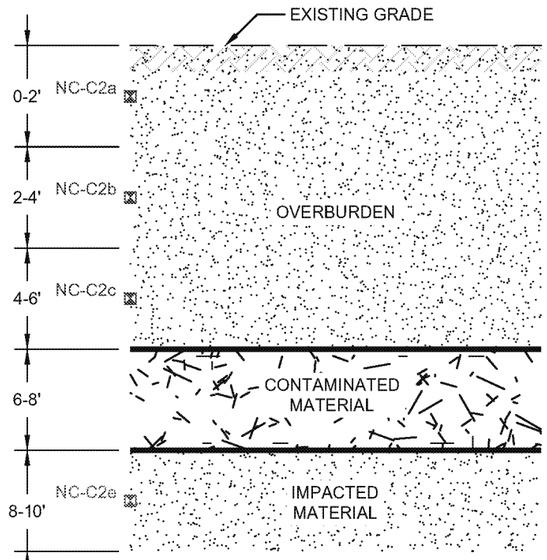
Sheet No.
FIGURE 2

Sheet 2 of 17

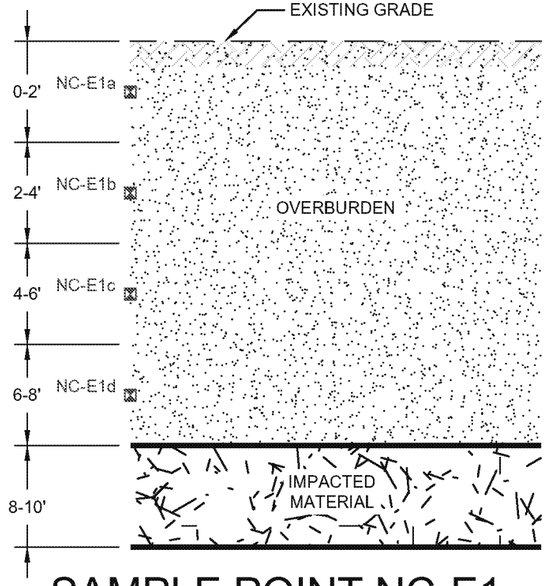
Plot Date: 16 December 2020 - 1:11 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Figures\11215131-02-DWG-G-202.dwg

ED_014247_00001508-00069





SAMPLE POINT NC-C2



SAMPLE POINT NC-E1

0 15 30ft

LEGEND

- POLYGON LIMITS (WITH ADDITIONAL SIDE SLOPE AREAS)
- SAMPLING GRIDS (~500 CY) WITHIN POLYGONS
- SJSB002 PDI/RI BORING LOCATION
- POLYGONS WITH IMPACTED SOILS AT DEPTH
- PRE-CONSTRUCTION SIDEWALL BORING LOCATIONS (SAMPLES COLLECTED EVERY 2 FEET, COMPOSITE TO BOTTOM OF EXCAVATION)
- PRE-CONSTRUCTION OVERBURDEN CONFIRMATION BORING LOCATIONS (COMPOSITE SAMPLES COLLECTED OVER SAMPLING GRID)
- BOTTOM OF EXCAVATION CONFIRMATION SAMPLE
- EXC. EXCAVATION
- PDI PRE-DESIGN INVESTIGATION
- RI REMEDIAL INVESTIGATION

SAN JACINTO RIVER WASTE PITS
SOUTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS

11215131
Dec 16, 2020

PRE-CONSTRUCTION FIELD SAMPLING PLAN CONFIRMATION SAMPLING EXAMPLE CROSS-SECTIONS

FIGURE 3

CAD File: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Figures\11215131-02-DWG-G-204.dwg

Notes:
PDI = Pre-Design Investigation
1) For the areas requiring soil removal near Market Street and the Glendale Boat Works, Inc. property, the lateral limits of the excavation will extend immediately up to Market Street and the Glendale Boat Works, Inc. property limits however; the excavation will not extend into either the street or onto the Glendale Boat Works, Inc. property.
2) For the areas requiring soil removal on the southwest portion of the Southern Impoundment, a bulkhead will be installed adjacent to the San Jacinto River. Excavation will be completed up to the lateral limit of the bulkhead.
3) A survey will be conducted to confirm the boundaries of the Market Street right-of-way, Glendale Boat Works property and other properties necessary to implement the design.

Source: Image ©2021 Google, Imagery date: 10/28/2017

0 62.5 125
Feet

Coordinate System:
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

SAN JACINTO RIVER WASTE PITS SITE
SOUTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS
PRE-CONSTRUCTION FIELD SAMPLING PLAN

11215131
Oct 5, 2021

WASTE CHARACTERIZATION SAMPLING LOCATIONS

FIGURE 4

GIS File: I:\GIS\GIS\Projects\11200000s\11215131\Layouts\REPORT005\11215131-00(REPORT_005)GIS-BR001.mxd

Attachments

Attachment A

Pre-Construction Confirmation Borings Drawings

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS. MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132026
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDIRI BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- POLYGON LIMITS (WITH ADDITIONAL SIDE SLOPE AREAS)
- SAMPLING GRIDS (~500 CY) WITHIN POLYGONS
- PRE-CONSTRUCTION SIDEWALL/ OVERBURDEN CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION OVERBURDEN CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. **11215131**

Title
NORTHEAST EXCAVATION AREA OVERBURDEN SAMPLING PLAN

Sheet No.
C-07

Sheet 8 of 49

Plot Date: 15 April 2021 - 6:49 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-023.dwg

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-320 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132028
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDIRI BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- PRE-CONSTRUCTION SIDEWALL CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. 11215131

Title
NORTHEAST EXCAVATION AREA SIDEWALL SAMPLING PLAN

Sheet No.
C-08

Sheet 9 of 49

Plot Date: 15 April 2021 - 1:13 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-026.dwg

ED_014247_00001508-00075

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.

JOB NO. 11215131 FILE NO. 02

GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCKERO
132028
LICENSED
PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDIPI BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- SAMPLING GRIDS (MAX. 500 CY)
- PRE-CONSTRUCTION SIDEWALL/ BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. **11215131**

Title
NORTHEAST EXCAVATION AREA BOTTOM OF EXCAVATION SAMPLING PLAN

Sheet No.
C-09

Sheet 10 of 49

Plot Date: 15 April 2021 - 6:50 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\56\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-027.dwg

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS. MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdy - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132028
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- SJSB002 PDIRI BORING LOCATION
- MW MONITORING WELL
- P.P POWER POLE
- L.P. LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- POLYGON LIMITS (WITH ADDITIONAL SIDE SLOPE AREAS)
- SAMPLING GRIDS (~500 CY) WITHIN POLYGONS
- PRE-CONSTRUCTION SIDEWALL/ OVERBURDEN CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION OVERBURDEN CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. **11215131**

Title
NORTH CENTRAL EXCAVATION AREA OVERBURDEN SAMPLING PLAN

Sheet No.
C-15

Sheet 16 of 49

Plot Date: 15 April 2021 - 12:44 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\58\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-017.dwg

ED_014247_00001508-00077

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132028
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDVR BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- **EXCAVATION CONTOUR INTERVAL**
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- **PRE-CONSTRUCTION SIDEWALL CONFIRMATION BORING LOCATIONS**

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. 11215131

Title
NORTH CENTRAL EXCAVATION AREA SIDEWALL SAMPLING PLAN

Sheet No.
C-16

Sheet 17 of 49

Plot Date: 15 April 2021 - 6:47 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-021.dwg

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132026
LICENSED
PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDVR BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- SAMPLING GRIDS (MAX. 500 CY)
- PRE-CONSTRUCTION SIDEWALL/ BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. 11215131

Title
NORTH CENTRAL EXCAVATION AREA BOTTOM OF EXCAVATION SAMPLING PLAN

Sheet No.
C-17

Sheet 18 of 49

Plot Date: 15 April 2021 - 6:48 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-022.dwg

ED_014247_00001508-00079

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132025
LICENSED
PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- POINT BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- AREA OF POTENTIAL VOLUNTARY EXCAVATION
- ASPHALT
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- POLYGON LIMITS (WITH ADDITIONAL SIDE SLOPE AREAS)
- SAMPLING GRIDS (~500 CY) WITHIN POLYGONS
- PRE-CONSTRUCTION SIDEWALL OVERBURDEN CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION OVERBURDEN CONFIRMATION BORING LOCATIONS

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS. MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. 11215131

Title
SOUTH CENTRAL EXCAVATION AREA OVERBURDEN SAMPLING PLAN

Sheet No.
C-23

Sheet 24 of 49

Plot Date: 15 April 2021 - 1:22 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-028.dwg

ED_014247_00001508-00080

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOGICERO
132023
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- 520 EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- SJSB002 PDIRI BORING LOCATION
- MW MONITORING WELL
- P.P. POWER POLE
- L.P. LIGHT POLE
- WELL
- AREA OF IMPACT
- **AREA OF POTENTIAL VOLUNTARY EXCAVATION**
- ASPHALT
- CONCRETE
- GRAVEL
- **520 EXCAVATION CONTOUR INTERVAL**
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- **PRE-CONSTRUCTION SIDEWALL CONFIRMATION BORING LOCATIONS**

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

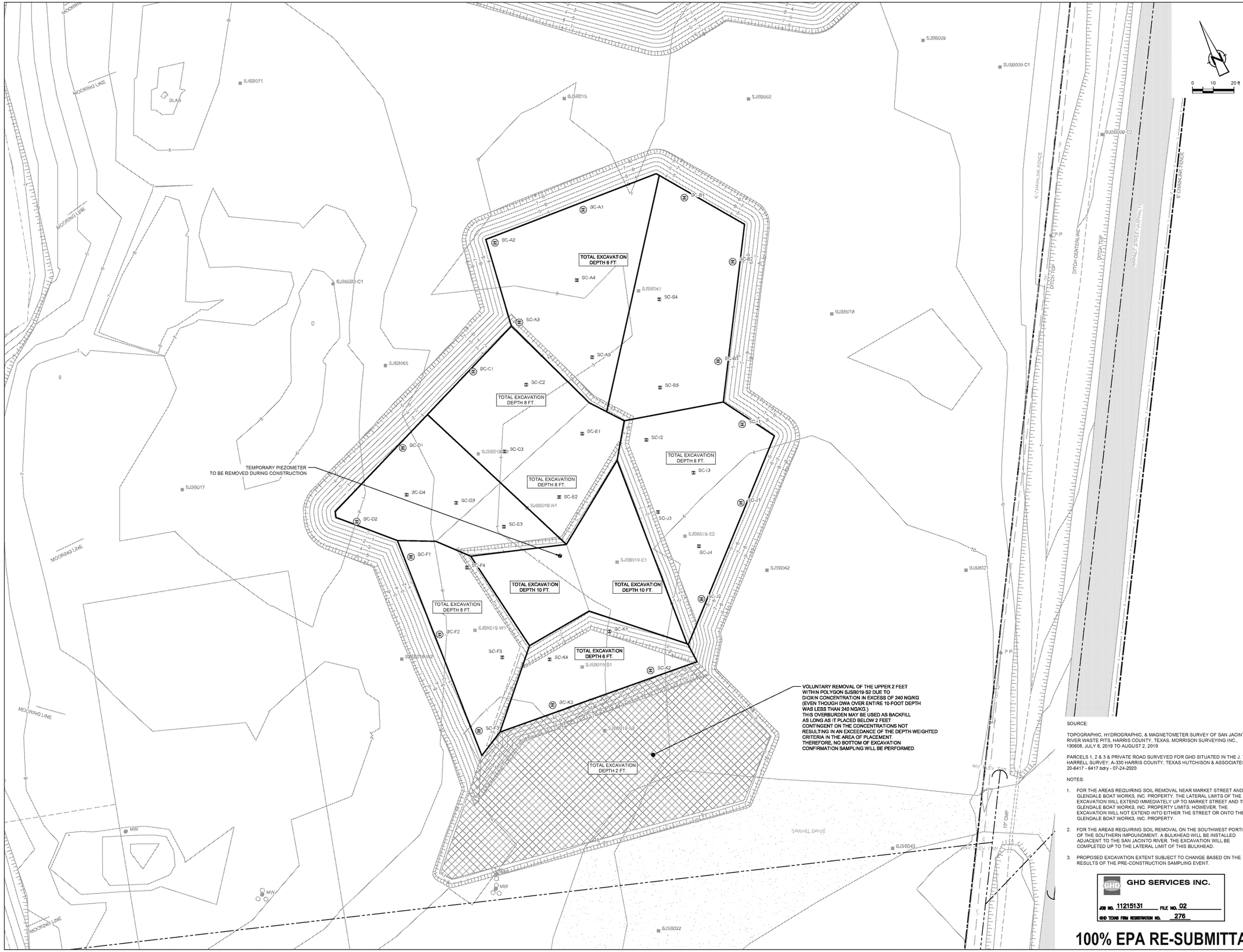
Project No. **11215131**

Title
SOUTH CENTRAL EXCAVATION AREA SIDEWALL SAMPLING PLAN

Sheet No.
C-24

Sheet 25 of 49

ED_014247_00001508-00081



SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132028
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDIRI BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- AREA OF POTENTIAL VOLUNTARY EXCAVATION
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- SAMPLING GRIDS (MAX. 500 CY)
- PRE-CONSTRUCTION SIDEWALL/ BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

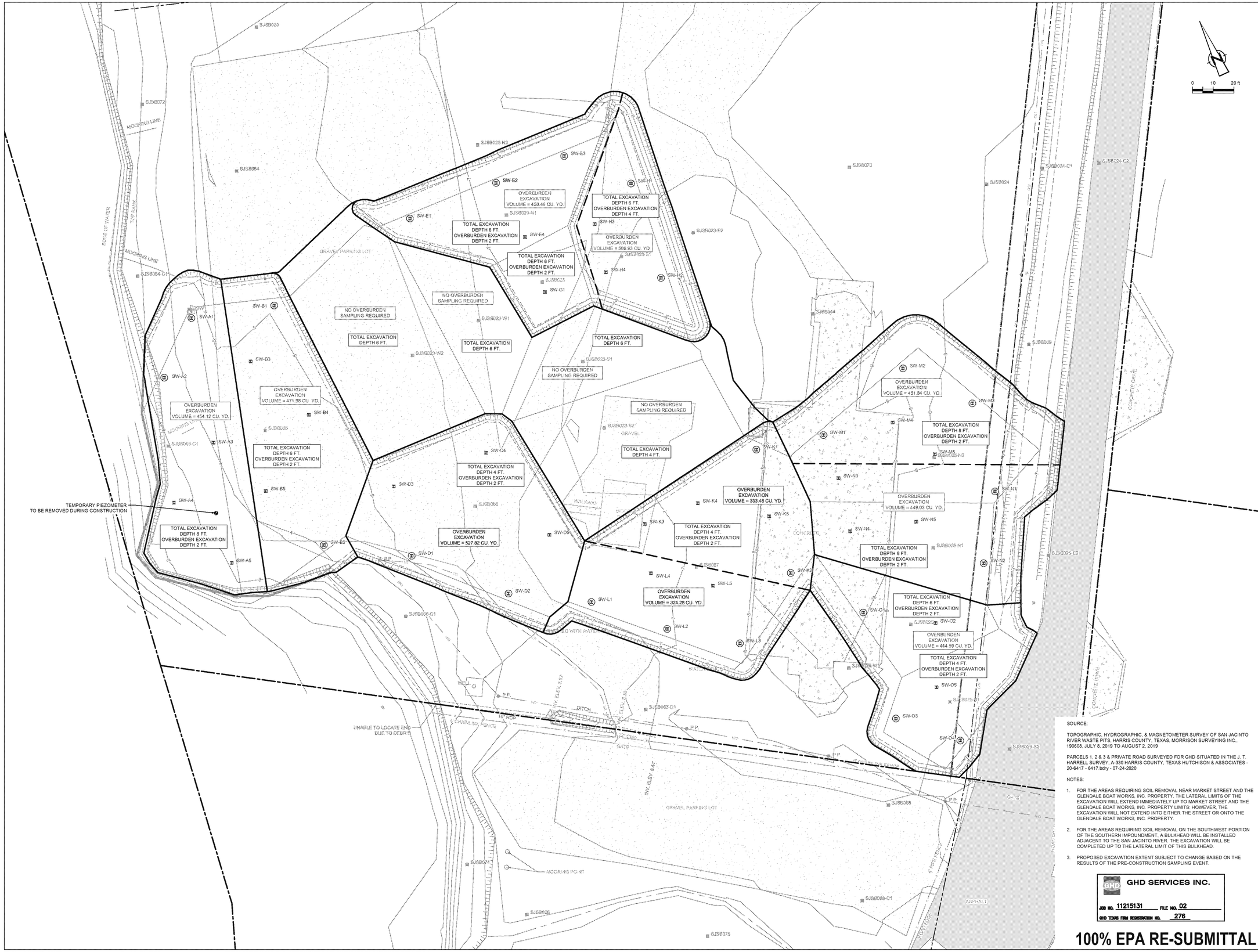
Project No. 11215131

Title
SOUTH CENTRAL EXCAVATION AREA BOTTOM OF EXCAVATION SAMPLING PLAN

Sheet No.
C-25

Sheet 26 of 49

Plot Date: 15 April 2021 - 7:05 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-033.dwg



Plot Date: 15 April 2021 - 7:04 PM | Plotted By: Matt Wolfer | Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-034.dwg

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132028
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- 520 EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- SJSB022 POURI BORING LOCATION
- MW MONITORING WELL
- P.P. POWER POLE
- L.P. LIGHT POLE
- WELL WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- 520 EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF SLOPE
- EXCAVATION TOE OF SLOPE
- POLYGON LIMITS (WITH ADDITIONAL SIDE SLOPE AREAS)
- SAMPLING GRIDS (~500 CY) WITHIN POLYGONS
- SW-E3 PRE-CONSTRUCTION SIDEWALL / OVERBURDEN CONFIRMATION BORING LOCATIONS
- SJSB023-N2 PRE-CONSTRUCTION OVERBURDEN CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 1"

Project No. **11215131**

Title
SOUTHWEST EXCAVATION AREA OVERBURDEN SAMPLING PLAN

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS. MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

Sheet No.
C-31

Sheet 32 of 49

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132028
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDIRI BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- PRE-CONSTRUCTION SIDEWALL CONFIRMATION BORING LOCATIONS

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS, MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 — 1"

Project No. 11215131

Title
SOUTHWEST EXCAVATION AREA SIDEWALL SAMPLING PLAN

Sheet No.
C-32

Sheet 33 of 49

Plot Date: 15 April 2021 - 1:28 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-035.dwg

ED_014247_00001508-00084

GHD
5551 Corporate Boulevard Suite 200
Baton Rouge Louisiana USA
T 225 292 9007 F 225 952 2978 W www.ghd.com

STATE OF TEXAS
LOGAN M. LOCICERO
132026
LICENSED PROFESSIONAL ENGINEER
4/19/2021

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2021 GHD

LEGEND

- PROPERTY BOUNDARY
- PROPERTY EASEMENT
- EXISTING CONTOUR INTERVAL
- FENCELINE
- SHORELINE
- TOP OF BANK
- TOE OF SLOPE
- OVERHEAD ELECTRICAL
- GUARDRAIL
- UNDERGROUND CCTV LINE
- PDIRI BORING LOCATION
- MONITORING WELL
- POWER POLE
- LIGHT POLE
- WELL
- AREA OF IMPACT
- ASPHALT
- CONCRETE
- GRAVEL
- EXCAVATION CONTOUR INTERVAL
- EXCAVATION TOP OF BANK
- EXCAVATION TOE OF SLOPE
- SAMPLING GRIDS (MAX. 500 CY)
- PRE-CONSTRUCTION SIDEWALL/ BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS
- PRE-CONSTRUCTION BASE OF EXCAVATION CONFIRMATION BORING LOCATIONS

Client
SAN JACINTO RIVER WASTE PITS

Project
FINAL (100%) REMEDIAL DESIGN SOUTHERN IMPOUNDMENT (AMENDED APRIL 2021) HARRIS COUNTY, TEXAS

No.	Issue	Drawn	Approved	Date
5	100% EPA RE-SUBMITTAL	MW	RH	04/19/2021
4	100% EPA SUBMITTAL	MW	RH	12/18/2020

Drawn	MW	Designer	RH
Drafting Check	BP	Design Check	LL
Project Coordinator	CM	Date	Apr 15, 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	1" = 20'
Original Size	Arch D	Bar is one inch on original size drawing	0 — 1"

Project No. **11215131**

Title
SOUTHWEST EXCAVATION AREA BOTTOM OF EXCAVATION SAMPLING PLAN

Sheet No.
C-33

Sheet 34 of 49

SOURCE:

TOPOGRAPHIC, HYDROGRAPHIC, & MAGNETOMETER SURVEY OF SAN JACINTO RIVER WASTE PITS, HARRIS COUNTY, TEXAS. MORRISON SURVEYING INC., 190608, JULY 8, 2019 TO AUGUST 2, 2019

PARCELS 1, 2 & 3 & PRIVATE ROAD SURVEYED FOR GHD SITUATED IN THE J. T. HARRELL SURVEY, A-330 HARRIS COUNTY, TEXAS HUTCHISON & ASSOCIATES - 20-6417 - 6417.bdry - 07-24-2020

NOTES:

1. FOR THE AREAS REQUIRING SOIL REMOVAL NEAR MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY, THE LATERAL LIMITS OF THE EXCAVATION WILL EXTEND IMMEDIATELY UP TO MARKET STREET AND THE GLENDALE BOAT WORKS, INC. PROPERTY LIMITS; HOWEVER, THE EXCAVATION WILL NOT EXTEND INTO EITHER THE STREET OR ONTO THE GLENDALE BOAT WORKS, INC. PROPERTY.
2. FOR THE AREAS REQUIRING SOIL REMOVAL ON THE SOUTHWEST PORTION OF THE SOUTHERN IMPOUNDMENT, A BULKHEAD WILL BE INSTALLED ADJACENT TO THE SAN JACINTO RIVER. THE EXCAVATION WILL BE COMPLETED UP TO THE LATERAL LIMIT OF THIS BULKHEAD.
3. PROPOSED EXCAVATION EXTENT SUBJECT TO CHANGE BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SAMPLING EVENT.

GHD SERVICES INC.
JOB NO. 11215131 FILE NO. 02
GHD TEXAS FIRM REGISTRATION NO. 276

100% EPA RE-SUBMITTAL

Plot Date: 15 April 2021 - 7:01 PM Plotted By: Matt Wolfer Filename: N:\US\Baton Rouge\Projects\562\11215131\Digital_Design\ACAD 2019\Sheets\11215131-01-DWG-C-036.dwg

ED_014247_00001508-00085

Attachment B

Microsoft Project Projected PCFSE Schedule

Microsoft Project Projected Dates Related to PCFSE

ATTACHMENT B - PROJECTED SOUTHERN IMPOUNDMENT PCFSE SCHEDULE
SAN JACINTO RIVER WASTE PITS SUPERFUND SITE
INTERNATIONAL PAPER COMPANY

ID	Task Name	Notes
1	**Pre-Construction Field Sampling**	
2	Submit RAWP including PCFSP to EPA	30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order
3	Pre-Construction Sampling Conference	14 days after final EPA approval of PCFSP
4	Start of Pre-Construction Sampling	30 days after final EPA approval of PCFSP
5	Submit updated Design Drawings and Specifications to EPA	60 days after receipt of all validated data from PCFSE

Date: 10/14/2021 The dates in this document are conditioned and based on a number of assumptions which are detailed in Section 6.0 of the RAWP. Project: 11215131

2 **Submit RAWP including PCFSP to EPA**
30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order

3 **Pre-Construction Sampling Conference**
14 days after final EPA approval of PCFSP

4 **Start of Pre-Construction Sampling**
30 days after final EPA approval of PCFSP

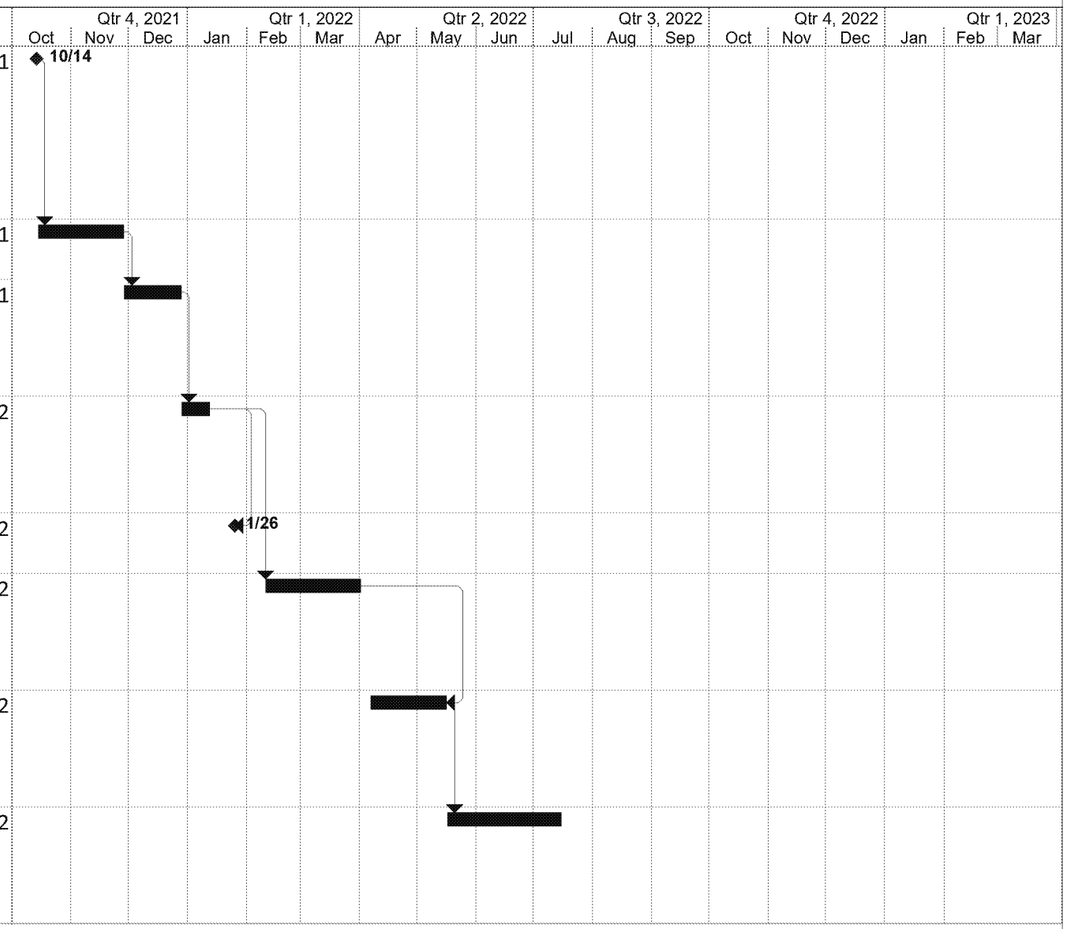
5 **Submit updated Design Drawings and Specifications to EPA**
60 days after receipt of all validated data from PCFSE

ED_014247_00001508-00088

ATTACHMENT B - PROJECTED DATES RELATIVE TO PCFSE

All of the dates in this document, other than the date for submission of the RAWP, are conditional and may change for the reasons discussed in Section 10.0 of the PCFSP.

WBS	Task Description	Notes	Duration	Start	Finish
1	Submit RAWP including PCFSP to EPA	30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order	1 day	Thu 10/14/21	Thu 10/14/21
2	EPA initial review of RAWP (Estimated)	Estimated at 45 days	45 days	Fri 10/15/21	Sun 11/28/21
3	Respondent response to EPA initial RAWP review comments (Estimated)	Estimated at 30 days	30 days	Mon 11/29/21	Tue 12/28/21
4	EPA final review and approval of RAWP (Estimated)	Estimated at 15 days	15 days	Wed 12/29/21	Wed 1/12/22
5	Pre Construction Sampling Conference	14 days after final EPA approval of PCFSP	1 day	Wed 1/26/22	Wed 1/26/22
6	Pre Construction Field Sampling Event (PCFSE) (Estimated)	Initiated 30 days after final EPA approval of PCFSP	50 days	Fri 2/11/22	Fri 4/1/22
7	Receipt of all validated data from the PCFSE (Estimated)	Estimated at 40 days following receipt of all PCFSE final analytical reports	40 days	Thu 4/7/22	Mon 5/16/22
8	Submit updated Design Drawings and Specifications to EPA	60 days after receipt of all validated data from PCFSE	60 days	Tue 5/17/22	Fri 7/15/22



Project:11215131-4
Date: Thu 10/14/21
*Grey highlighted tasks are from the Projected RA Schedule in Table 10.1.

Task | Provisional Task | Summary | Milestone

Changes in any date or time period in this document will affect subsequent dates, including the date projected for the start of RA Construction.
This document contains estimated time periods for EPA review and approval of deliverables.

The actual time periods for that process may be shorter or longer, which will directly impact and change subsequent dates, including the projected start of RA Construction.

GHD.com

→ The Power of Commitment

Appendix B

Pre-Construction Field Sampling Health and Safety Plan

Pre-Construction Field Sampling Health and Safety Plan

Southern Impoundment

San Jacinto River Waste Pits Superfund Site

Appendix B of Remedial Action Work Plan

International Paper Company

October 14, 2021

→ The Power of Commitment

Emergency Contact List and Hospital Route Map

Table 1 Emergency Information

Contact	Phone Number	Site Location, Hospital, & Clinic Directions
Local Police: Harris County Constable Baytown Police Department	911 (713) 637-0014 (281) 422-8371	Adjacent to 18003 Market St. Channelview, Texas 77530 (29.791692, -95.066069)
Local Fire Department: Channelview Fire Department	911 (281) 452-5782	
Ambulance	911	
Local Hospital: Houston Methodist Baytown Hospital Address: 4401 Garth Rd. Baytown, Texas 77521	(281) 420-8600	Hospital Directions: 1. Get on I-10 East (1.5 mi) 2. Keep right at fork to continue on TX-330 Spur South following signs for Baytown (1.5 mi) 3. Take the Wade Rd/Baker Rd exit (0.3 mi) 4. Merge onto Decker Dr. (1.1 mi) 5. Turn left onto W Baker Rd (2.1 mi) 6. Turn right (400 ft.) 7. Turn right (351 ft.) 8. Turn right at the first cross street (128 ft.) 9. Destination will be on the right Driving Time: 13 minutes Driving Distance: 7.9 miles
Work Care Clinic: Occupational Healthcare Address: 610 S. Main St. Highlands, Texas 77562	(281) 843-2441	Occupational Healthcare Directions: 1. Head Northeast on Market St (1.2 mi) 2. Turn right onto Monmouth St (161 ft) 3. Merge onto I-10E (1.3 mi) 4. Take Exist 767 for Crosby-Lynchburg Rd (0.2 mi) 5. Turn left onto Crosby Lynchburg/Main St (0.1 mi) 6. Continue straight onto S Main St (1.2 mi) 7. Destination will be on the left Driving Time: 7 min Driving Distance: 4.0 miles
National Poison Center	(800) 222-1222	
National Response Center	(800) 424-8802	
State Emergency Response System	(512) 424-2138	
EPA Environmental Response Team	(201) 321-6600	
United State Coast Guard	(713) 578-3000	
IP Contact Work: Cell:		
Project Manager Work: Cell:		
Project Coordinator Cell:		

ED_014247_00001508-00093

Contact	Phone Number	Site Location, Hospital, & Clinic Directions
Site Supervisor Cell:		
GHD RSHM Work: Cell:		GHD-Incident Reporting Hotline Please call (866) 529-4886 and provide: 1. Name and location of caller 2. Description of incident 3. Name of any injured persons 4. Description of injuries 5. Phone number for return call
GHD SHO Work: Cell:		
Other Contact-GHD Work: Cell:		
Person to verify hospital route	**Signature**	

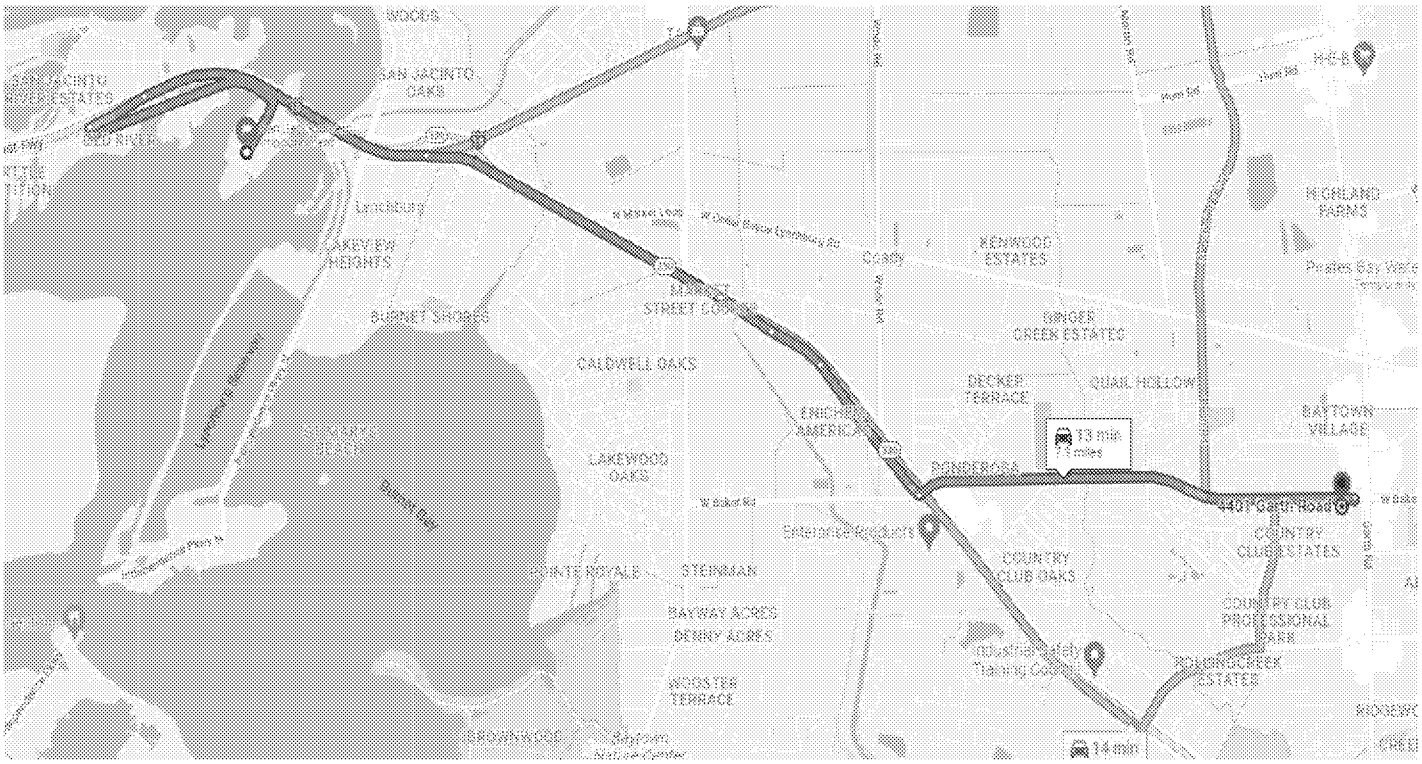
ED_014247_00001508-00094

Hospital Route-Houston Methodist Baytown Hospital

Directions from the Southern Impoundment:

- Head northeast on Market St.
- Turn right onto Monmouth St.
- Turn right onto the I-10 East ramp.
- Merge onto I-10 East.
- Keep right at the fork to continue on TX-330 Spur S, following signs for Baytown.
- Take the Wade Rd./Baker Rd. exit.
- Merge onto Decker Dr.
- Turn left onto W Baker Rd.
- Continue on W Baker Rd for 2.1 miles.
- Turn right into the hospital entrance.

Houston Methodist Baytown Hospital will be on the right.

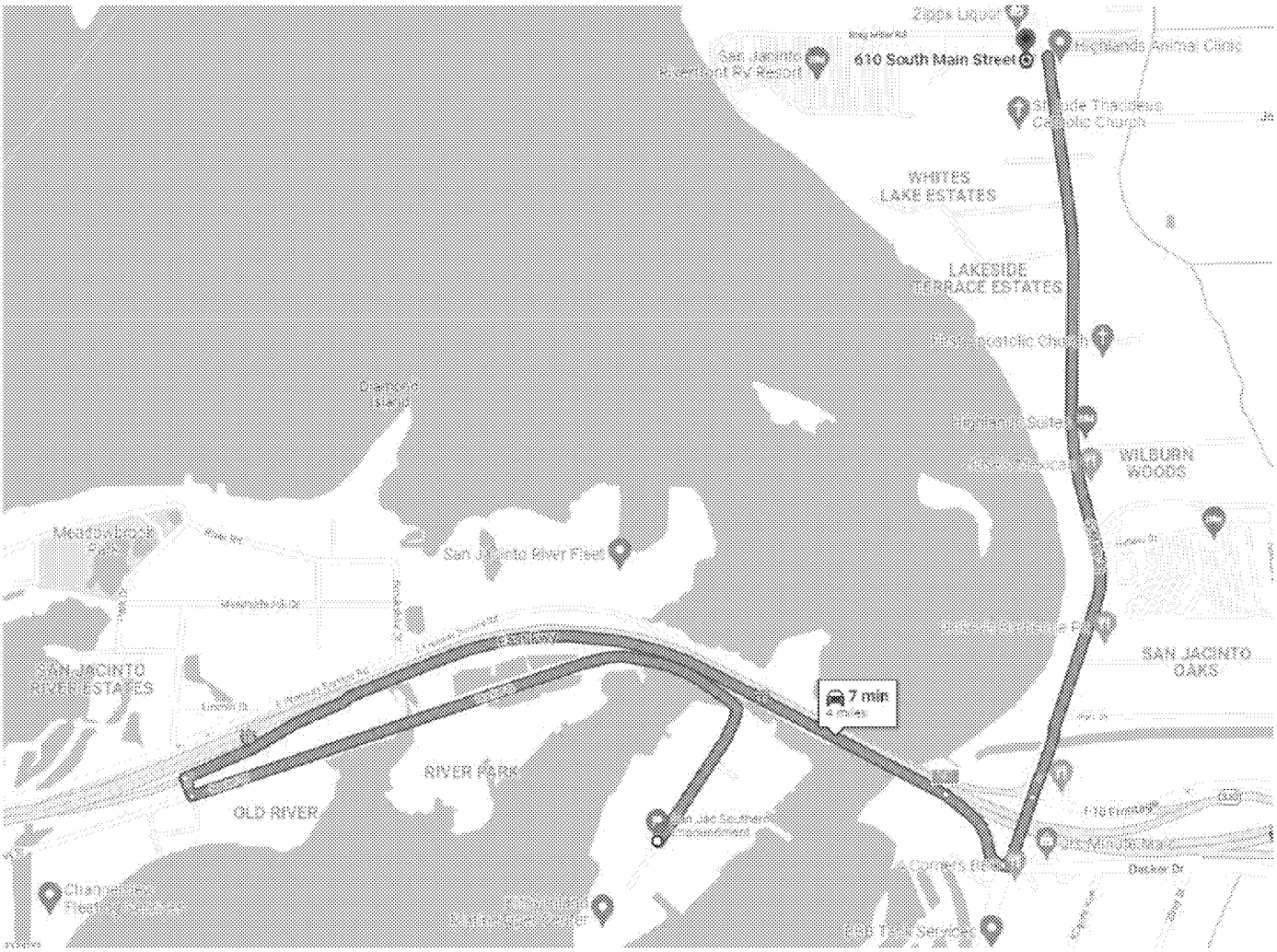


Occupational Medical Clinic Route-Occupational Healthcare

Directions from the Southern Impoundment:

- Head northeast on Market St.
- Turn right onto Monmouth St.
- Turn right onto the I-10 East ramp.
- Merge onto I-10 East.
- Take exit 787 for Crosby-Lynchburg Rd.
- Use any lane to turn left onto Crosby Lynchburg Rd/S Main St.
- Continue on S Main St. for 1.2 miles.

Occupational Healthcare will be on the left.



ED_014247_00001508-00096

Contents

Hospital Route-Houston Methodist Baytown Hospital iii

Directions from the Southern Impoundment: iii

Occupational Medical Clinic Route-Occupational Healthcare iv

Directions from the Southern Impoundment: iv

1. Introduction 1

1.1 Site Description 1

1.2 Purpose 1

1.3 Stop Work Authority 2

2. Personnel Requirements 2

2.1 Short Service Employees 2

2.2 Project Management and Safety Responsibilities 2

2.2.1 Project Manager-GHD 2

2.2.2 Site Supervisor-GHD 3

2.2.3 Regional Safety & Health Manager-GHD 3

2.2.4 Employee Safety Responsibility 3

2.2.5 Subcontractors-GHD 4

2.2.6 Equipment Operators 4

2.2.7 Authorized Visitors 4

3. Site HASP Amendments 4

3.1 Training Requirements 4

3.1.1 Site-Specific Training 5

3.1.2 Safety Meeting/HASP Review 5

3.1.3 Medical Surveillance Program 5

4. Site Operations 6

4.1 Scope of Work 6

5. Hazard Evaluation 6

5.1 Chemical Hazards 6

5.1.1 Chemical Hazard Controls 7

5.1.2 Skin Contact and Absorption Contaminants 7

5.1.3 Hazard Communication/WHMIS 7

Flammable and Combustible Liquids 7

5.2 Physical Hazards 8

5.2.1 Heavy Equipment Safety 8

5.2.2 Noise 9

5.2.3 Utility Clearances 9

5.2.4 Vehicle Traffic and Control 10

5.2.5 Material Handling and Storage 10

5.2.6 Working Over or Near Water 11

5.2.7 Manual Lifting 11

5.2.8 Hand and Power Tools 12

ED_014247_00001508-00097

Contents

5.2.9 Electrical Hazards 12
5.2.10 Control of Hazardous Energy 13
5.2.11 Slip/Trip/Hit/Fall 14
5.2.12 Heat Stress 14
5.2.13 Sun Exposure 15
5.2.14 Cold Stress 16
5.2.15 Adverse Weather Conditions 17
5.3 Biological Hazards 17
5.3.1 Vegetation Overgrowth 17
5.3.2 Poisonous Plants 18
5.3.3 Insects 18
5.3.4 Poisonous Spiders 20
5.3.5 Threatening Dogs 21
5.3.6 Rodents 21
5.3.7 Snakes 22
5.3.8 Scorpions 23
5.3.9 Alligators/Crocodiles 23
5.3.10 Bloodborne Pathogens 24
5.3.11 COVID-19 Guidance 25
6. Personal Protective Equipment (PPE) 25
6.1 General 25
6.2 Levels of Protection 25
6.2.1 Reassessment of Protection Levels 25
7. Air Monitoring Program 26
7.1 Exposure Monitoring 26
7.1.1 Multi-Gas Meters (LEL/O_2/H_2S/CO Meters) 26
7.1.2 Monitoring Frequency 26
7.1.3 HSE Action Levels 27
8. Site Control 27
8.1 Communication 27
8.2 Buddy System 28
8.3 Site Security 28
8.4 Decontamination 28
8.4.1 Personnel and Equipment Decontamination Procedures 28
9. Emergency Procedures 29
9.1 On-Site Emergencies 29
9.2 Incident, Injury, and Illness Reporting and Investigation 29
9.3 Emergency Equipment and First Aid 29
9.4 Emergency Procedures for Contaminated Personnel 30
9.5 Site Evacuation 30

ED_014247_00001508-00098

Contents

9.6 Spill and Release Contingencies 30

10. Recordkeeping 30

11. References 31

Table index

Table 1 Properties of Potential Site Contaminants

Table 2 On-Site Air Monitoring Program

Figure index

Figure 1 Site Vicinity

Figure 2 Site Plan

Attachments

Attachment A Paper Copy Forms (Can Alternatively Use GHD Smart App)

Attachment B Job Safety Analysis Forms

Attachment C Safety Data Sheets

Attachment D Journey Management Plan

Attachment E Decontamination Plan

Attachment F Fatigue Management Plan

ED_014247_00001508-00099

Health and Safety Plan
Signature Page

Site Name:	San Jacinto River Waste Pits Site
Location Address:	Adjacent to 18003 Market Street, Channelview, Texas 77530

Reference No.:	11215131	GHD Office:	Baton Rouge
Anticipated Start Date:	November 2021	Anticipated Project Duration:	7 Weeks
Updated By (Signature):	Marc Kemper	Date:	9/28/2021
Project Manager (Signature):	Meagan Willis	Date:	10/14/2021
Reviewed By (Signature):	Phillip Young	Date:	9/29/2021

ED_014247_00001508-00100

1. Introduction

This Health and Safety Plan (HASP) was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC), for the Southern Impoundment of the San Jacinto River Waste Pits Site in Harris County, Texas. This HASP is an updated version of the HASP included as one of the supporting deliverables with respect to the Final 100% Remedial Design - Southern Impoundment (Amended April 2021) (Southern Impoundment RD). It is a part of the Southern Impoundment Remedial Action Work Plan (RAWP) that is being submitted on behalf of IPC to meet the requirements contained in the August 5, 2021, Unilateral Administrative Order for Removal Action for Southern Impoundment (UAO; EPA, 2021) and to support the pre-construction field sampling event (PCFSE) described in the Pre-Constriction Field Sampling Plan being submitted as part of the RAWP. The PCFSE involves the collection of samples to a maximum depth of 10 feet below ground surface (bgs) in four areas to be excavated as part of the Southern Impoundment remedial action (RA). References to the "work site" are to the areas within the Southern Impoundment at which the PCFSE will take place.

This HASP was developed to outline all activities to be performed to protect personnel at the work site and area residents from physical, chemical, and all other hazards posed by the PCFS fieldwork. As specified in the SOW, this HASP was prepared in accordance with the EPA Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 Code of Federal Regulations (CFR) 1910 and 1926.

This HASP is for the PCFSE only. It will be updated or a separate HASP will be developed for purposes of the remaining portions of the Southern Impoundment RA.

1.1 Site Description

The work site is located in Harris County, Texas, east of the City of Houston, between two unincorporated areas known as Channelview and Highlands as depicted on Figure 1. The Southern Impoundment is approximately 20 acres in size and is located on a small peninsula that extends south of Interstate Highway 10 as depicted on Figure 2.

The primary hazardous substances identified in the subsurface within the Southern Impoundment are polychlorinated dibenzopdioxins and polychlorinated dibenzofurans.

1.2 Purpose

The purpose of this work site-specific HASP is to provide specific guidelines and establish procedures for the protection of personnel performing the activities described in Section 2. The HASP is a living document, in that it must continually evolve as work site conditions and knowledge of the work site activities develop.

A vital element of GHD's Health, Safety, and Environment (HSE) Policy and Procedures is the implementation of a site-specific HASP for field activities. The HASP, as applicable to this project, includes the following measures:

- Communicate the contents of this HASP to work site personnel.
- Eliminate unsafe conditions. Efforts must be initiated to identify conditions that can contribute to an incident and to prevent exposure to these conditions.
- Utilize the STAR (Stop, Think, Act, and Review) process before beginning any activity/task/job, after an incident, and/or during any unusual circumstances. Stop the activities to think about the task, analyze the task hazards and determine methods to reduce risk, and review the results with affected personnel.
- Revise or develop Job Safety Analysis (JSA) forms for activities. Supervisors and affected personnel are responsible for JSA development. A blank JSA form has been included in Attachment B of this HASP.
- Complete behavioral-based safety (BBS) observations via the use of the Safe Task Evaluation Process (STEP).

ED_014247_00001508-00101

- Reduce unsafe acts by using the GHD BBS tools (STEPs, JSAs, STAR, etc.). Personnel shall make a conscious effort to work safely. A high degree of safety awareness must be maintained so that safety factors become an integral part of the task. Supervisory personnel shall ensure that personnel committing unsafe acts are held accountable via counseling, mentoring, and, if necessary, reprimand.
- Inspect frequently. Regular documented safety inspections of the work area, materials, and equipment by qualified persons ensure early detection of unsafe conditions. HSE deficiencies shall be corrected as soon as possible, or project activities shall be suspended. Documentation of daily inspections and corrective actions should be kept with the project files.
- Field personnel can document HSE activities via paper copies or alternatively utilize the GHD Smart APP.

1.3 Stop Work Authority

All GHD employees are empowered and expected to stop the work of co-workers, subcontractors, client employees, or other contractors if any person's safety or the environment is at risk. No repercussions will result from this action. Reporting of unsafe condition/acts and/or Stop Work Authority (SWA) shall be documented using the Unsafe Condition/Acts and SWA form located in Attachment A.

During the PCFSE, the discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the removal of work site personnel from that area and re-evaluation of the hazard and the levels of protection.

2. Personnel Requirements

All personnel conducting activities at the work site must conduct their activities in compliance with all applicable HSE legislation at both state and federal levels to include, but not limited to, the Texas Administrative Code (TAC), 29 CFR 1910, 29 CFR 1926, and associated policies and procedures. OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standards (in general industry, 29 CFR 1910.120; and construction 29 CFR 1926.65) establish health and safety requirements for employers and require that employers follow specific work policies, practices, and procedures to protect their workers potential exposure to hazardous substances. The policies and practices, and procedures are incorporated into this document.

Project personnel must also be familiar with the procedures and requirements of this site-specific HASP. In the event of conflicting safety procedures/requirements, personnel must implement those safety practices affording the highest level of safety and protection.

2.1 Short Service Employees

GHD employees and subcontractors identified as Short Service Employees (SSE) (6 months or less) shall not be permitted to work without another non-SSE employee present.

2.2 Project Management and Safety Responsibilities

The organizational structure of this HASP is consistent with OSHA requirements in 29 CFR 1910.120(b)(2) and, for purposes of the PCFSE, outlines project management and safety responsibilities, as described below.

2.2.1 Project Manager-GHD

The GHD Project Manager (PM) shall be responsible for the overall implementation of the HASP, and for ensuring that all HSE responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP, ensuring that STEP forms are completed properly, qualifying, and directing subcontractors

ED_014247_00001508-00102

relative to HSE performance, coordinating all HSE submittals, and consultation with the Site Supervisor (SS) regarding appropriate changes to the HASP. The PM will also ensure that the appropriate resources are provided to support the project with respect to all operations.

2.2.2 Site Supervisor-GHD

The SS is the person who, under the supervision of the PM, shall be responsible for the communication of work site requirements to work site project personnel and subcontractors, and is responsible for carrying out the HSE responsibilities by ensuring that the following occur:

1. A daily tailgate safety meeting is conducted that communicates the work site-specific hazards for the operations that day and what proactive measure will minimize the hazards. Each meeting must be documented on the Tailgate Safety Meeting Form to include all topics covered and the signatures of those in attendance.
2. All necessary clean-up and maintenance of safety equipment is conducted by project personnel.
3. Emergency phone numbers and services, including hospital and clinic locations, are verified.
4. Work site personnel are implementing the STAR process before initiating activities.
5. JSA forms are developed and revised accordingly.
6. Forms attached to the HASP are completed, filed, and submitted correctly, including daily Tailgate Safety Meeting Forms and daily inspection checklists.
7. A pre-entry briefing is conducted and documented and serves to familiarize work site personnel with the procedures, requirements, and provisions of the HASP.

Other duties include overall implementation of the HASP and ensuring that all HSE responsibilities are carried out in conjunction with the project. This shall include, but is not limited to, review and approval of the HASP, communication of work site requirements to subcontractor personnel, and consultation with the client/work site representative regarding appropriate changes to the HASP.

The SS is also responsible for enforcing safe work practices for project employees. The SS watches for ill effects on any crew member, especially those symptoms caused by cold/heat stress or chemical exposure. The SS oversees the safety of visitors who enter the work site. The SS maintains communication with the client/work site representative(s).

Other specific duties of the SS include:

- Ordering the immediate shutdown and/or stop work of work site activities in the case of a medical emergency, unsafe condition, or unsafe practice.
- Providing the safety equipment, personal protective equipment (PPE), and other items necessary for employees
- Enforcing the use of required safety equipment, PPE, and other items necessary for employee or community safety.
- Conducting work site inspections as a part of quality assurance for HSE.
- Reporting HSE concerns to work site and/or project management, as necessary.

2.2.3 Regional Safety & Health Manager-GHD

The Regional Safety & Health Manager (RSHM) is a full-time GHD employee who is trained as a HSE professional and serves in a consulting role to the PM and SS regarding potential HSE issues.

2.2.4 Employee Safety Responsibility

GHD employees are responsible for their own safety as well as the safety of those around them. GHD employees and subcontractors shall use any equipment provided in a safe and responsible manner, as directed by their supervisor.

Employees are directed to take the following actions when appropriate:

ED_014247_00001508-00103

- Suspend any operations that may cause an imminent health hazard to employees, subcontractors, or others.
- Utilize the STAR process before initiating work.
- Assist in the development and revision of JSA forms that are appropriate to their current scope of work.
- Prepare, submit, and review behavior-based safety observations using the STEP form. The STEP form is to be used in conjunction with the appropriate JSA to identify positive aspects of task performance as well as to identify any deficiencies associated with the observed task.
- Inspect tools and other equipment before each use or as manufacturer and/or OSHA dictates.
- Correct work site hazards, when possible, without endangering life or health.
- Report HSE concerns to the SS, PM, or RSHM.

2.2.5 Subcontractors-GHD

Subcontractors are each responsible for the implementation of its own HASP and agree to comply with its contents. Alternatively, subcontractors can choose to work under this HASP. In the event of conflicting safety procedures or requirements, personnel must implement those safety practices that afford the highest level of safety and protection. In addition, non-compliance with HSE policies and procedures may subject the subcontractor to disciplinary action up to and including termination of its contract with GHD. Subcontractors will be required to attend an initial work site orientation and subsequent safety meetings. Subcontractors will be required to provide task specific JSAs prior to initiating work.

2.2.6 Equipment Operators

All equipment operators are responsible for the safe operation of heavy equipment. Operators are responsible for inspecting their equipment daily to ensure safe performance. Brakes, hydraulic lines, backup alarms, and fire extinguishers must be inspected routinely throughout the project. Equipment will be taken out of service if an unsafe condition occurs. Documentation of daily inspections is required.

2.2.7 Authorized Visitors

Authorized visitors shall be provided with all known information with respect to work site operations and hazards as applicable to the purpose of their visit and should be accompanied with personnel familiar with the work site's layout and procedures.

3. Site HASP Amendments

Any change to the scope of work must be evaluated for its impact on the overall health and safety of the project and associated personnel. A minor change is one that adjusts already documented hazards within the HASP and does not expose work site personnel to chemicals above exposure limits, such as the introduction of a new JSA, Journey Management Plan, or PPE that does not involve a change in respiratory protection. Amendments must be documented on the HASP Amendment Form located in Attachment A, in addition to notifications to key personnel.

Significant changes to the scope of work require a rewrite and review/approval of the HASP.

3.1 Training Requirements

All personnel conducting work at the work site are to be required to have completed the appropriate HSE training as applicable to their job tasks/duties. Training requirements are consistent with the requirements of 29 CFR 1910.120(e) and (q)(11) and are referenced throughout this HASP.

ED_014247_00001508-00104

3.1.1 Site-Specific Training

An initial work site-specific training session or briefing shall be conducted by the PM or SS prior to commencement of work activities. During this initial training session, employees shall be instructed on the following topics:

- Personnel responsibilities.
- Content and implementation of the HASP.
- Work site hazards and controls.
- Work site-specific hazardous procedures (e.g., drilling, excavations, etc.).
- Training requirements.
- PPE requirements.
- Emergency information, including local emergency response team phone numbers, route to nearest hospital, incident reporting procedures, and emergency response procedures as detailed in the Emergency Response Plan included as Appendix C of the RAWP.
- Instruction in the completion of required inspections and forms.
- Location of safety equipment, such as portable eyewash, first aid kit, fire extinguishers, etc.

The various components of the project HASP will be presented, followed by an opportunity to ask questions to ensure that each attendee understands the HASP. Personnel will not be permitted to enter or work in potentially contaminated areas of the work site until they have completed the work site-specific training session. Personnel successfully completing the training session shall sign the HASP Training Acknowledgement Form, which is presented in Attachment A.

In addition to the initial work site briefing conducted at the commencement of the project, supplemental brief safety meetings shall be conducted by the SS to discuss potential HSE hazards associated with upcoming tasks and necessary precautions to be taken.

3.1.2 Safety Meeting/HASP Review

Tailgate safety meetings will take place each day prior to beginning the day's work. All work site personnel will attend these safety meetings conducted by the SS. The safety meetings will cover specific HSE issues, including the appropriate JSAs, work site activities, changes in work site conditions, and a review of topics covered in the site-specific pre-entry briefing. The safety meetings will be documented each day with written sign-in sheets containing a list of topics discussed or utilizing the GHD Smart APP. To assist in documenting the tailgate safety meetings, there are two formats available. For meetings attended by more than four people, please use the Tailgate Safety Meeting Form-Large Group daily format, which requires one page for each tailgate safety meeting conducted. If there are four or fewer people at the work site, please use the Tailgate Safety Meeting Form-Small Group multiple-day format, which provides room to document three tailgate safety meetings on one page. The two Tailgate Safety Meeting Forms (Large Group and Small Group) are located in Attachment A.

3.1.3 Medical Surveillance Program

Medical surveillance requirements should be based on a worker's potential for exposure as determined by the site characterization and job hazard analysis and as required by 29 CFR 1910.120(f)(2).

A work site medical surveillance program should be developed that provides that if a worker is injured, becomes ill, or develops signs or symptoms of possible over exposure to hazardous substances or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.

Medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to employees free of cost, without loss of pay, and at a reasonable time and place. The need to implement a more comprehensive medical surveillance program will be re-evaluated in the event of an over exposure incident.

ED_014247_00001508-00105

4. Site Operations

4.1 Scope of Work

PCFSE activities are to be conducted in accordance with the Pre-Construction Field Sampling Plan as an appendix to the RAWP.

This HASP covers the specific work site activities that will be conducted by GHD personnel and their subcontractors. These activities are as follows:

- Mobilization of personnel, materials, and equipment to and from the work site.
- Work site reconnaissance activities.
- Heavy equipment usage and spotting.
- Surveying.
- Equipment fueling.
- Soil sampling using Direct Push Technology, drilling.
- Monitor well installation.
- Groundwater slug testing.
- Decontamination of personnel and equipment.
- Driving.

If work site operations are altered or if additional tasks are assigned, an addendum to this HASP shall be developed to address the specific hazards associated with these changes.

5. Hazard Evaluation

This section identifies and evaluates potential chemical, physical, and biological hazards that may be encountered during the PCFSE , in compliance with 29 CFR 1910.120(b)(4)(ii)(A), 1910.120(c) and 1910.120(i). These hazards and any discussion regarding anticipated initial exposure levels are based on information developed in connection with the Southern Impoundment RD.

Specific activity JSA forms (located in Attachment B) have been developed to address the hazards associated with the work site operations outlined in Section 2. New JSAs will be developed on an as-necessary basis if a JSA for that specific task is not available in the HASP. Additionally, current JSAs will be modified and customized in the field to ensure that the task-specific requirements are addressed each time the task is performed. JSAs will be modified and "dirtied up" in the field to address work site-specific hazards present at the work site during a given workday.

5.1 Chemical Hazards

The chemical hazards associated with conducting work site operations are expected to include the potential exposure to work site contaminants encountered during field activities such as soil sampling, water sampling, products used in decontamination of equipment, and support products such as fuel. The potential routes of exposure from these products during normal use may occur through inhalation of vapors and dusts, or direct contact or absorption with the materials.

The chemical hazards of concern that may be encountered during the tasks identified in the project's scope of work are listed in Table 1, and include dioxins, furans, and PCBs. Information about those chemical hazards includes exposure limits, signs and symptoms of exposure, chemical properties, and physical characteristics.

ED_014247_00001508-00106

5.1.1 Chemical Hazard Controls

Exposure to potential on-work site contaminants/chemicals, such as those listed in Table 1 and the Safety Data Sheets (SDSs) in Attachment C, shall be controlled by:

- Monitoring for visible dust.
- Revising JSAs to list chemical hazards and associated hazard controls on a task-specific basis.
- Employing dust control measures such as wetting the immediate area.
- Using chemical protective PPE/respiratory protection, as appropriate, in areas known to have concentrations above the specified action level for each contaminant.

5.1.2 Skin Contact and Absorption Contaminants

Skin contact with chemicals may be controlled by use of the proper PPE and good housekeeping procedures. The proper PPE (e.g., gloves) as described in Section 4 shall be worn for all activities where contact with potentially harmful media or materials is anticipated. Utilize manufacturer data on permeation and degradation to minimize skin contact potential (see Section 4.2.1 for additional information).

5.1.3 Hazard Communication/WHMIS

Personnel required to handle or use hazardous materials as part of their job duties shall be trained and educated in accordance with the Workplace Hazardous Materials Information System (WHMIS) standard as applicable. Such training may include instruction on the safe use and handling procedures of hazardous materials, how to read and access safety data sheets (SDSs), and the proper labeling requirements.

The appropriate SDS for the chemicals in use at the work site will be maintained by and available for project personnel throughout the course of the project. A copy of all SDSs is provided in Attachment C.

Flammable and Combustible Liquids

The storage, dispensing, and handling of flammable and combustible liquids must be in accordance with industry standards such as National Fire Protection Agency (NFPA) guidelines. The specific flammable or combustible liquids used at the work site may include gasoline, diesel, kerosene, oils, and solvents.

Flammable and combustible liquids are classified according to flash point. This is the temperature at which the liquid gives off sufficient vapors to readily ignite. Flammable liquids have flash points below 100°F (37.8°C). Combustible liquids have flash points above 100°F (37.8°C) and below 200°F (93.3°C).

Storage

Many flammables can ignite at temperatures at or below room temperature. They are far more dangerous than combustibles when they are heated. As a result, these products must be handled very carefully. At normal temperatures, these liquids can release vapors that are explosive and hazardous to employee health. Exposure to heat can cause some of these liquids to break down into acids, corrosives, or toxic gases. For this reason, flammable and combustible liquids should be stored in cool, well-ventilated areas away from any source of ignition. Always consult the SDS of the product for specific information.

Flammable and combustible liquids must be stored in designated areas. Such areas must be isolated from equipment and work activity that may produce flames, sparks, heat, or any form of ignition, including smoking. The most practical method is the use of one or more approved (commercially available) flammable/combustible liquid storage cabinets.

Cabinets must be labeled “Flammable-Keep Fire Away.” Doors must be kept closed and labeled accordingly. Containers must be kept in the cabinet when not in use.

General Requirements

- Keep containers of flammable/combustible liquids closed when not in use.
- Keep flammable/combustible liquids in designated areas and approved cabinets.
- Do not allow use of unapproved containers for transfer or storage. Use only approved safety cans (5-gallon maximum) with a spring closing lid and spout cover, designated to safely relieve internal pressure when exposed to heat or fire.
- Use only approved self-closing spigots, faucets, and manual pumps when drawing flammable/combustible liquids from larger containers/barrels.
- Use only approved metal waste cans with lids for disposal of shop towels/oily rags.
- Designate "Smoking" and "No Smoking" areas.
- Designate fueling areas.
- Observe all signs indicating "No Smoking," "No Flames," and "No Ignition."

Transferring Flammable/Combustible Liquids

This seemingly routine task can be hazardous if certain precautions are not followed. Grounding and bonding should be observed at all times to prevent the accumulation of static electricity when transferring containers/barrels one to another. Bonding is necessary between conductive containers (e.g., a barrel and a 5-gallon container).

5.2 Physical Hazards

Physical hazards that may be present during project work include: potential for close proximity to heavy equipment, noise, overhead or underground utilities, vehicle traffic, material handling, heavy lifting, electrical or stored energy, excavations, use of hand and power tools, use of all-terrain vehicles, use of utility task vehicles, slip/trip/hit/fall injuries, heat/cold stress, working on or near water, boating, working at night or with illumination difficulties, biological hazards, and other potential adverse weather conditions. In addition, personnel must be aware that the protective equipment worn may limit dexterity and visibility and may increase the difficulty of performing some tasks.

5.2.1 Heavy Equipment Safety

Heavy Equipment

The following practices shall be adhered to by personnel operating heavy equipment (such as skid steers) and personnel working in the vicinity of heavy equipment:

- Heavy equipment is to be inspected when equipment is initially mobilized, delivered to the work site, or after it is repaired and returned to service, to ensure that it meets all manufacturer and OSHA specifications (e.g., fire extinguishers, backup alarms, etc.).
- Heavy equipment is to be inspected daily. Documentation of this daily pre-operational inspection is to be filed with the project files. The GHD Safety Inspection Checklist is attached in Attachment A.
- Heavy equipment is only to be operated by authorized, competent operators.
- Seat belts are to be provided on heavy equipment that is not designed for stand-up operation.
- Equipment/vehicles whose payload is loaded by crane, excavator, loader, etc. will have a cab shield and/or canopy to protect the operator.
- Personnel will not be raised/lowered in buckets.
- Personnel will not ride on fender steps or any place outside the cab.
- Before leaving the equipment controls, ensure that the equipment is in its safe resting position. For a backhoe, apply the parking brake, put the front loader bucket down on the ground level, and ensure that the rear excavator

bucket is locked in the travel position. Bulldozers and scraper blades, loader buckets, dump bodies, and similar equipment will be fully lowered or blocked when not in use.

- Before raising any booms, buckets, etc., check for overhead obstructions.
- Employees involved in the operation shall not wear any loose-fitting clothing, as it has the potential to be caught in moving machinery.
- Personnel shall wear high visibility safety vests, steel-toed shoes, safety glasses, hearing protection, and hard hats during heavy equipment operations.
- When moving heavy equipment or when working within 10 feet of a stationary object or in tight quarters, a spotter will be used.

5.2.2 Noise

Project activities that include working in close proximity to heavy equipment and/or drilling operations or using power tools that generate noise levels exceeding the decibel range of 85 dBA, should require the use of hearing protection with a Noise Reduction Rating (NRR) of at least 20. Hearing protection (earplugs/muffs) should be available to personnel and visitors requiring entry into these areas.

Noise monitoring should be conducted in accordance with the Hearing Conservation Program. The hearing conservation program requires monitoring of noise exposure levels in a way that identifies employees exposed to noise at or above 85 decibels (dB) averaged over 8 working hours, or an 8-hour time-weighted average (TWA).

5.2.3 Utility Clearances

Elevated superstructures (e.g., drill rigs, backhoes, scaffolding, ladders, cranes) shall remain a distance of 10 feet away from utility lines (<50 kV) and 20 feet away from power lines (>50 kV). Underground utilities, if present, shall be clearly marked and identified prior to commencement of work. Local/state/provincial regulations and client requirements with regards to utility locating requirements (e.g., One-Call) shall be followed.

Personnel involved in intrusive work shall:

- Confirm proposed intrusive work and heavy truck routes are not in the area of subsurface utilities. This meeting is to be documented.
- Review and adhere to GHD's Subsurface Utility Clearance Protocol. Use prudent digging techniques inside 18 inches of the outside edge of an underground facility. This distance will vary based on state law, facility/client requirements, etc. Refer to the *Texas Utilities Code, Title 5, Chapter 251, and TAC Title 16, Chapter 18* for additional guidance.
- **Utilize the Underground Utilities Checklist included in Attachment A. This is to be completed prior to initiating excavation activities.**
- Be able to determine the minimum distance from marked utilities, identify the work that can be conducted with the assistance of the locator line service, coordinate document/drawing review, and inspect the work site for manholes, catch basins, valve boxes, etc. that may indicate the direction/depth of underground installations. Marking indicates only the approximate location of buried lines. After obtaining the facility owner's permission, hand dig test holes (or use an equivalent means) in a careful and prudent manner to determine the precise location of underground facility lines. If the location of the lines is still undeterminable after hand digging/probing/soft digging, call the facility owner for additional direction and assistance prior to initiating intrusive operations.
- If you must expose a line, state law requires GHD to protect and support the underground facility line while working at the work site.

ED_014247_00001508-00109

5.2.4 Vehicle Traffic and Control

The following safety measures are to be taken by GHD personnel that have the potential to be exposed to vehicle traffic:

- A high visibility safety vest meeting American National Standards Institute (ANSI) Class II garment requirements is to be worn at all times.
- Employees will work using the "buddy system."
- Cones and other visible markers will be used to demarcate a safe work zone around the active work zone(s).
- Appropriate signage will be posted as necessary, to inform roadway/parking lot users of any additional control measures necessary to protect the public and GHD employees.

The GHD motor vehicle safety program includes the following critical components that must be followed at all times:

- Driving restrictions around electronic device usage.
- Defensive driving training requirements.
- Operating standards.
- Driver qualifications.
- Proper vehicle selection.
- Vehicle inspection/maintenance.

Drivers are to make a 360-degree (360°) walk around of the vehicle immediately before placing vehicle into motion to determine if there are any hazards or possible obstructions in the proposed path of travel. Drivers are to clear the area of people and objects before placing the vehicle in motion. A check will also be performed to ensure overhead and side clearances are adequate.

The journey planning process is a simple risk assessment to ensure that all identified hazards are understood and managed and that unnecessary trips or those presenting an unreasonable or uncertain risk are not taken. Journey Management Plans (JMPs) will be developed for routine travel and work site access. JMP documentation and forms are provided in Attachment D.

Additionally, **when working on an active roadway or along the shoulder or side of the road is necessary**, project personnel should follow the requirements presented in the Manual on Uniform Traffic Control Devices (MUTCD), which is found at: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm.

5.2.5 Material Handling and Storage

Material handling and storage practices to be conducted at the project work site include manual lifting of materials and possibly the use of hoisting and rigging equipment. As a rule, use mechanical means for lifting heavy loads whenever possible.

General Storage Practices

The basic safety requirement for storage areas is that the storage of materials and supplies shall not create a hazard. Additional general storage area practices include the following:

- Bags, containers, bundles, etc. stored in tiers shall be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.
- All stacked materials, cargo, etc. shall be examined for sharp edges, protrusions, signs of damage, or other factors likely to cause injury to persons handling these objects. Defects should be corrected as they are detected.
- Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage.
- Storage areas shall have provisions to minimize manual lifting and carrying. Aisles and passageways shall provide for the movement of mechanical lifting and conveyance devices.

ED_014247_00001508-00110

- Stored materials shall not block or obstruct access to emergency exits, fire extinguishers, alarm boxes, first aid equipment, lights, electrical control panels, or other control boxes.
- "NO SMOKING" signs shall be conspicuously posted, as needed, in areas where combustible or flammable materials are stored and handled.

Cylindrical materials such as pipes and poles shall be stored in racks or stacked on the ground and blocked.

Special Precautions for Hazardous or Incompatible Materials Storage

Generally, materials are considered hazardous if they are ignitable, corrosive, reactive, or toxic. Manufacturers and suppliers of these materials must provide the recipient with SDSs, which describe their hazardous characteristics and give instructions for their safe handling and storage.

Many hazardous materials are incompatible, which means they form mixtures that may have hazardous characteristics not described on the individual SDSs. The following special precautions shall be followed regarding the storage of hazardous materials:

- Based on the information available on the SDSs, incompatible materials shall be kept in separate storage areas.
- Warning signs shall be conspicuously posted, as needed, in areas where hazardous materials are stored.

5.2.6 Working Over or Near Water

The procedures outlined in this section are to be implemented by all GHD and subcontractor personnel if working within 10 feet of the water (southwest corner).

- Personnel working over water or within 10 feet of water will be required to wear U.S. Coast Guard-approved life jackets or buoyant work vests, with the exception of divers conducting underwater diving operations. Prior to each use and after each use, the buoyant work vests and life preservers must be inspected for defects that would affect strength and/or buoyancy. Any damaged or defective buoyant work vest or life preserver cannot be used.
- Call in or make prearranged contacts after each activity posing a drowning hazard is completed.
- If work on wet or slippery surfaces above water is necessary, non-slip tape or other methods are to be used to increase traction.
- Ring buoys with a minimum 90 feet of line must be readily available for emergency operations.

5.2.7 Manual Lifting

Proper lifting takes the hazard out of moving heavy objects. Below are some items that should be considered prior to a lift.

- Establish that you can lift the load safely; if the load is in excess of 50 pounds, you are required to ask for assistance.
- Use a mechanical lifting device if available.
- Inspect route to be traveled, confirming sufficient clearance.
- Look for any obstructions or spills.
- Inspect the object to determine how it should be grasped.
- Look for any sharp edges, slivers, or other things that may cause personal injury.
- Do not move any object that will obstruct your field of vision when transporting the load.

When lifting objects, use the following proper lifting techniques:

- Feet must be parted, with one foot alongside the object being lifted and one foot behind. When the feet are comfortably spread, a more stable lift can occur, and the rear foot is in a better position for the upward thrust of the lift.

ED_014247_00001508-00111

- Use the squat position and keep the back straight-but remember that straight does not mean vertical. A straight back keeps the spine, back muscles, and organs of the body in correct alignment, and minimizes the risk of injury to internal organs.
- Grip is one of the most important elements of correct lifting. The fingers and the hand are extended around the object, using the full palm. Fingers have very little power, so use the strength of your entire hand.
- The load must be drawn close, and the arms and elbows must be tucked into the side of the body. Holding the arms away from the body increases the strain on the arms and elbows. Keeping the arms tucked in helps keep the body weight centered. The body must be positioned so that the weight of the body is centered over the feet. This provides a more powerful line of thrust and ensures better balance. Start the lift with a thrust of the rear foot. Do not twist.

5.2.8 Hand and Power Tools

Hand Tools

- Hand tools must meet the manufacturer's safety standards.
- Hand tools must not be altered in any way.
- At a minimum, eye protection must be used when working with hand tools.
- Wrenches (including adjustable, pipe, end, and socket wrenches) must not be used when jaws are sprung to the point that slippage occurs.
- Impact tools (such as drift pins, wedges, and chisels) must be kept free of mushroom heads.
- Wooden handles must be free of splinters or cracks and secured tightly to the tool.
- Any damaged or defective tools must be immediately removed from service and tagged for destruction.

Power Tools

- All power tools must be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities.
- Electric tools must not be used in areas subject to fire or explosion hazards unless they are approved for that purpose.
- Portable electric tools must be connected to a Ground Fault Circuit Interrupter (GFCI) when working in wet areas.
- Proper eye protection must be used when working with power tools.
- Personnel must be trained in the proper use of each specific tool.
- Any damaged or defective power tools must be immediately tagged and removed from service.

5.2.9 Electrical Hazards

Only qualified individuals will be allowed to perform work on electrical circuits or perform electrical work on equipment. No employee shall be permitted to work on any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or ensuring that it has been locked and tagged out:

- All electrical wiring and equipment shall be a type listed by Underwriters Laboratories (UL) or Factory Mutual (FM) for the specific application.
- All installations shall comply with the National Electric Code (NEC) and the National Electric Safety Code (NESC).
- All electrical circuits shall be grounded according to NEC and NESC Code. GFCIs shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- Generators and like equipment will be grounded in accordance with NEC, unless exempted by NEC 250-6.
- All live wiring or equipment shall be guarded to protect all persons or objects from harm.

ED_014247_00001508-00112

5.2.10 Control of Hazardous Energy

Hazardous energy sources may be encountered during the servicing and maintenance of machines and equipment, in which the unexpected energization or start-up of the machines or equipment could cause injury to employees.

The minimum performance requirements to control hazardous energy requires that employers develop and implement an energy control program. The elements of an energy control program are as follows:

- Lockout/tagout.
- Employee protection.
- Energy control procedure.
- Protective materials and hardware.
- Periodic inspections.
- Training and communication.
- Energy isolation.
- Employee notification.

Project personnel who are required to conduct operations and maintenance activities that will require the isolation of an energy hazard using a lockout/tagout device shall follow the GHD program requirements and written procedures for that operation.

Employee Training

Employees authorized to attach and remove lockout/tagout devices shall be provided with initial training regarding the safe application, usage, and removal of such devices. Each authorized employee will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the associated energy, and the methods necessary for energy isolation and control.

All authorized employees will be provided with refresher training annually, or at more frequent intervals whenever the following conditions apply:

- A job assignment change.
- A change in machinery or equipment, or a process change that presents new hazard.
- A change in the energy control procedures.
- Possible deficiencies in the employee's understanding of the following.
- The hazards associated with the energy that controls the machinery or equipment in the employee's work area.
- Application and removal procedures for lockout/tagout devices.

Employees who work in areas where lockout/tagout procedures are used shall receive initial and annual refresher training in the purpose and use of lockout/tagout devices and principles behind their use.

Compressed Gas Cylinders

Compressed gases present several hazards. The cylinder must be properly labeled, identifying the hazardous properties of the gas, such as toxicity, flammability, or the presence of an oxidizer, and a SDS must be supplied by the manufacturer. In addition to the gas hazards, compressed gas cylinders pose other hazards simply because they contain gas under pressure.

Regardless of the properties of the gas, any gas under pressure can explode if the cylinder is improperly stored or handled. Improperly releasing the gas from a compressed gas cylinder is extremely dangerous. A sudden release of the gas can cause a cylinder to become a missile-like projectile, destroying everything in its path. Cylinders have been known to penetrate concrete-block walls. To prevent such a dangerous situation, there are several general procedures to follow for the safe storage and handling of a compressed gas cylinder:

ED_014247_00001508-00113

- Store cylinders in an area specifically designated for that purpose. This area must protect the cylinders from being struck by another object. The area must be well-ventilated, away from sources of heat, and at least 20 feet away from highly combustible materials. Oxidizers must be stored at least 20 feet away from flammable gases.
- Cylinders must not be dropped or allowed to fall. Chain and rack them in an upright position during use and storage. When transporting cylinders, they must be secured from falling.
- When moving a cylinder, even for a short distance, all the valves must be closed, the regulator removed, and the valve cap installed. Never use the valve cap to lift a cylinder. If you are using a crane or some other lifting device to move a cylinder, use a cradle or boat designed for that purpose. Never use a sling or a magnet to move a cylinder.
- Never permit cylinders to contact live electrical equipment or grounding cables.
- Cylinders must be protected from the sun's direct rays, especially in high-temperature climates. Cylinders must also be protected from ice and snow accumulation.
- Before the gas is used, install the proper pressure-reducing regulator on the valve. After installation, verify the regulator is working, all gauges are operating correctly, and all connections are tight to ensure that there are no leaks. When you are ready to use the gas, open the valve with your hands. Never use a wrench or other tool. If you cannot open it with your hands, do not use it.

5.2.11 Slip/Trip/Hit/Fall

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers, but can be minimized by the following prudent practices:

- Spot check the work area to identify hazards.
- Establish and utilize a pathway free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to work site personnel.
- Secure all loose clothing and ties and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.

5.2.12 Heat Stress

Recognition and Symptoms

Temperature stress is one of the most common illnesses faced by project personnel when working in elevated temperatures and/or humidity. Acclimatization and frequent rest periods must be established for conducting activities where heat stress may occur. Below are listed signs and symptoms of heat stress. Personnel should follow appropriate guidelines if any personnel exhibit these symptoms:

- **Heat Rash:** Redness of skin. Frequent rest and change of clothing.
- **Heat Cramps:** Painful muscle spasms in hands, feet, and/or abdomen. Administer lightly salted water by mouth unless there are medical restrictions.
- **Heat Exhaustion:** Clammy, moist, pale skin, along with dizziness, nausea, rapid pulse, fainting. Remove to cooler area and administer fluids.
- **Heat Stroke:** Hot dry skin; red, spotted, or bluish; high body temperature of 104°F; mental confusion; loss of consciousness; convulsions or coma. Immediately cool victim by immersion in cool water. Wrap with wet sheet

ED_014247_00001508-00114

and sponge with cool liquid while fanning; treat for shock. **Do not delay treatment. Cool body while awaiting ambulance.**

Work Practices

The following procedures will be carried out to reduce heat stress:

- Heat stress monitoring.
- Acclimatization.
- Work/rest regimes (schedule of breaks) -mandatory breaks scheduled in summer months or during high-risk activities for heat stress.
- Heat stress safety PPE (cool-vests, bandanas, etc.).
- Liquids that replace electrolytes, water, and salty foods available during rest.
- Use of buddy system.

Acclimatization

The level of heat stress at which excessive heat strain will result depends on the heat tolerance capabilities of the worker. Each worker has an upper limit for heat stress, beyond which the resulting heat strain can cause the worker to display symptoms of heat stress. In most workers, appropriate repeated exposure to elevated heat stress causes a series of physiologic adaptations called acclimatization, whereby the body becomes more efficient in coping with the heat stress. Work/rest regimes should be planned as a component of project preparation and discussed during the daily tailgate safety meetings.

Worker Information and Training

All new and current employees who work in areas where there is a reasonable likelihood of heat injury or illness should be kept informed through continuing education programs (e.g., hazards, effects, preventative measures, drug/alcohol interaction). A Fatigue Management Plan that addresses working in extreme temperatures is provided in Attachment F.

5.2.13 Sun Exposure

Overexposure to sunlight is a common concern when field activities occur during warm weather conditions. Overexposure can occur on clear, sunny days as well as on overcast and cloudy days. Ultraviolet (UV) rays from the sun can cause skin damage or sunburn, but can also result in vision problems, allergic reactions, and other skin concerns. Two types of UV rays are emitted from the sun: UVA and UVB rays.

UVB rays cause sunburn, skin cancer, and premature aging of the skin. UVB rays stimulate tanning but are also linked to other problems such as impaired vision, skin rashes, and some allergic and other reactions to certain drugs. Extra care should be taken if activities are to be conducted on or near water. Sunlight reflected off the surface of the water is intensified resulting in accelerated effects. The following steps should be taken to protect against overexposure to sunlight:

- ***Always Use Sunscreen:*** Apply a broad-spectrum sunscreen with Sun Protection Factor (SPF) of at least 15 or higher liberally on exposed skin. Reapply every 2 hours or more. Even waterproof sunscreen can come off when you towel off or sweat.
- ***Cover Up:*** Wearing tightly woven, loose-fitting, and full-length clothing is a good way to protect your skin from UV rays.
- ***Wear a Hat:*** A hat with a wide brim offers good sun protection to your eyes, ears, face, and the back of your neck-areas particularly prone to overexposure to the sun.

ED_014247_00001508-00115

- ***Wear Sunglasses That Block 99 to 100 Percent of UV Radiation:*** Sunglasses that provide 99 to 100 percent UVA and UVB protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses.
- ***Seek Shade:*** Shade is a good source of protection, but keep in mind that shade structures (e.g., trees, umbrellas, canopies) do not offer complete sun protection.
- ***Limit Time in the Midday Sun:*** The sun's rays are strongest between 10:00 a.m. and 4:00 p.m. Whenever possible, limit exposure to the sun during these hours.

5.2.14 Cold Stress

Cold stress is similar to heat stress, in that it is caused by a number of interacting factors including environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual. Fatal exposures to cold have been reported in employees failing to escape from low environmental air temperatures or from immersion in low temperature water. Hypothermia, a condition in which the body's deep core temperature falls significantly below 98.6°F (37°C), can be life threatening. A drop in core temperature to 95°F (35°C) or lower must be prevented.

Air temperature is not sufficient to determine the cold hazard of the work environment. The wind chill must be considered as it contributes to the effective temperature and insulating capabilities of clothing. The equivalent chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the body's core temperature.

The body's physiologic defense against cold includes constriction of the blood vessels, inhibition of the sweat glands to prevent loss of heat via evaporation, glucose production, and involuntary shivering to produce heat by rapid muscle contraction.

The frequency of incidents increases with cold temperature exposures as the body's nerve impulses slow down, individuals react sluggishly, and numb extremities make for increased clumsiness. Additional safety hazards include ice, snow blindness, reflections from snow, and possible skin burns from contact with cold metal.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F (35°C). This must be taken as a sign of danger to the employees on the work site, and cold exposures should be immediately terminated for any employee when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Predisposing Factors for Cold Stress

Certain predisposing factors make an individual more susceptible to cold stress. The project team members are responsible for informing the SS to monitor an individual, if necessary, or use other means of preventing/reducing the individual's likelihood of experiencing a cold related illness or disorder.

Predisposing factors that will increase an individual's susceptibility to cold stress are listed below:

- **Dehydration:** The use of diuretics and/or alcohol, or diarrhea can cause dehydration. Dehydration reduces blood circulation to the extremities.
- **Fatigue During Physical Activity:** Exhaustion reduces the body's ability to constrict blood vessels. This results in the blood circulation occurring closer to the surface of the skin and the rapid loss of body heat.
- **Age:** Some older and very young individuals may have an impaired ability to sense cold.
- **Poor Circulation:** Vasoconstriction of peripheral vessels reduces blood flow to the skin surface.
- **Heavy Workload:** Heavy workloads generate metabolic heat and make an individual perspire even in extremely cold environments. If perspiration is absorbed by the individual's clothing and is in contact with the skin, cooling of the body will occur.
- **Use of PPE:** PPE usage that traps sweat inside the PPE may increase an individual's susceptibility to cold stress.

- **Lack of Acclimatization**: Acclimatization, the gradual introduction of workers into a cold environment, allows the body to physiologically adjust to cold working conditions.
- **History of Cold Injury:** Previous injury from cold exposures may result in increased cold sensitivity.

Prevention of Cold Stress

A variety of measures can be implemented to prevent or reduce the likelihood of employees developing cold related ailments and disorders. These include acclimatization, fluid, and electrolyte replenishment, eating a well-balanced diet, wearing warm clothing, the provision of shelter from the cold, thermal insulation of metal surfaces, adjusting work schedules, and employee education.

- **Acclimatization:** Acclimatization is the gradual introduction of workers into the cold environment to allow their bodies to physiologically adjust to cold working conditions. However, the physiological changes are usually minor and require repeated uncomfortably cold exposures to induce them.
- **Fluid and Electrolyte Replenishment:** Cold, dry air can cause employees to lose significant amounts of water through the skin and lungs. Dehydration affects the flow of blood to the extremities and increases the risk of cold injury. Warm, sweet, caffeine-free, non-alcoholic drinks and soup are good sources to replenish body fluids.
- **Eating a Well-Balanced Diet:** Restricted diets including low salt diets can deprive the body of elements needed to withstand cold stress. Eat high-energy foods throughout the day.
- **Warm Clothing:** Maintaining air space between the body and outer layers of clothing is beneficial to retain body heat. However, the insulating effect provided by such air spaces is lost when the skin or clothing is wet.
- **Work/Rest Regimes:** Schedule work during the warmest part of the day, if possible. Rotate personnel and adjust the work/rest schedule to enable employees to recover from the effects of cold stress.

The parts of the body most important to keep warm are the feet, hands, head, and face. As much as 40 percent of body heat can be lost when the head is exposed.

5.2.15 Adverse Weather Conditions

The SS shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, heavy rains, hurricanes, tornado warnings, and sustained strong winds (approximately 40 miles per hour [mph]) are examples of conditions that would call for the discontinuation of work and evacuation of the work site.

In addition, no work with elevated super structures (e.g., drilling, crane operations) will be permitted during any type of electrical storm, or during wind events that have wind speeds exceeding 40 mph.

5.3 Biological Hazards

GHD employees conduct numerous project activities that may encounter biological hazards, including bloodborne pathogens, insects, spiders, scorpions, rodents, snakes, and large predators. This section identifies precautions to be taken if these hazards are encountered.

5.3.1 Vegetation Overgrowth

Overgrown weeds, bushes, trees, grass, and other vegetation are fire and safety hazards. A number of hidden hazards may not be immediately recognized due to the overgrowth of vegetation in areas where field activities may occur, including discarded junk, litter, and debris. Construction materials such as boards, nails, concrete, and other debris may be hidden beneath tall grass, weeds, and bushes. Other hazards may include steep slopes, potholes, trenches, soft spots, dips, etc., all dangerously concealed from the view of the individual walking or operating motorized equipment in the area. Additionally, biological hazards such as snakes, ticks, chiggers, and mosquitoes may be present, as they breed in overgrowth conditions.

Here are some simple actions you can take:

ED_014247_00001508-00117

- Assess the work area and determine if the area requires vegetation clearance. Consider that overgrowth extending above the lowest level of motorized equipment (i.e., bumper or fender) or 6 inches above your ankle has hidden hazards that you will not be able to readily identify.
- Determine if the area is safe to walk or whether you need motorized equipment. Consider the limitations of the equipment.
- Identify slip, trip, and fall hazards and remove from the general work area. Remember to give adequate clearance so that the items being removed do not pose future hazards.
- Adequately protect yourself against the hazards by wearing boots that protect the ankles, wearing long pants, and using insecticides.
- Consider the limitations of manual or mechanical equipment for the clearance of overgrowth, particularly the safety hazards when using sling blades, machetes, weed eaters, bush hogs, or other brush removing equipment.

Before taking any action, determine whether there any ecological issues that would affect or prevent the removal of overgrowth in protected areas such as wetlands, wildlife habitats, or sanctuaries for endangered and/or protected species.

5.3.2 Poisonous Plants

Common poison ivy grows as a small plant, a vine, and a shrub. Poison ivy occurs in every state. The leaves always consist of three glossy leaflets.

Poison sumac grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction, referred to as “contact dermatitis.”

Dermatitis, in Rhus-sensitive persons, may result from contact with the milky sap found in the roots, stems, leaves, and fruit, and may be carried by contacted animals, equipment, or apparel.

The best form of prevention is to avoid contact. Wearing long sleeves, gloves, and disposable clothing, such as Tyvek, is recommended in high-risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

5.3.3 Insects

Ticks

Ticks are blood feeding external parasites of mammals, birds, and reptiles throughout the world. Some human diseases of current interest in the United States caused by tick-borne pathogens include Lyme disease, ehrlichiosis, babesiosis, Rocky Mountain spotted fever, tularemia, and tick-borne relapsing fever. Lyme disease is caused by a bacterial parasite called spirochete and is spread by infected ticks that live in and near wooded areas, tall grass, and brush. The ticks that cause the disease in the Northeast and Midwest are often no bigger than a poppy seed or a comma in newsprint. The peak months for human infection are June through October. Many other tick-borne diseases, such as Rocky Mountain spotted fever, can be carried by a variety of ticks. The prevention and treatment of these diseases are similar to those of Lyme disease.

Prevention

Preventative measures include wearing light-colored clothing, keeping clothing buttoned, tucking pant legs in socks, and keeping shirttails tucked in. Periodic checks for ticks should be made during the day, and especially at night. Hair should also be checked by parting it and combing through it to make sure that no ticks have attached to the scalp. Also, check clothing when it is first removed before ticks have a chance to crawl off. A shower or bath should be taken as soon as possible after leaving the work site for the day.

ED_014247_00001508-00118

The most common repellent recommended for ticks is N, N-dimethyl-m-toluamide, or DEET. It is important to follow the manufacturer's instructions found on the container with all insecticides, especially those containing DEET.

In general, DEET insect repellent should only be applied to clothing, not directly on the skin. Do not apply to sunburns, cuts, or abrasions. Use soap and water to remove DEET once indoors. However, the DEET user is required to read the insect repellant label and/or SDS for safe use requirements. If ticks are not responding to DEET or other safety methods, then the PM and RSHM are to be notified and additional safety controls may be utilized.

Removal

The best way to remove a tick is removal by tweezers. If tweezers are not available, cover your fingers (tissue paper) while grasping the tick. It is important to grasp the tick as close as possible to the site of attachment and use a firm steady pull to remove it. When removing the tick, be certain to remove all the mouth parts from your skin so as not to cause irritation or infection. Wash hands immediately after with soap and water and apply antiseptic to the area where tick was removed. Get medical attention if necessary.

Symptoms of Lyme Disease

The first symptoms of Lyme disease usually appear from 2 days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick attached, and often red on the outside and clear in the center. The rash may be warm, itchy, tender, and/or "doughy" and appears in only 60 to 80 percent of infected persons. An infected person also has flu-like symptoms of fever, fatigue, chills, headaches, a stiff neck, and muscle aches and pains (especially knees). Rashes may be found some distance away from the original rash. Symptoms often disappear after a few weeks.

Bees, Wasps, and Yellow Jackets

Stinging insects are members of the order Hymenoptera of the class Insecta. There are two major subgroups: Apidae (honeybees and bumblebees) and vespids (wasps, yellow jackets, and hornets). Apidae are docile and usually do not sting unless provoked. The stinger of the honeybee has multiple barbs, which usually detach after a sting. Vespids have few barbs and can inflict multiple stings.

Types of stinging insects that might be encountered at this work site may include:

Carpenter bees	Africanized killer bees	Honeybees
Bumblebees	Cicada killer wasps	Paper wasps
Mud dauber wasps	Giant hornets	Yellow jackets

Symptoms

If you are stung, three types of reactions are possible: a normal, a toxic, or an allergic reaction.

- **Normal Reaction:** Only lasts a few hours and consists of pain, redness, swelling, itching, and warmth near the sting area.
- **Toxic Reaction**: Will last for several days, results from multiple stings, and may cause cramps, headaches, fever, and drowsiness.
- **Allergic Reaction:** Can cause hives, itching, swelling, tightness in the chest area, and a possibility of breathing difficulties, dizziness, unconsciousness, and cardiac arrest.

The stingers of many Hymenoptera may remain in the skin and should be removed as quickly as possible without concern for the method of removal. An ice cube placed over the sting will reduce pain; aspirin may also be useful. Persons with known hypersensitivity to such stings should carry a kit containing epinephrine in a prefilled syringe. Antihistamines may help decrease hives and angioedema. Persons who have severe symptoms of anaphylaxis, have positive venom skin test results, and are at risk for subsequent stings should receive immunotherapy regardless of age or time since anaphylaxis.

ED_014247_00001508-00119

Precautions

The following precautions can help you avoid stings. Try to wear light colored clothing and shy away from dark or floral prints. Avoid wearing perfumes, hairsprays, colognes, and scented deodorants while working outside. If eating outside, keep all food and drinks covered; sweet foods and strong scents attract stinging insects as well. Never swat or swing at the insect; it is best to wait for it to leave, softly blow it away, or gently brush it aside. Seek medical attention when the reaction to a sting includes swelling, itching, dizziness, or shortness of breath.

If physical control measures are not effective, use a pesticide that will have a minimal impact on both you and the environment.

Fire Ants

Fire ants are reddish-brown in color and range from 1/8 inch to 3/8 inch in length. When a fire ant stings an individual, the individual is rarely only stung once. Most fire ant stings result in a raised welt with a white pustule. If stung by a fire ant, continue to observe the welt and try to prevent secondary infection by keeping the welt intact. However, some individuals may have an allergic reaction to a fire ant sting and require immediate medical attention. Pesticides and even hot water can be used to kill fire ant colonies. Fire ants are normally seen in the southern states.

Mosquitoes

Mosquitoes are common pests that can be found in any state and any work environment where warm, humid conditions exist. Mosquitoes can pass along diseases such as West Nile virus and malaria. Several different methods can be used to control adult mosquito populations: repellants such as DEET, mosquito traps, foggers, and vegetation and water management.

5.3.4 Poisonous Spiders

Black Widow

Black Widow spiders are not usually deadly (especially to adults) and only the female is venomous. The female spider is shiny black, usually with a reddish hourglass shape on the underside of her spherical abdomen. Her body is about 1.5 inches long, while the adult male's is approximately half that. The spider's span ranges from 1 to 3 inches. The adult males are harmless, have longer legs, and usually have yellow and red bands and spots over their back, while the young black widows are colored orange and white. The bite of a black widow is often not painful and may go unnoticed. However, the poison injected by the spider's bite can cause severe reactions in certain individuals.

Symptoms

Symptoms include abdominal pain, profuse sweating, swelling of the eyelids, pains to muscles or the soles of the feet, salivation and dry-mouth (alternating), and paralysis of the diaphragm. If a person is bitten, they should seek immediate medical attention. Clean the area of the bite with soap and water. Apply a cool compress to the bite location. Keep effected limb elevated to about heart level. Ask a doctor if acetaminophen or aspirin can be taken to relieve minor symptoms. Additional information can be obtained from the Poison Center (1-800) 222-1222. Black widows are found throughout the tropics, U.S., and Canada.

Brown Recluse

Brown recluse spiders are usually light brown in color, but in some instances they may be darker. Brown recluse spiders are highly venomous spiders, native to the United States, and found coast to coast. The brown recluse can vary in size, but some can obtain bodies of 5/8 inches in length with a leg span of 1 1/2 inches in diameter. They can be identified by their three pairs of eyes along the head area and their fiddle shaped markings on the back. Most brown recluse bites are defensive rather than offensive. They generally only bite when they feel threatened.

ED_014247_00001508-00120

Symptoms

If bitten by a brown recluse, an individual may experience open, ulcerated sores, which when left untreated may become infected and cause tissue necrosis. If an individual believes a spider has bitten them, they need to seek medical attention as soon as possible. To minimize the occurrence of brown recluse bites, individuals should shake their clothing and shoes thoroughly, eliminate the presence of cluttered areas, and spray the building perimeters with pesticides. Brown recluse are found throughout the U.S., Mexico, and Canada.

5.3.5 Threatening Dogs

If you are approached by a frightened or menacing dog:

- Do not attempt to run and do not turn your back.
- Stay quiet and remember to breathe.
- Be still, with arms at sides or folded over chest with hands in fists.
- Slowly walk away sideways.
- Do not stare a dog in the eyes, as this will be interpreted as a threat.
- Avoid eye contact.
- If you have a jacket, you can wrap it around your arm to reduce harm, should the dog move to bite.

5.3.6 Rodents

Rodentia: (Rats, Mice, Beavers, Squirrels, Guinea Pigs, Capybaras, Coypu)

Rodents, or Rodentia, are the most abundant order of mammals. There are hundreds of species of rats; the most common are the black and brown rat.

The **Brown Rat** has small ears, blunt nose, and short hair. It is approximately 14 to 18 inches long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, shops, and supermarkets; they also frequent any space with an easy meal and potential nesting sites.

The **Black Rat** can be identified by its tail, which is always longer than the combined length of the head and body. It is also slimmer and more agile than the Norwegian or Brown rat. Its size varies according to its environment and food supply.

The **House Mouse** has the amazing ability to adapt and now can frequently be found in human dwellings. In buildings, mice will live anywhere, and they are very difficult to keep out. Mice are also omnivorous and will eat anything.

Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

There are six major problems caused by rats and mice:

1. They eat food and contaminate it with urine and excrement.
2. They gnaw into materials such as paper, books, wood, or upholstery, which they use as nest material. They also gnaw plastic, cinder blocks, soft metals such as lead and aluminum, and wiring, which may cause a fire hazard.
3. Rats occasionally bite people and may kill small animals.
4. They, or the parasites they carry (such as fleas, mites, and worms), spread many diseases such as salmonella, trichinosis, rat bite fever, hantavirus, Weil's disease, and the bubonic plague.
5. Rats can damage ornamental plants by burrowing among the roots or feeding on new growth or twigs. They also eat some garden vegetables, such as corn and squash.

ED_014247_00001508-00121

6. Rats and mice are socially unacceptable. These rodents have been a problem for centuries, chiefly because they have an incredible ability to survive and are so difficult to eliminate. In addition, they are extremely compatible with human behavior and needs.

5.3.7 Snakes

Snakes may be found in any region of the country. While many snakes encountered are not venomous, a few are, so all snakes should be given a wide berth. Of the 7,000 venomous snakebites reported each year, only about 15 prove to be fatal, so your chances of survival are extremely high. The usual snake encounter is one in which they see you before you see them, and they slither away from you quickly, startling you. If you see a snake, back away from it slowly and do not touch it. If you or someone you know are bitten, try to see and remember the color and shape of the snake, which can help with treatment of the snakebite.

Venomous snakes include the coral snake and pit vipers, such as the cottonmouth (water moccasin), copperhead, and rattlesnake. The venom of pit vipers is primarily *hematoxic* because it acts upon the victim's blood system. This venom breaks down blood cells and blood vessels and affects heart action. Bite victims experience severe burning pain, localized swelling, and discoloration for the first 3 to 30 minutes, followed by nausea, vomiting, occasional diarrhea, and usually shock.

Preventing Snakebites

The best ways to prevent snakebites are to watch where you step, put your hands, or sit down. Poisonous snakes live on or near the ground and often like rocks, woodpiles, and other spots that offer both a place to sun and a place to hide. Most bites occur in and around the ankle. About 99 percent of all bites occur below the knee, except when someone accidentally picks up or falls on the snake.

Watching where you step and wearing boots in tall grass can prevent most snakebites. Snake chaps can also help protect against snakebites.

Signals that indicate a poisonous snakebite include:

- One or two distinct puncture wounds, which may or may not bleed. The exception is the coral snake, whose teeth leave a semicircular mark.
- Severe pain and burning at the wound site immediately after or within 4 hours of the incident.
- Swelling and discoloration at the wound site immediately after or within 4 hours of the incident

Emergency First Aid for Poisonous Snakebite

Although it is important to obtain medical aid immediately, emergency first aid can slow the spread of poison from the bite. Remain calm and avoid unnecessary movement, especially if someone is with you. The rate of venom distribution throughout your body will be slower if you are still and quiet. *Do not* use home remedies, and *do not* drink alcoholic beverages.

To care for a bite from a pit viper, such as a rattlesnake, copperhead, or cottonmouth, follow these steps:

- Call 9-1-1 or the local emergency number.
- Wash the wound.
- Keep the injured area still and lower than the heart; if possible, carry a person who must be taken to a medical facility or have him or her walk slowly.
- Do not apply ice.
- Do not cut the wound.
- Do not apply suction.
- Do not apply a tourniquet.
- Do not use electric shock, such as from a car battery.

ED_014247_00001508-00122

Care for a bite from an elapid snake, such as a coral snake, is the same as for a pit viper, except that after washing the wound, you should apply an elastic roller bandage by following these steps:

- Check for feeling, warmth, and color of the limb beyond where you will be placing the bandage by noting changes in skin color and temperature.
- Place the end of the bandage against the skin and use overlapping turns.
- Gently stretch the bandage as you continue wrapping. The wrap should cover a long body section, such as an arm or a calf, beginning at the point farthest from the heart. For a joint like a knee or ankle, use figure-eight turns to support the joint.
- Always check the area above and below the injury site for feeling, warmth, and color, especially fingers and toes, after you have applied an elastic roller bandage. By checking before and after bandaging, you will be able to tell if any tingling or numbness is from the bandaging or the injury.
- Check the snugness of the bandaging a finger should easily, but not loosely, pass under the bandage.
- Keep the injured area still and lower than the heart. If possible, carry a person who must be taken to a medical facility or have him or her walk slowly.
- Do not apply ice.
- Do not cut the wound.
- Do not apply suction.
- Do not apply a tourniquet.
- Do not use electric shock, such as from a car battery.

5.3.8 Scorpions

Forty different types of scorpions are found in the U.S. All the different types are located in the southern states.

Wind scorpions, including sun scorpions, are easily recognized by the pair of large, pincer-like chelicerae on the head in front of the mouth and by the slight, waist-like constriction near the middle of the body. Unlike the broadly joined cephalothorax and abdomen of scorpions, wind scorpions have three distinct body regions:

- A segmented cephalothoracic area with two eyes at the front margin.
- A three-segmented thorax.
- A ten-segmented abdomen.

Death by a scorpion sting, if it occurs, is the result of heart or respiratory failure some hours after the incident.

5.3.9 Alligators/Crocodiles

Alligators, crocodiles, and gharials make up the group of animals known as crocodilians. Crocodilians are the world's largest reptiles. The American alligator or *Alligator mississippenisis* is the least aggressive crocodilian.

Similar to snakes, lizards, and other reptiles, alligators are cold-blooded (or ectothermic), meaning the air or water temperature around them determines their body temperature. The **American alligator** primarily ***inhabits the southeastern U.S.: Alabama, Arkansas, North and South Carolina, Florida, Georgia, Louisiana, Mississippi, Oklahoma, and Texas.*** They primarily live in freshwater swamps and marshes, but also in rivers, lakes, and smaller bodies of water. They can tolerate a reasonable degree of salinity for short periods of time as they are occasionally found in brackish water around mangrove swamps, although they lack the buccal salt-secreting glands present in crocodiles. Adult males typically reach 4 to 4.5 meters (approximately 13 to 14.7 feet). Alligators are classified as a threatened species and thus enjoy the protection of state and federal law. State and federal law prohibits people from killing, harassing, molesting, or attempting to move alligators. The potential for being bitten or injured by a provoked alligator is high. Maintain a distance of at least 15 feet from any alligator. Fifteen feet is the outside range for the alligator's frightening burst of speed.

ED_014247_00001508-00123

If an alligator attacks:

Run away in a straight line. Crocodiles and alligators will outrun you for about 30 feet (10 meters) or so at speeds up to 20 mph, after which they will need to rest. They will have no trouble out swimming you, however.

If an alligator grabs you:

- Hit it repeatedly on its relatively sensitive nose, poke it in the eyes, and scream. Alligators do not like resistance.
- Do not try to pry the jaws open.
- Play dead. They stop shaking their prey when they think that it is dead, wedging the body in their pantry for later consumption. This is when you can escape.

Seek immediate medical attention if you are bitten by an alligator. Alligators harbor very infectious bacteria, and even minor bites may require special treatment.

5.3.10 Bloodborne Pathogens

Hepatitis and other communicable diseases are largely transmitted through exposure to bodily fluids containing the hepatitis virus, which could be found on refuse encountered in subsurface investigations. They may also be encountered during activities occurring at landfills, sewage treatment facilities, and sewers, and locations where topical spreading of treated waste and medical wastes (e.g., contaminated needles and syringes) occurs. Individuals performing tasks for these types of projects should consult with their physicians and be properly vaccinated. The primary method of transmission depends on the prevalence of the disease in a given area.

Hepatitis A

Hepatitis A is a liver disease caused by the hepatitis A virus. Hepatitis A can affect anyone and can occur in situations ranging from isolated cases of disease to widespread epidemics.

Hepatitis B

Hepatitis B is a serious disease caused by a virus that attacks the liver. The virus, which is called hepatitis B virus (HBV), can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death.

Hepatitis C

Hepatitis C is a liver disease caused by the hepatitis C virus (HCV), which is found in the blood of persons who have the disease. HCV is spread by contact with the blood of an infected person.

Hepatitis D

Hepatitis D is a liver disease caused by the hepatitis D virus (HDV), a defective virus that needs the hepatitis B virus to exist. HDV is found in the blood of persons infected with the virus.

Hepatitis E

Hepatitis E is a liver disease caused by the hepatitis E virus (HEV) and is transmitted in much the same way as hepatitis A virus. Hepatitis E, however, does not often occur in North America.

Prevention

Preventative measures include wearing appropriate PPE: leather work gloves, a long-sleeved shirt, and safety footwear. Several vaccines have been developed for the prevention of hepatitis B and C virus infection. Vaccines rely on the use of one of the viral proteins (hepatitis B surface antigen or HBsAg). The vaccine was originally prepared from plasma obtained from patients who had long-standing hepatitis B virus infection. However, currently these are more often made using recombinant technology, though plasma-derived vaccines continue to be used; the two types of vaccines are equally effective and safe.

ED_014247_00001508-00124

5.3.11 COVID-19 Guidance

The COVID-19 outbreak is affecting our people, our clients, and all organizations across the globe. GHD will maintain regular communication with field staff and clients to gather information for project sites, fieldwork, and travel. GHD and subcontractors will adhere to requirements outlined in the GHD COVD-19 Precautions-Field Work JSA and COVID-19 Guidance for GHD Field Personnel. In addition, it may be necessary to adhere to COVID-19 protocols established by the terms of access agreements for property, on which work is taking place.

Prior to accessing the work site, GHD personnel will obtain proper approvals and authorization. Prior to mobilizing to the work site, GHD personnel will complete the GHD boarding pass, and each subcontractor will be required to complete the screening questionnaire daily.

Additionally, the different field teams will be segregated from each other to maintain separation. TGSMs will be conducted outside while maintaining 6-feet of distance. Access to the field trailer will minimized.

6. Personal Protective Equipment (PPE)

6.1 General

This section covers the applicable PPE requirements, which shall include eye, face, hand, head, foot, and respiratory protection.

The purpose of PPE is to shield or isolate individuals from the chemical and physical hazards that may be encountered during work activities.

6.2 Levels of Protection

The level of protection must correspond to the level of hazard known or suspected in the specific work area. PPE has been selected with specific considerations to the hazards associated with work site activities. The specific PPE to be used for each activity is outlined in each JSA located in Attachment B. A detailed Decontamination Plan is located in Attachment E.

- All PPE will be disposed of and/or decontaminated at the conclusion of each workday as described below. Decontamination procedures will follow the concept of decontaminating the most contaminated PPE first.
- All disposable equipment shall be removed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work.
- Eating, drinking, chewing gum or tobacco, and smoking are prohibited while working in areas where the potential for chemical and/or explosive hazards may be present. Personnel must wash thoroughly before initiating any of the aforementioned activities.

6.2.1 Reassessment of Protection Levels

Protection levels provided by PPE selection shall be upgraded or downgraded based upon a change in work site conditions. PPE has been selected based on exposure assessment activities conducted by a GHD Certified Industrial Hygienist (CIH) as part of the remedial design.

When a significant change occurs, the hazards shall be reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase.
- Change in job tasks during a work phase.
- Change of season/weather.

ED_014247_00001508-00125

- Temperature extremes or individual medical considerations limit the effectiveness of PPE.
- Chemicals other than those expected to be encountered are identified.
- Change in ambient levels of chemicals.
- Change in work scope, which affects the degree of contact with areas of potentially elevated chemical presence.

All proposed changes to protection levels and PPE requirements will be reviewed and approved prior to their implementation by the SS.

7. Air Monitoring Program

Inhalation hazards are caused from the intake of vapors and contaminated dust. Air monitoring shall be performed while intrusive activities are taking place to detect the presence and relative level of those air contaminants that are inhalation hazards. The purpose of air monitoring is to identify and quantify airborne contaminants to determine the level of worker protection needed. Initial screening for identification is often qualitative, but the determination of its concentration (quantification) must await subsequent testing.

All instruments will be calibrated daily in accordance with the manufacturer's guidelines. Records of all calibrations and real-time measurements will be kept in a bound field logbook or documented via air monitoring and calibration log sheets.

When air monitoring is required, the workers breathing zone(s) will be monitored and the results recorded. Additionally, area samples at the following locations will be taken daily. Record time, location, and results of monitoring and actions taken based on the readings:

- Upwind of work areas to establish background concentrations.
- In support zone to check for contamination or migration of emissions.
- Along decontamination line to check that decontamination workers are properly protected and on-site workers are not removing protective equipment in a contaminated area.
- Downwind of work area to track any contaminants/emissions leaving the work site

The data collected throughout the monitoring effort shall be used to determine the appropriate levels of protection. Action levels for upgrading or downgrading of PPE have been established and Table 2 presents the action levels for the work site Air Monitoring Program.

7.1 Exposure Monitoring

7.1.1 Multi-Gas Meters (LEL/O_2/H_2S/CO Meters)

The multi-gas meter is a combination indicator typically including oxygen, carbon monoxide, hydrogen sulfide, and combustible gas, which simultaneously analyzes concentrations of each contaminant in air. When used properly, the portable oxygen indicator will read the percent oxygen in the immediate atmosphere; the normal ambient oxygen concentration is 20.9 percent at sea level.

Action levels for each contaminant being monitored can be found in Table 2, which includes parameters, action levels, and actions to be taken.

7.1.2 Monitoring Frequency

Monitoring will be conducted continuously during ground intrusive activities or during any activity where airborne hazards (e.g., organic vapors) may be present. The monitoring equipment listed per work activity relates to the initial level of protection. The monitoring frequency may be decreased if the work areas and activities are unchanging, the

ED_014247_00001508-00126

result of the first hour of monitoring indicate contaminant concentrations are non-detect, and no differing conditions are observed.

Monitoring results will be legibly documented each workday. They will note project name/number, date, time, serial number, date of last calibration, name of person performing calibration, name of person performing monitoring, monitor location within the work site, and monitoring results. Daily documentation will be kept with the SS and included in the project file.

7.1.3 HSE Action Levels

An action level is a point at which increased protection or cessation of activities is required due to the concentration of contaminants in the work area. All activities shall be initiated in Modified Level D. The appropriate actions are to be taken at designated action levels. The initial action level(s) for the work site can be located in Table 2.

In addition to the action level, an upgrade to Level C is required if:

- Any symptoms of chemical exposure occur, as described in Table 1.
- Requested by an individual performing the task.
- Any irritation to eye, nose, throat, or skin occurs.

8. Site Control

The purpose of work site control is to minimize potential contamination of workers and protect the public from hazards found at the work site. Work site control is especially important in emergency situations.

- Work site control and work area demarcation will be achieved through posting of signage and placement of barricades. All construction areas will have the appropriate signage posted. Barricades and warning signs will be placed to warn personnel of potential hazards. A standby person (spotter) may be utilized in place of barricades, where appropriate. The following materials may be used to barricade construction areas, crane swing radius, and control traffic:
  - Existing permanent and/or temporary fence.
  - High visibility tape, rope, or chains.
  - Traffic cones.
  - Sawhorses.
  - Wood or metal guardrails.

One pathway should be established for heavy equipment and one for personnel decontamination.

The majority of work site operations, as well as access to the work site, could be controlled from the support zone. The support zone will provide for team communications, emergency response, and sanitary facilities. Appropriate safety and support equipment also will be located in this zone.

The support zone will be located upwind of work site operations if possible and would be used as a potential evacuation point if appropriate. No potentially contaminated personnel or materials are allowed in this zone.

8.1 Communication

Each member of the project team will be able to communicate with other team members at all times. Communications will be by way of an air horn, walkie-talkie, cell phones, or hand signals.

The primary means for external communication are cell phones and radio.

ED_014247_00001508-00127

Understanding of the following standard hand signals will be mandatory for all employees, regardless of other means of communication:

- Hand gripping throat-Cannot breathe.
- Hands on top of head-Need assistance.
- Thumbs up-OK; I'm all right; I understand.
- Thumbs down-No; negative.
- Gripping partner's wrist or gripping both of your own wrists (if partner is out of reach) -Leave area immediately.

8.2 Buddy System

A buddy system shall be implemented when conducting intrusive activities at the work site. This buddy shall be able to:

- Provide his or her partner with assistance.
- Observe his or her partner for signs of chemical exposure or temperature stress.
- Periodically check the integrity of his or her partner's protective clothing.
- Notify emergency personnel if emergency help is needed.

8.3 Site Security

Work site security is necessary to prevent the exposure of unauthorized, unprotected people to work site hazards and to avoid interference with safe working procedures. Security should be maintained outside of the actual work area(s) as to prevent unauthorized entry into the work area(s).

"No Trespassing Violators Will Be Prosecuted" sign should be maintained at the entrance to the work site, with only authorized personnel allowed in this area.

First time work site visitors, at a minimum, should be accompanied by personnel familiar with the work site's layout and procedures.

8.4 Decontamination

The SS shall have responsibility for ensuring that all personnel and pieces of equipment leaving the work site are properly decontaminated according to the procedures outlined below.

8.4.1 Personnel and Equipment Decontamination Procedures

All PPE should be disposed of and/or decontaminated at the conclusion of each workday. Decontamination procedures should follow the concept of decontaminating the most contaminated PPE first, along with other requirements of 29 CFR 1910.120(k).

All disposable equipment should be removed before meal breaks and at the conclusion of the workday and should be replaced with new equipment prior to commencing work.

- All equipment should be decontaminated before leaving the work site.
- A temporary decontamination pad will be set up at the work site during project operations, as needed. All decontamination materials should be drummed for subsequent disposal.

ED_014247_00001508-00128

9. Emergency Procedures

9.1 On-Site Emergencies

Emergencies can range from minor to serious conditions. Various procedures for responding to work site emergencies are listed in this section. The PM or SS is responsible for contacting local emergency services, if necessary, for specific emergency situations. Various individual work site characteristics will determine preliminary action to ensure that these entry procedures are successfully implemented in the event of an emergency. The project team will address necessary facility/client emergency protocols to ensure compatibility between this document and facility/client programs and expectations.

An Emergency Information Sheet containing the hospital location, directions, government agency phone numbers, emergency phone numbers, and a map with directions to the hospital is located in at the front of this HASP.

9.2 Incident, Injury, and Illness Reporting and Investigation

Any work-related incident, injury, illness, exposure, or property loss must be reported the SS, and **within 1 hour** through the GHD Incident Reporting Hotline. Motor vehicle accidents must also be reported through this system. GHD's Incident Reporting Form, located in Attachment A, must also be filled out and provided to the SS. The report must be filed for the following circumstances:

- Incident, injury, illness, or exposure of an employee.
- Injury of a subcontractor.
- Damage, loss, or theft of property.
- Any motor vehicle accident, regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while the employee is acting in the course of employment.

Occupational incidents resulting in employee injury or illness will be investigated by the SS. This investigation will focus on determining the cause of the incident and modifying future work activities to eliminate the hazard.

All employees have the right and obligation to report unsafe work conditions, previously unrecognized safety hazards, or safety violations of others. If you wish to make such a report, it may be made orally to your supervisor or other member of management, or you may submit your concern in writing, either signed or anonymously.

9.3 Emergency Equipment and First Aid

Safety equipment will be available for use by work site personnel, located within 30 feet of the work area(s), and maintained at the work site. The safety equipment may include, but is not limited to, the following:

- First Aid kit (size is dependent upon the number of personnel at the work site):
- Automated External Defibrillators (AEDs) are optional first aid response equipment for conditions related to heart stoppage. If a unit is on site, designated personnel must be trained in the specific AED unit in addition to First Aid and cardiopulmonary resuscitation (CPR) certification, conduct monthly inspections, and contact listed AED Unit coordinator.
- Emergency eyewash bottles and/or an eyewash station lasting 15 minutes.
- Emergency alarms to alert all personnel instantaneously for an emergency.
- Fire extinguisher (at a minimum, a 2A/10BC will be at the work site).

ED_014247_00001508-00129

9.4 Emergency Procedures for Contaminated Personnel

Whenever possible, personnel should be decontaminated in the contamination reduction zone before administering first aid, without causing further harm to the patient.

- ***Skin Contact:*** Remove contaminated clothing, wash immediately with water, and use soap, if available.
- ***Inhalation:*** Remove victim from contaminated atmosphere. Remove any respiratory protection equipment. Initiate artificial respiration, if necessary. Transport to the hospital.
- ***Ingestion:*** Remove victim from contaminated atmosphere. Do not induce vomiting if victim is unconscious. Never induce vomiting when acids, alkalis, or petroleum products are suspected. Transport to the hospital, if necessary.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a listing of the contaminants of concern to which they may have been exposed.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated, as necessary.

9.5 Site Evacuation

In the event of an emergency situation such as fire, explosion, or significant release of toxic gases, project personnel in the field will be notified by cell phone established communications to evacuate the area. In the event of an emergency, GHD personnel will gather at their primary mustering point for a head count. The SS will determine a primary and secondary muster point to be used as an assembly area in the event of an emergency. The secondary muster point will be located at least 90 degrees from the primary. These locations will be communicated to the work crew(s) during the work site-specific training prior to commencement of work activities, weekly thereafter, and prior to the advent of potentially threatening weather. Muster points and evacuation routes will be identified during the tailgate safety meeting.

9.6 Spill and Release Contingencies

If a spill has occurred, the first step is personal safety, then controlling the spread of contamination, if possible. GHD personnel will immediately contact work site management to inform them of the spill and activate emergency spill procedures.

10. Recordkeeping

The SS shall establish and maintain records of all necessary and prudent monitoring activities as described below:

- Name and job classification of the employees involved on specific tasks.
- Air monitoring/sampling results and instrument calibration logs.
- Records of training acknowledgment forms (work site-specific training, toolbox meetings, etc.).
- Documentation of work site inspections, results of inspections, and corrective actions implemented.
- Emergency reports describing any incidents or accidents.

ED_014247_00001508-00130

11. References

– EPA, 2021. Unilateral Administrative Order for the Remedial Action of the Southern Impoundment. U.S. EPA Region 6, CERCLA Docket No. 06-05-21. In the matter of: San Jacinto River Waste Pits Superfund Site, Harris County, Texas, Respondent. August 2021.

ED_014247_00001508-00131

Table 1.0

Properties of Potential Site Contaminants

Chemical Name (Synonyms)	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
2, 3, 7, 8-tetrachloro-dibenzo-p-dioxin Dioxine TCDBD TCDD 2, 3, 7, 8-TCDD CAS-1746-01-6	TLV: NE PEL: NE STEL: NE IDLH: NE	Inhalation Absorption Ingestion Eye/skin contact	ACUTE: Irritation to the eyes; allergic dermatitis; gastrointestinal disturbance; CHRONIC: Chloracne; Porphyria; possible reproductive and teratogenic effects; liver and kidney damage; hemorrhage. Potential occupational carcinogen.	(FP) NE (VP) 0.000002 mm (IP) NE (UEL) NE (LEL) NE	Colorless to white, crystalline solid. (Exposure may occur through contact at previously contaminated worksites
Furfuran Divinylene oxide CAS-110-00-9	TLV: NE PEL: NE STEL: NE IDLH: NE	Inhalation Absorption	ACUTE: Irritation of the respiratory tract. May cause lung oedema. CHRONIC: May be fatal if swallowed	(FP) -35 C (VP) NE (IP) NE (UEL) 14.3% (LEL) 2.3%	Clear, colorless liquid that turns brown upon standing with a characteristic odor.
Mercury (metal) Quicksilver Liquid silver CAS-7439-97-6	TLV: 0.025 mg/m3 PEL: 0.1 mg/m3 STEL: 0.03 mg/m3 IDLH: 10 mg/m3	Inhalation Absorption (skin) Ingestion	ACUTE: Irritation to skin. Vapor inhalation may cause pneumonitis. May effect CNS and kidneys. CHRONIC: May effect CNS and kidneys, resulting in irritability, tremors, speech disorders, mental/memory disturbances. Inflammation/discoloration of gums. Danger of cumulative effects.	(FP) NA (VP) 0.0012 mm (IP) NE (UEL) NA (LEL) NA	Odorless, heavy and mobile silvery-white liquid metal
Polychlorinated Biphenyls PCB (42%) Chlorodiphenyl (42% chlorine) Aroclor 1242 CAS-53469-21-9	TLV: 1 mg/m3 [skin] PEL: 1 mg/m3 [skin] STEL: NE IDLH: 5 mg/m3	Inhalation Absorption (skin) Ingestion	ACUTE: Eye irritation. CHRONIC: Dermatitis, chloracne, liver damage.	(FP) NA (VP) 0.001 mm (IP) NE (UEL) NA (LEL) NA	Colorless to light colored viscous liquid with a mild hydrocarbon odor.
Polychlorinated Biphenyls PCB (54%) Chlorodiphenyl (54% chlorine) Aroclor 1254 CAS-11097-69-1	TLV: 0.5 mg/m3 [skin] PEL: 0.5 mg/m3 [skin] STEL: NE IDLH: 5 mg/m3	Inhalation Absorption (skin) Ingestion	ACUTE: Eye irritation. CHRONIC: Dermatitis, chloracne, liver damage.	(FP) NA (VP) 0.00006 mm (IP) NA (UEL) NA (LEL) NA	Colorless to pale yellow viscous liquid or solid (<50°F) with a mild hydrocarbon odor.

Notes:

FP	FP - Flash Point	PEL	PEL - OSHA Permissible Exposure Limit
IDLH	IDLH - Immediately Dangerous to Life and Health	STEL	STEL - Short Term Exposure Limit
IP	IP - Ionization Potential	TLV	TLV - ACGIH Threshold Limit Value
NE	NE - Not Established (Information Not Available)	VP	VP - Vapor Pressure
NA	NA - Not Applicable	C	C - Ceiling Exposure Limit
CNS	CNS - Central Nervous System	[skin]	[skin] - potential for dermal absorption
PNS	PNS - Peripheral Nervous System	mm	mm - millimeters Hg (mercury)
ppm	ppm - parts per million	eV	eV - electrowolts
mg/m3	mg/m3 - milligrams per cubic meter		

ED_014247_00001508-00132

Table 2

On-Site Air Monitoring Program Action Levels
Health and Safety Plan

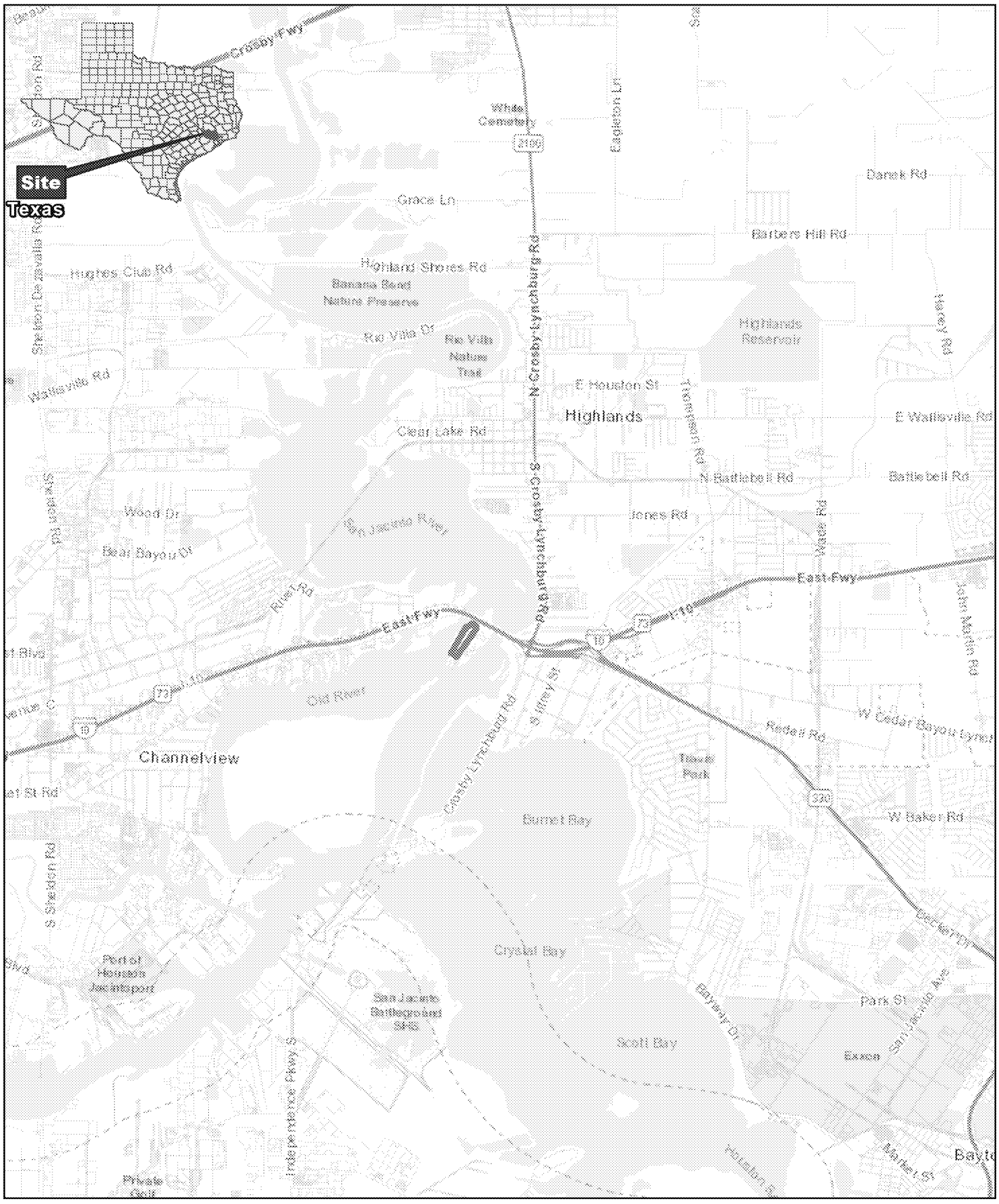
Monitoring Device	*Action Level*	*Action*
Photoionization Detector (PID)	**Benzene present in the Breathing Zone:**	Determine via Colorimetric Sampling
10.6 or greater eV lamp	<0.5 ppm or Background	Full-Face Respirator Available
Detector Tubes	≥0.5 ppm and ≤5 ppm	Full-face air purifying respirator Level C PPE MSA GME P100 Cartridge
	>5 ppm	Shut down activities. Notify SHO, PM, & RSHM. additional engineering controls
	Benzene not present in the Breathing Zone:	Determine via Colorimetric Sampling
	<10 ppm or Background	Full-Face Respirator Available
	≥10 ppm and <50 ppm	Full-face air purifying respirator Level C PPE MSA GME P100 Cartridge
	≥50 ppm	Shut down activities. Notify SHO, PM, & RSHM. Implement additional engineering controls
Dust/Particulate - (Impacted Soils/Sludges/Sediments)	No Visible Dust	Initiate/Continue Activities
	Visible Dust	Shut down activities. Notify SHO, PM, & RSHM. Implement additional engineering controls
Hydrogen Sulfide	>5 ppm	Shut down activities. Notify SHO, PM, & RSHM. Implement additional engineering controls
Carbon Monoxide	>35 ppm	Shut down activities. Notify SHO, PM, & RSHM. Implement additional engineering controls
Combustible Gas Indicator	>10 Percent LEL	Cease operations and move to a safe place. Notify SHO, PM, & RSHM. Do not continue working until conditions are constantly below 10 percent LEL
Oxygen Meter	<19.5 Percent or >23.5 Percent When oxygen levels are outside this range, percent LEL readings are not reliable	Cease operations and move to a safe place. Notify SHO, PM, & RSHM. Do not continue working until oxygen levels are between 19.5 and 23.5 percent

If GHD is unable to identify/quantify the contaminants, supplied air will be required when the PID reading is greater than background, as the contaminant will be unknown and NIOSH, OSHA, and the manufacturer's use requirements for Level C (air purifying respirators) will not be met. If PID readings subside, workers can downgrade as necessary. GHD will upgrade to supplied air and attempt to obtain additional information for possible chemicals present in GHD's work area. The Owner will need to provide/obtain additional information as to the identity of the contaminant(s) in order to permit the use of Modified D and/or Level C.

Notes:

SHO Safety and Health Officer
LEL Lower Explosive Limit
PPE Personnel Protective Equipment
ppm parts per million

ED_014247_00001508-00133



Source: ESRI World Topographic Maps.

0 0.5 1
Miles

Coordinate System:
NAD 1983 UTM Zone 15N

INTERNATIONAL PAPER COMPANY
HARRIS COUNTY, TEXAS
HEALTH AND SAFETY PLAN

11187072
Sep 30, 2021

VICINITY MAP

FIGURE 1

GIS File: I:\GIS\GIS\Projects\11180000s\11187072\Layouts\002\11187072-00(002)GIS-BR027.mxd

ED_014247_00001508-00134

Source: ESRI World Imagery Basemap Services. 9/9/2017.

0 625 1,250
Feet

Coordinate System:
NAD 1983 UTM Zone 15N

JOINT DEFENSE PRIVILEGED
PRIVILEGED AND CONFIDENTIAL
ATTORNEY WORK PRODUCT

INTERNATIONAL PAPER COMPANY
HARRIS COUNTY, TEXAS
HEALTH AND SAFETY PLAN

SITE PLAN

11187072
Sep 30, 2021

FIGURE 2

GIS File: I:\GIS\GIS\Projects\11180000s\11187072\Layouts\002\11187072-00(002)GIS-BR028.mxd

Attachments

Attachment A

Paper Copy Forms (Can Alternatively Use GHD Smart App)

Daily Project Site COVID-19 Subcontractor Screening Questionnaire

To be completed by GHD Site Supervisor daily who will ask the following questions listed below and complete a temperature check for all Subcontractors working at a GHD controlled site.

No other person is to touch this form to prevent the transmission of viruses.

Item No.	Questions Please circle the answer	Yes	No
1.0	Are you currently sick?	Yes	No
2.0	Do you currently have any of the following symptoms: sneezing, fever, dry cough, body aches, headache, sore throat, runny nose, tiredness, shortness of breath, new loss of taste or smell?	Yes	No
3.0	Have you, in the last 14 days, had contact with anyone who has confirmed or suspected symptoms of COVID-19 (sneezing, fever, dry cough, body aches, headache, sore throat, runny nose, tiredness, shortness of breath, new loss of taste or smell?	Yes	No
4.0	Have you travelled internationally or been in close contact with anyone who has travelled internationally in the past 14 days?	Yes	No
5.0	What is person's temperature? Please circle		
	Below 37.4°C/99.32°F	**Between 37.4°C/99.32°F and 38°C/100.4°F**	**Above 38°C/100.4°F**

If the person has answered yes to any of these questions, or if their temperature exceeds 38°C/100.4°F they will not be allowed to enter/work at a GHD project site. They must leave the site immediately and notify their supervisor for further instructions.

If their temperature is between 37.4°C/99.32°F and 38°C/100.4°F, they will need to have their temperature taken a second time throughout the day to determine the onset of a fever. If the second temperature is still in the yellow range or red, the subcontractor will be asked to leave the site immediately.

Please review with subcontractor:

While on a GHD controlled site you are required to:

- Immediately notify the GHD site supervisor if you start to exhibit any flu-like symptoms.
- Review GHD's COVID-19 site requirements with the GHD Site supervisor.
- Communicate GHD's COVID-19 site requirements to all subcontractors hired by your company.
- Maintain a physical distance of (2 meters/ 6 feet) between site workers.
- Practice proper personal hygiene.
- Clean and disinfect tools and equipment on a regular basis.

Subcontractor	Employee Name	Meets Requirements Yes/No	If No Action Taken?

GHD Site Supervisor Name:_____ Signature: _____

Date: _____ Project Number:_____

ED_014247_00001508-00139

Tailgate Safety Meeting Form
Large Group Format - Single Day

Date:		Time:		Project No.:	
Presenter:			Project Name:		

Safety topics/items discussed:

Emergency preparedness:

First Aid Provider(s):		Muster Point:	
		Method of Communication:	
AED Responder:		Fire Extinguisher Location:	
First Aid Kit Location:		Eye Wash Location:	

Site personnel in attendance:

Print Name:	Signature:	Company:

ED_014247_00001508-00140

Tailgate Safety Meeting Form
Small Group Format - Multiple Days

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Emergency preparedness:

First Aid Provider(s):		Muster Point:	
		Method of Communication:	
AED Responder:		Fire Extinguisher Location:	
First Aid Kit Location:		Eye Wash Location:	

Print Name	Signature	Company

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Emergency preparedness:

First Aid Provider(s):		Muster Point:	
		Emergency Communication:	
AED Responder:		Fire Extinguisher Location:	
First Aid Kit Location:		Eye Wash Location:	

Print Name	Signature	Company

ED_014247_00001508-00141

Field Safe Task Evaluation Process (F-STEP)

Report status: (insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Observer's name:	Date:	Time:
Client:	Project name :	
Observer's office:	Site location:	
Observer's supervisor:	Project no. (if applicable):	
Subcontractor: ☐ Yes ☐ No	Subcontractor company name:	

Feedback conducted by:	Date:
Observee's supervisor:	Time:

Check task being observed (if not listed here, go to columns at right)		If checking this column, write in the specific task	
☐ Air knifing	☐ Mob/demob	☐ Agricultural services	
☐ Clearing	☐ Project oversight	☐ Construction	
☐ Demolition	☐ Soil sampling	☐ Landfill	
☐ Drilling	☐ Stack testing	☐ Office operations	
☐ Electrical work	☐ Surveys & audits	☐ O&M	
☐ Excavation	☐ Traffic control	☐ Pipeline	
☐ General site cleaning	☐ UST removal	☐ Refinery	
☐ Heavy equipment operations	☐ Water sampling	☐ Treatment plants	
☐ IH sampling	☐ Well management	☐ Other	
☐ Manual lifting			

Background information (Give a brief description of task being performed and your surroundings)

Observer's positive comments

1.

2.

3.

Feedback session conclusion:
If no questionable items: brief recap of positive actions/comments
If questionable items: brief recap of positive actions/comments and why did the questionable item(s) occur?

ED_014247_00001508-00142

Personal protective equipment	Meets work standards	???	N/A	Evaluation comments
1. Hearing protection (e.g., ear plugs)			☐	
2. Head protection (e.g., hard hat)			☐	
3. Eye protection (e.g., safety glasses/goggles)			☐	
4. Hand protection (e.g., gloves)			☐	
5. Foot protection (e.g., steel-toe boots)			☐	
6. Respiratory protection			☐	
7. Fall protection (e.g., lanyard/harness)			☐	
8. High visibility clothing (e.g., work vest)			☐	
9. First aid kit/fire extinguisher			☐	
10. Other (be specific)			☐	
Body position	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
11. Proper body positioning when exerting force (lifting/pushing/pulling)			☐	
12. Pinch points/moving equipment - hands/body placement			☐	
13. 3-points of contact			☐	
14. Other (be specific)			☐	
Work environment	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
15. Work/walk surface clear (free and clear pathway)			☐	
16. Housekeeping/equipment storage			☐	
17. Controlled work zone (e.g., warning devices, barricades, cones, flags)			☐	
18. Emergency stop/safety switches			☐	
19. Materials labeled correctly			☐	
20. Storage/disposal of waste			☐	
21. Other (be specific)			☐	
Operating procedures	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
22. Star performed/job planning			☐	
23. Stop work authority process – understood and considered			☐	
24. JSA/JLA/risk assessment reviewed and followed			☐	
25. Daily site inspection			☐	
26. High risk task specific (hot work, confined space, LOTO, excavation/ trenching)			☐	
27. Inspect work zone for hazards			☐	
28. Coordinate/communicate with site rep and/or others on site			☐	
29. Spotters used appropriately			☐	
30. Underground/overhead utilities identified			☐	
31. Other (be specific)			☐	
Tools/equipment	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
32. Hand/power tool - selection, condition, and use			☐	
33. Field/test equipment - selection, condition, and use			☐	
34. Heavy equipment - selection, condition, and use			☐	
35. Other (be specific)			☐	
Observation total occurrences			☐	
% observations to meet work standards			☐	
Item specific to work task	**Meets works standards**	**???**	**N/A**	**Evaluation comments**
Insert task/JSA/SOP Step			☐	
Insert task/JSA/SOP Step			☐	
Insert task/JSA/SOP Step			☐	

ED_014247_00001508-00143

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	CF	Corrective actions (Must match Causative Factor)	Responsible party	Date due	Date completed	Verified by/ Validated by	Date	Details
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by :		
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

ED_014247_00001508-00144

Driving Safe Task Evaluation Process (D-STEP)

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Observer's name:	Date:	Time:
Client:	Project name:	
Observer's office:	Site location:	
Observer's supervisor:	Project no. (if applicable):	
Subcontractor: ☐ Yes ☐ No	Subcontractor company name:	

Feedback conducted by:	Date:
Observee's supervisor:	Time:

Driving conditions			
☐ Freeway/interstate	☐ Wet	☐ Day	☐ Raining
☐ Surfaced street	☐ Dry	☐ Night	☐ Windy
☐ Dirt road	☐ Snow/ice		☐ Snowing
	☐ Mud		☐ Fog

Vehicle condition			
☐ Car	☐ Truck	☐ Van	☐ Pulling trailer
☐ Company owned	☐ Rental	☐ Personal	

Background information (Give a brief description of where you are driving from and to and your surroundings)

Observer's positive comments

1.

2.

3.

Feedback session conclusion:
If no questionable Items: brief recap of positive actions/comments
If questionable Items: brief recap of positive actions/comments and why did the questionable item(s) occur?

ED_014247_00001508-00145

Pre-driving	Meets work standards	???	N/A	Evaluation comments
1. JMP/JSA/Risk Assessment developed and/or reviewed			☐	
2. STAR performed/job planning			☐	
3. Stop Work Authority – understood and considered			☐	
4. Registration/insurance/last maintenance report			☐	
5. Tire inflation and tread			☐	
6. Wipers and washer fluid/clean windows/mirrors			☐	
7. Horn/lights operation/instrument panel			☐	
8. Body damage/overall vehicle appearance			☐	
9. Under-vehicle check for leaks/obstructions			☐	
10. Secure loose items			☐	
11. Check fluid levels			☐	
12. Fire extinguisher/triangles/first aid kit/jack/spare			☐	
13. Verifies area is clear before moving vehicle			☐	
Body positioning	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
14. Adjust seat			☐	
15. Adjust head rest			☐	
16. Adjust mirrors to minimize blind spots			☐	
17. Seat belts (driver/passengers)			☐	
18. Locks doors			☐	
Operating procedures	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
19. Yields right-of-way and allows other vehicles to merge, change lanes, turn			☐	
20. Respects pedestrians, cyclists, other drivers			☐	
21. Is courteous/tolerant of others' poor driving			☐	
22. Two hands on wheel no higher than 9 and 3			☐	
23. Skill in handling distractions			☐	
24. Adjusts to traffic conditions (speed / traffic)			☐	
25. Uses turn signals (for turns and lane changes)			☐	
26. Following distance is appropriate (4-second rule)			☐	
27. Avoids sudden acceleration and deceleration			☐	
28. Before backing up, looks behind vehicle/checks for traffic, pedestrians, parked vehicles, uses spotter			☐	
29. Scans the road ahead (15-second eye lead or 2-3 blocks-1/4 mile) and anticipates actions of others to avoid sudden swerves, stops, lane changes			☐	
30. Checks mirrors every 5-8 seconds			☐	
31. Checks for hazards on the road (e.g., animals, debris, road conditions)			☐	
32. Reads and obeys traffic signals			☐	
33. Makes complete stops at signals, at a safe distance			☐	
34. Scans intersection left and right/anticipates intent of other vehicles before reaching "point of no return"			☐	
35. Covers brakes safely and adjusts speed			☐	
36. Does not use cell phone during operation of vehicle			☐	
37. Other (be specific)			☐	
Operating procedures - Parking	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
38. Looks for pull through parking before backing in			☐	
39. Uses signals, leaves adequate space before pulling back into lane			☐	
40. Obeys signs and uses signals in parking lot			☐	
41. Maintains proper speed inside the lot			☐	
42. Ensures vehicle is legally/properly parked			☐	
43. Sets parking brake and secures vehicle			☐	
44. Other (be specific)			☐	
Observation total occurrences			☐	
% Observations to meet work standards			☐	
Item specific to work task				
Insert Task/JSA/SOP Step			☐	
Insert Task/JSA/SOP Step			☐	

ED_014247_00001508-00146

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	CF	Corrective actions (Must match Causative Factor)	Responsible party	Date due	Date completed	Verified by/ Validated by	Date	Details
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

ED_014247_00001508-00147

Motor Vehicle Daily Inspection Checklist

Long Version	
Vehicle Operator(s):	**Vehicle/License Number:**
Vehicle Classification: ____ GHD ____ Rental ____ Personal	
DATE:	
Odometer Start:	
Odometer Finish:	

Pre-Departure Check		Status (√ or X)
360° Walk around completed		
1. Lights	a. Headlights	
	b. Tail lights/rear lights	
	c. Turn signals/indicator	
	d. Brake lights	
	e. Emergency flashers/hazard lights	
	f. Service indicator lights (e.g. check engine, oil check, etc.)	
2. Tires - visual check (pressure/wear)		
3. Fuel level		
4. Windshield and windows (cracks or chips, clean)		
5. Windshield wipers (motion, condition)		
6. Windshield cleaning fluid		
7. Secure load (in passenger compartment, trunk, bed of truck)		
8. Mirrors (cracks, broken, clean)		
9. Horn		
10. Paperwork (registration, insurance card, inspection sticker, tax disc)		
11. Safety items (first aid kit, fire extinguisher, road hazard kit) - field vehicles only		
12. Vehicle requirements met (3-point seatbelt, head restraints, ABS brakes, side-impact protection, and airbags)		

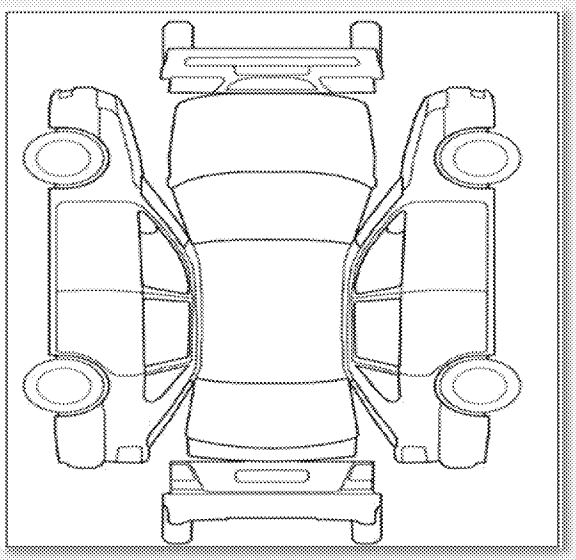
Post-Departure Check		Status (√ or X)
1. Engine	a. Overheating	
	b. Oil Leaks	
	c. Knocks	
	d. Engine Lights	
2. Transmission (Shifting)		
3. Service indicator lights (e.g. check engine light, oil check, etc.)		

ED_014247_00001508-00148

Post-Departure Check		Status (√ or X)
4. Brakes	a. Squeaking	
	b. Excessive Pedal Travel	
	c. Grinding	
5. Steering	a. Alignment	
	b. Grinding	
	c. Steering Wheel Vibrations	

Details of Unsatisfactory Conditions or Indicate on Diagram

Safety conditions require the use of Stop Work Authority until fixed.



Printed Name

Signature:

Completed forms - All vehicle classifications with Journey Management Plans, GHD vehicles shall also be sent to the Office Vehicle Manager

ED_014247_00001508-00149

Safety Inspection Checklist – Mobile Equipment Safety

	Week Ending:	Job No.:	Equipment:

(This form is to be completed daily by the operator. Deficiencies should be addressed immediately.)

Superintendent: _____

	Date:	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Comments
Equipment Hours:	***Start:***								
	Stop:								
Fluid Levels:									
	Oil								
	Hydraulic								
	Transmission								
	Radiator								
	Grease Fittings								
	Fuel								
Safety Checks:									
	Fire Extinguisher								
	Seat and Safety Belts								
	Warning Devices (backup alarms, lights, etc.)								
	Housekeeping								
	Brakes								
	Mirrors								
	Windshield and Wipers								
	Steering								
	Horn								
	Lights								
	Tires								
	Guards								
	Instruments								
	Exhaust System								
Accessories:									
	Boom or Mast								
	Controls								
	Level Indicators								
	Tracks								
	Other								
Sign-Off:									
	Operator's Initials								
	Supervisor's Initials								

Additional Comments: (Please write any additional comments here. Use the back of this form if necessary.)

√ = OK NR = Needs Repair NA = Not Applicable

ED_014247_00001508-00150

Unsafe Act / Unsafe Condition / Stop Work Authority (SWA) Report

Reported by:		Employee's office:	
RSHM:		Date:	Time:
Employee's supervisor:		Employee's principal:	
Project related:	☐ No ☐ Yes	If yes, name of client:	
Client contact (if applicable):		Project no (if applicable):	

Re: (check all that apply) ☐ **Unsafe act** ☐ **Unsafe condition** ☐ **Stop work authority (SWA)**

Location: (check one) ☐ Driving ☐ Field ☐ Office

Date reported to supervisor/PM:		Date corrected:	
Time reported to supervisor/PM:		Time corrected:	

Describe the unsafe act, unsafe condition or SWA situation

List corrective action(s) implemented

Did the corrective action(s) mitigate the unsafe act/unsafe condition?

For SMART administrators use only:

Category:

- ☐ **PPE** Personal Protective Equipment
- ☐ **BP** Body Positioning
- ☐ **WE** Work Environment
- ☐ **OP** Operating Procedures
- ☐ **TE** Tools and Equipment
- ☐ **CU** Computer Usage
- ☐ **PD** Pre-Driving
- ☐ **OPP** Operating Procedures – Parking

Chevron category:

- ☐ **A** Person or People
- ☐ **B** Equipment
- ☐ **C** Environmental
- ☐ **D** Procedures/ Processes/
  - ☐ JSA-review/revise
- ☐ **E** Visitors

Causative factor:

- ☐ **1** Insufficient training for task
- ☐ **2** Hurrying to complete the task
- ☐ **3** Easier if proper process not followed
- ☐ **4** Took shortcuts without prior incident
- ☐ **5** Incomplete or no procedures
- ☐ **6** Procedures not known or enforced
- ☐ **7** Improper PPE
- ☐ **8** Improper tools
- ☐ **9** Improper workplace layout
- ☐ **10** Exposure to conditions

Energy source:

- ☐ **G** Gravity
- ☐ **M** Motion
- ☐ **ME** Mechanical
- ☐ **E** Electrical
- ☐ **P** Pressure
- ☐ **T** Temperature
- ☐ **B** Biological
- ☐ **C** Chemical
- ☐ **R** Radiation
- ☐ **S** Sound

Are additional actions required? ☐ No ☐ Yes If yes, what?

ED_014247_00001508-00151

Near Miss Reporting Form

Note: A Significant Near Miss must be called into the HSE Help Line: 1-866-529-4886

Instructions:
1) Employee completes the Near Miss Report and submits to Supervisor.
2) Supervisor reviews and makes other comments.
3) Employee discusses Near Miss with Project Manager.
4) Submit to applicable SMART Reporting submission address.

Report status: (insert date)					
	Initial report	**Updated report**	**Final report**	**Verification/validation**	**Report input to SMART database**

Section 1

A. Employee Identification ☐ **GHD Employee** ☐ **Temporary Employee** ☐ **Subcontractor**			
Employee No.	Last Name	First Name	Employee's Company - if Subcontractor
Date of Hire	Position/Title	Supervisor	Home Office Location - if GHD Employee

B. General Information	
Where did the Near Miss occur? ☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States ☐ UK	Type of Near Miss (Check all that apply) ☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage ☐ Environmental
Address of Near Miss (City, State/Province/County, Postal/Zip Code)	Specific Location of Near Miss (e.g., where on site)

Date and Hour of Near Miss	Date and Hour Reported to GHD	Time Employee Began Work
Month Day Year a.m. p.m. / /	Month Day Year a.m. p.m. / /	a.m. p.m.

Witnesses?	Witness Name and Telephone Number
☐ Yes ☐ No	

C. Project Information (Project Related Near Miss Only): Project Related: ( ) Yes ( ) No				
Project #	Project Name	GHD Project Manager	Client	Client Contact

Was the Client Advised of the Near Miss?	Name	Date and Time
☐ Yes ☐ No ☐ N/A		Month Day Year Time / /

Section 2

A. Details of the Near Miss
1. What job/task was being performed when the Near Miss occurred? (Example: collecting groundwater samples).
2. Provide a detailed description of the employee's specific activities at the time of the Near Miss. Include details of equipment/materials being used, including the size and weights of objects being handled, and weather conditions at time of the Near Loss. If necessary, attach additional pages to the report.

ED_014247_00001508-00152

Section 2 (continued)

B. Near Miss Investigation	
Conduct a 5-Why Root Cause Analysis Investigation. In addition, if there was the potential for a significant injury or loss, report the Near Miss to the Incident Help Line (this will determine if a Tap Root Cause Analysis is necessary).	
HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks being performed when the Near Miss occurred? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____

5-Why Root Cause:	Additional information: Attach photos, witness statement(s), affected employee statement, as applicable, to the end of this document.
1. Why did "above" happen?	
2. Why did "1" happen?	
3. Why did "2" happen?	
4. Why did "3" happen?	
5. Why did "4" happen?	See Section 3 Below: Corrective Actions/ Verification and Validation
6. Why did "5" happen?	

C. Accountability		
Initial Report Date Month Day Year / /	Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team	Company	Position/Title
Final Report Date Month Day Year / /	Final Report Prepared by: (please print)	Final Report Prepared by: (signature)

D. Stewardship		
Will a Near Miss Summary be Prepared? ☐ Yes ☐ No If yes, by:		
Quality Review By:	Date:	Findings:

ED_014247_00001508-00153

Section 3

Corrective Action					Validation & Verification		
CF	Corrective actions (must match causative factor)	Responsible party	Due date	Date completed	Verified by/ Validated by	Date	Details
					Verified by:		
					Validated by:		
					Verified by:		
					Validated by:		
					Verified by:		
					Validated by:		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

ED_014247_00001508-00154

Incident Reporting Form

Note: Incidents must be called into the HSE Help Line: 1-866-529-4886

Instructions: 1) For Personal Injuries, Occupational Illnesses, and Property Damage, complete Sections 1 and 2
2) For Motor Vehicle Accidents, complete Sections 1, 2, and 4
3) Initial report must be submitted within 24 hours

Report status: (insert date)	**Initial report**	**Updated report**	**Final report**	**Verification/validation**	**Report input to SMART database**

Section 1

A. Employee Identification ☐ **GHD Employee** ☐ **Temporary Employee** ☐ **Subcontractor**				
Employee No.	Last Name	First Name	Middle Name/Initial	☐ Male ☐ Female
Area Code Telephone Number ( )	Employee Home Address (Street, City, State/Province/County, Postal/Zip Code)			
Date of Hire Month Day Year / /	Position/Title	Supervisor	Employee's Company/Home Office Location	

B. General Information			
Where did the Incident occur and which country? ☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States		Type of incident (Check all that apply) ☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage Only	
Address of Incident (City, State/Providence/County, Postal/Zip Code)		Specific Location of incident (e.g., where on site)	
Date and Hour of Incident Month Day Year / / a.m. p.m.	Date and Hour Reported to Employer Month Day Year / / a.m. p.m.	Date and Hour Last Worked Month Day Year / / a.m. p.m.	Time Employee Began Work a.m. p.m.
Normal Work Hours From: To:		Witnesses? ☐ Yes ☐ No	Witness Name and Telephone Number

C. Project Information (Project Related Incident Only) Project Related? ☐ Yes ☐ No				
Project #	Project Name	Project Manager	Site Telephone Number ( )	Project Manager Cell Number ( )
Client Name		Was the Client Advised of the Incident? ☐ Yes ☐ No	Name of Person Contacted	Date and Time Contacted

Section 2

A. Details of the Incident
1. What job/task was being performed when the incident occurred? (Example: collecting groundwater samples).
2. Provide a detailed description of the employee's specific activities at the time of the incident. Include details of equipment/materials being used, including the size and weight of objects being handled, and weather conditions at time of the incident. If necessary, attach additional pages to the report.

ED_014247_00001508-00155

3. For injuries, identify the specific part of body injured, and specify left or right side. For illnesses, identify and describe the affected area/body part.	
4. Identify the object or substance that directly injured the employee and how. Include size, weight, and shape of object, quantity of substance, etc.	
5. Identify property damaged and how it was damaged (include owner of property, nature and source of damage, and model and serial number, if appropriate).	

B. Health Care/Medical Treatment

Employee received health care? ☐ Yes ☐ No	Identify the type of health care provided and where it was performed. **(Check all that apply).** ☐ First Aid ☐ Medical treatment other than first aid (sutures, etc.) ☐ Hospitalized ☐ Clinic ☐ Hospital emergency room ☐ On location by self or GHD employee ☐ On site by EMT
Name of Health Care Provider, Physician Name, Phone Number, Address (Street, City, Province/State/County, and Postal/Zip Code)	

C. Incident Investigation

☐ **5 Why Root Cause Analysis Investigation [Non-OSHA Recordable, <$5,000/£3,000 damage]**
☐ **Tap Root Cause Analysis [OSHA Recordable, and/or >$5,000/£3,000 damages]**

HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP and relevant JSA(s)/Risk Assessment to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks the employee was conducting when injured? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____ Was the employee drug & alcohol tested post incident? ☐ Yes ☐No

5-Why Root Cause: Incident Statement	Additional information: Attach photos, witness statement(s), affected employee statement, accident diagrams, as applicable, to the end of this document.
1. Why did "above" happen?	
2. Why did "1" happen?	
3. Why did "2" happen?	
4. Why did "3" happen?	
	See *Corrective Actions/Verification and Validation* Section (Page 4).
5. Why did "4" happen?	
6. Why did "5" happen?	

ED_014247_00001508-00156

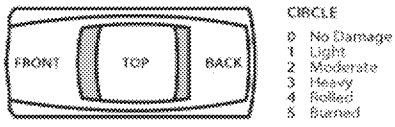
D. Accountability		
Initial Report Date Month Day Year / /	Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team	Company	Position/Title
Final Report Date Month Day Year / /	Final Report Prepared by: (please print)	Final Report Prepared by: (signature)
E. Stewardship		
Will an Incident Summary be Prepared? ☐ Yes ☐ No By:		
Quality Review By:	Date:	Findings:

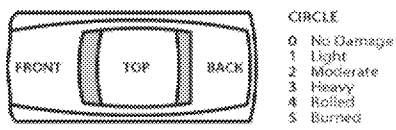
Section 3

A. Agency Reporting and Recording Information (to be completed by an HSE Team Member)			
CANADA			
Provincial Regulatory Agency Reporting Required? ☐ Yes ☐ Not required	Employee Injury Information (Injury met the following criteria): ☐ First Aid ☐ Medical Treatment ☐ Critical Injury ☐ Modified Duty ☐ Lost Time Injury If medical treatment, what?		
Joint Safety and Health Committee Notified? ☐ Yes ☐ No	Total days of modified duty If exceeds 7 days, report to WSIB	Total days of lost time (if any)	Date employee returned to work Month Day Year / /
UNITED STATES			
OSHA Recordable Injury? ☐ Yes ☐ No OSHA Recordable.pdf	Employee Injury Information (Injury met the following OSHA 300 Log criteria) ☐ First Aid ☐ Medical Treatment ☐ Restricted Duty ☐ Lost Time Injury If medical treatment, what?		
Total days of restricted duty:	Total days of lost time (if any)	Date employee returned to work Month Day Year / /	

ED_014247_00001508-00157

Section 4

A. Vehicle GHD Employee was Operating ☐ Personal ☐ GHD-Owned ☐ Rental - Rental Company:			
License Plate No.	State/Province/County	Police Department City State/Province/County	
Vehicle Year/Make/Model	Odometer Reading at Time of Accident	Police Report Number	Weather Conditions
Name of Person Operating Vehicle Address City State/Province/County Postal/Zip Code Telephone: Area Code ( )	"X" in area of vehicle damage  		
Description of Vehicle Damage:			

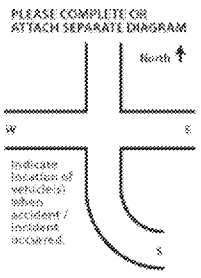
B. Other Vehicles Involved			
Name of Owner	Address	City/State/Prov./County/Postal/Zip	Area Code and Telephone Number ( )
Operator's Name (if different from above)	Address	City/State/Prov./County/Postal/Zip	Area Code and Telephone Number ( )
Year/Make/Model	Description of Property Damage	"X" in area of vehicle damage  	
Insurance Co. Name & Telephone			
License Plate No./State/Province			

C. Injured Persons				
Name	Address Street, City, State/Prov./ County/Postal/Zip Code	Telephone Number	Nature of Injury	Indicate if Injured was a Vehicle Driver/Passenger, GHD Employee, Other, or Pedestrian
1.		( )		
2.		( )		
3.		( )		

D. Witnesses		
Name	Address Street, City, State/Prov./County/Postal/Zip Code	Telephone Number
1.		( )
2.		( )

ED_014247_00001508-00158

E. Description of Accident



Was Ticket Issued? Reason: _____

☐ Other Operator _____

☐ GHD Operator _____

_____

Report Date Month Day Year / /	Report Prepared by: (please print)	Report Prepared by: (signature)

Note: If additional space is required to complete this report, use separate sheet of paper and attach.

ED_014247_00001508-00159

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	CF	Corrective actions (must match causative factor)	Responsible party	Date due	Date completed	Verified by/ Validated by	Date	Details
						Verified by: Validated by:		
						Verified by: Validated by:		
						Verified by: Validated by:		
						Verified by: Validated by:		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

ED_014247_00001508-00160

Management of Change Form (QSF-006)

Form initiated by: _____ Date initiated: _____

Initiator's role/responsibility: _____ Project number: _____

Affected location(s): _____

Client's management of change documentation attached, if required or applicable: ☐ Yes ☐ N/A

Type of change:

- ☐ Field operations/SOPs
- ☐ Equipment
- ☐ Safety
- ☐ Project management/resources

Duration of change:

- ☐ Permanent
- ☐ Temporary (specify how long change will be in place): _____
- ☐ Emergency

Describe the change:

Describe the procedure/task(s) required to complete the change:

Who needs to know about the change and how will you communicate this to them?

Is additional training for GHD people required as a result of this change? ☐ Yes ☐ No

If yes, please describe training needs and those who require it:

Coordination with Business School Learning Centre underway: ☐ Yes ☐ No

Identify any associated risks/hazards/impacts as a result of this change:

This completed form is a quality record

ED_014247_00001508-00161

Does the change need to be approved by a client? ☐ Yes ☐ No

If Yes, state client's name: _____

Client role/responsibility: _____

Date authorized by client: _____
(mm/dd/yyyy)

Change approved by project manager: _____
(please print)

_____ _____
(signature) (approval date – mm/dd/yyyy)

Summary:

Item	Completion date	Confirmed by
1. Task(s) to execute change have been completed		
2. Those who need to know have been notified		
3. Additional training has been completed		
4. Risk(s) have been mitigated		
5. Change has been approved by all required parties		

Notes:

Scope: GHD may use the Management of Change Form (QSF-006) to identify and record project additions, revisions, changes, or updates regarding field operations, field SOPs, equipment, safety, resources, or project management.

Detail: The level of detail to a documented project change is ultimately determined by the project manager and/or any client expectations.

File location: Correspondence folder of the project file.

Underground Utilities Checklist

(QSF-019)

Pre-Drilling/Excavation Checklist and Utility Clearance Log

Project number:	**Project name:**
Date:	**Project location:**
Public utility locator:	**Public utility locator phone number:**
Date of public utility locator request:	**Public locator call reference number:**
Private utility locator (If applicable):	**Private utility locator phone number:**

Utilities (indicate that location/utility presence was checked)

Borehole/ Excavation location	Date (mm/dd/yyyy)	Telephone	Water	Storm sewer	Sanitary sewer	Process sewer	Gas	Electrical	Cable	Overhead utilities	Other	Comments/Warnings
Utility owner												

Instructions: This checklist is to be completed by GHD personnel prior to initiation of field activities as a safety measure, to ensure that all underground utility lines, other underground structures, and above-ground power lines are clearly marked in the area selected for boring or excavation.

Notes: _____

Client: _____ **Client representative:** _____ **Phone number:** _____

Client or property owner acknowledgement of utility clearance: _____ **(Client, property owner, or authorized agent signature)**

Subcontractor acknowledgement of utility clearance: _____ **(Subcontractor or subcontractor representative signature)**

GHD field representative name: _____ **Signature:** _____

GHD project manager's review/confirmation of locate completion: _____

In the event that client or property owner acknowledgement cannot be obtained, all boreholes shall be hydro vacuumed and the costs passed on to the client. Attach any clearance documentation from utility owner/operator to this document.

ED_014247_00001508-00163

Underground Utilities Checklist for GHD Personnel

Pre-Drilling/Excavation Checklist and Utility Clearance Log

Drilling or excavation work may not proceed if any of the questions answered below are answered "No." Implement stop work authority and contact the GHD project manager to discuss and resolve any concerns or issues. Document the reason for a "No" answer in the comments section below.

Yes	No	N/A	Pre-Mobilization
☐	☐	☐	1. Has a utility locator request been completed within the last 30 days (verify time limit with state or provincial law)? If no, stop work and comment below.
☐	☐	☐	2. Is a scaled site plan, map or drawing showing the proposed borehole locations attached to this form?
☐	☐	☐	3. Does each borehole and excavation location allow for clear entry and exit, adequate workspace, and a clear path for raising the mast (or boom) and operating the drill rig and all support equipment? Ensure that the minimum OSHA/state/provincial utility clearance requirements between the mast or boom and the power line(s) are met. For instance, OSHA requires a minimum approach distance of 10 feet for systems below 50 kV and an increase of 4" for every 10 kV over 50 kV. Confirm if additional permits are required if the boom or mast will be working 5 meters (15 feet) or less from the electrical lines.
☐	☐	☐	4. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface or above-ground utilities shown on client's building plans? Check here ☐ if plans not provided by client (therefore not applicable to this job.
☐	☐	☐	5. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface or above-ground utilities shown on public right-of-way street improvement or other public property plan or site map?
☐	☐	☐	6. Has the site representative, familiar with the site, indicated no knowledge of any subsurface or above-ground utilities within 3 metres (10 feet) of the proposed borehole and excavation locations? (Review locations with site representative)
☐	☐	☐	7. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface utilities identified during a geophysical survey? Check here ☐ if no geophysical survey has been completed (therefore not applicable to this job).
☐	☐	☐	8. Have all utility locating service providers, notified by the public line locator, marked out their facilities in the vicinity of the borehole and excavation locations or otherwise notified us that they do not have any facilities near the proposed locations? (Attached confirmation and utility locate sheets from public locator)
☐	☐	☐	9. Are all proposed borehole and excavation locations at least 1.5 meters (5 feet) from a visual line connecting two similar looking manhole covers?
☐	☐	☐	10. Are all proposed borehole and excavation locations at least 1.5 meters (5 feet) from a visual line perpendicular to the street from the water, gas, and electrical meters?
☐	☐	☐	11. Are all proposed boring and excavation locations clear of pavement joints, curbs, crash posts, or other engineered structures?
☐	☐	☐	12. Does the ground surface/pavement lack signs of previous excavation (e.g., no pavement subsidence, no differences in pavement texture or relief, no pavement patching)?
			Pre-Drilling and Excavation
☐	☐	☐	13. Has it been verified that the proposed drilling or excavation work will not affect any work currently in progress?
☐	☐	☐	14. Has the drill rig or heavy equipment been inspected prior to use and documented? (See Drill Rig Inspection Checklist or Mobile Equipment Safety Inspection Checklist)
			15. Have barricades been erected to prevent unauthorized access, where applicable?
☐	☐	☐	16. Have all known live electrical or product lines within 3 meters (10 feet) of the dig path been visually verified? If no, comment below.
			17. For boreholes that have not been cleared or are within 3 meters of a utility:
☐	☐	☐	a. Before drilling have you cleared a hole to 2.4 meters (8 feet) below grade using an air-knife, or equivalent, before drilling and is the diameter of this hole greater than the final outside diameter of the boring? If not required comment below.
☐	☐	☐	b. Does the soil you encountered in the hand-dug hole appear to be native material (i.e., free of clean gravel, clean sand, aggregate base [gravelly sand ~ 10% fines] or other non-native looking material)? If not required comment below.

Have the above concerns been discussed with the GHD project manager?	☐ Yes	☐ No	☐ Not Applicable
Has the start of subsurface work been communicated to the GHD project manager?	☐ Yes	☐ No	☐ Not Applicable
Have the above concerns been discussed with the client?	☐ Yes	☐ No	☐ Not Applicable
Has the scope of work been approved by the client?	☐ Yes	☐ No	☐ Not Applicable

Comments: _____

_____

_____

_____

_____

GHD field representative name: _____ **Date:** _____

ED_014247_00001508-00164

Site Health and Safety Plan Amendment Form

This document is to be completed for ANY changes that occur within the Site Health and Safety Plan (HASP). This document is to be sent to the Regional Safety & Health Manager (RSHM) for review, verification and sign off of the HASP.

Amendment #	
Site Name/Project ID	
Date	
Client Contact (same/change)	
Reason for Amendment (SOW change, JSA addition, Chemical, etc.)	
Alternate or Additional Safeguard Procedures	
Required changes in PPE	
Additional Comments:	

Project Manager Notified	☐
RSHM Notified	☐
Client PM Notified (if necessary)	☐

Site HSE Officer (sign above)	Date

The Project Manager is ultimately responsible for the accuracy of the information on this amendment and ensuring any changes to the original HASP is discussed with all affected site personnel prior to commencing work

This original form must be placed in the project file and a copy needs to be attached to the Site Health and Safety Plan (HASP).

ED_014247_00001508-00165

HASP Acknowledgment Sheet

Project Name:_____ Project Number: _____

This is to certify that I have received a pre-entry briefing regarding this HASP, and I understand its contents. My failure to follow and comply with the requirements contained in this plan may result in disciplinary action and/or termination.

Print Name	Signature	Date

ED_014247_00001508-00166

Attachment B

Job Safety Analysis Forms

COVID-19 Guidance for GHD Field Personnel

As you are aware, the COVID-19 outbreak is affecting our people, our clients, and all organizations across the globe. GHD has implemented a comprehensive business continuity plan (BCP) to keep our employees safe while we continue to support our clients through this difficult time. Elements of the BCP will be monitored and adjusted as new information becomes available.

GHD will maintain regular communication with field staff and clients to gather information for project sites, fieldwork and travel.

Symptoms of COVID-19 range from mild to severe flu, and other common respiratory infections, and can include:

- Fever
- Cough
- Difficulty breathing
- Muscle aches
- Fatigue
- Headache
- Sore throat
- Runny nose
- Recent loss of taste or smell
- Nausea or vomiting
- Diarrhea

Guidance for All NA Field Personnel

Outlined below are guidelines for GHD field staff to mitigate exposure to COVID-19 when engaged in fieldwork in North America. If you have **any** of the symptoms related to COVID-19, you are to remain at home and notify your supervisor.

For all employee mobilization and project site work, the following mitigation measures must be implemented:

Travel

- Check local area restrictions to determine if work can be initiated or continued.
- Check with the GHD Project Manager to ensure the project site work is continuing. Ensure to follow all client guidelines and policies.
- All travel via land, air, or water requires RGM approval.
- No more than one person per vehicle when to and from project sites or traveling within the project site.
- The interior (cab) vehicle surfaces (i.e., steering wheel, dash, gearshift, door handles, etc.) must be disinfected daily.
- When refuelling a vehicle, wear gloves and sanitize hands once completed.
- Make as few stops as possible during travels limiting exposure to public spaces; and adhere to Journey Management Plan requirements.
- Avoid close contact with anyone experiencing flu like symptoms during your rest/fuel stops.
- When traveling by air, print and carry a boarding pass rather than electronic boarding pass to prevent airport staff from handling your personal phone.
- Disinfect the aircraft trays and arm rests prior to use.
- A face mask must be worn at all times in the airport, while on the aircraft, in rental car lobbies and while using public transportation.

ED_014247_00001508-00168

Site Operations

- All GHD personnel working at a project site must complete the GHD Boarding Pass Application daily.
- All GHD subcontractors must participate in the completion of the GHD Project Site COVID-19 Screening Questionnaire. Those subcontractor employees who do not pass the screening assessment must immediately leave the site.
- Maintain a distance of 2 m/6 ft. between on-site workers whether in the field or in a meeting setting (video meetings and conference calls are preferable).
- In-person meetings should be limited to key individuals who absolutely need to attend as long as physical distancing is maintained.
- Alternate meeting methods must be used in place of face-to-face meetings, such as conference calls, WebEx, Skype or MS Teams.
- Discontinue entering contractor's project site office/trailer.
- Practice physical distancing between GHD field staff, GHD subcontractors, client and client contractors. In-person meetings will be eliminated where possible.
- If site meetings are required, request they be conducted outdoors while maintaining physical distance.
- During receipt of deliveries at a project site, workers must ensure physical distancing is maintained. The GHD Receiver will not sign or provide a record of sample receipt as a precaution to reduce exposure to contact surfaces (e.g., pens, clipboard, paper, etc.).
- Wear gloves when handling/opening delivery packages.
- During sample deliveries to laboratories, workers must follow the laboratory COVID-19 protocols. Communicate with onsite personnel via text messages, emails, phone calls or two-way radio.
- Avoid physical greetings (e.g. shaking hands).
- Avoid touching your face. The mucus membranes in your eyes nose and mouth are the primary pathways for the virus to gain entry into your body.
- Cover your mouth and nose with a tissue when you cough, sneeze, or use the inside of your elbow.
- Carry a supply of facial tissues and properly dispose in a receptacle after use.
- Avoid close contact with anyone experiencing flu-like symptoms.
- Sites with stairway access to work task locations are to establish one-way staircases where practicable to minimize worker's contact.
- Projects where multiple work crews are conducting work tasks, evaluate the need to stagger work schedules/shifts, breaks and lunches to maintain physical distancing (2 meters/6 feet).
- Consider total number of workers and where they are allowed to work.
- Where workers cannot maintain physical distance (2 meters/6 feet) to conduct a work task, nitrile gloves, a half face respirator with N95 cartridges and safety glasses must be worn.
- Workers required to wear respiratory protection must complete respiratory protection training (inspection, fit, care, use, cleaning and limitations) and have a current fit test.
- Adequate supply of cleaning and disinfecting products must be available for sanitation of respirator.
- Surgical style or cloth face coverings must be worn in the field at all times when others are present. Wearing of either type does not provide you with sufficient protection to breach the 2m/6 ft. physical distancing requirement.
- Face coverings are not substitutes for respiratory protection (e.g. half face respirator and N95 cartridge). Workers who choose to wear face coverings must understand the limitation of use, as they do not provide total protection from the COVID-19 virus inhalation hazard.
- The on-site trailer/facilities (at GHD controlled sites) shall be cleaned on a daily basis with surfaces disinfected several times a day, on an ongoing basis. Personal sanitation and cleaning supplies shall be available on site (i.e. hand sanitizer and sanitizing wipes) and used frequently to wipe down surfaces such as handles on doors, desks, fridges, microwaves, light switches, thermostats, surfaces in/on portable bathrooms and other equipment they come in contact with.
- Mobile and stationary equipment interior (cab) surfaces shall be disinfected prior to entering the cab and when exiting the cab.

ED_014247_00001508-00169

- GHD employees must wear gloves while on site and wash and or/sanitize their hands upon removing them.
- Do not touch your face with gloved hands.
- Clean and disinfect frequently touched surfaces daily, for example, cell phones, computer equipment, headsets, tables, doorknobs, light switches, countertops, handles, railings, desks, toilets, faucets, sinks, and/or other frequent contact surfaces.
- Monitor supply of detergent/disinfectant solution/wipes and PPE to ensure adequate inventory is maintained.
- Do not share personal items such as pens/pencils, phones, notebooks or other equipment between project personnel unless they have been disinfected.
- Tools and equipment shall be disinfected often and at the end of each use.
- If tools must be shared, they must be sanitized at the end of each use, prior to being used by others.
- To the extent possible, do not interact with the public during work tasks.
- Practice physical distancing when conducting Daily Tailgate Safety Meetings/Pre-Work Assessments.
- HASPs and JSEAs shall include this guideline and JSA – COVID-19 Field Precautions.
- Where required by local jurisdiction, post the current version of the "COVID-19 Guidance for GHD Field Personnel" or where no trailer is available maintain a copy in the HASP or JSEA.
- Teams working under a HASP must not circulate the daily tailgate sign in sheets. Designate one person to document those in attendance on the sheet.
- Teams working under a JSEA must not circulate the pre-work assessment sheet. Designate one person to document those in attendance on the sheet. As an alternate, staff may document their pre-work assessment using the HSE SMART App (pre-work assessment button).
- If an employee requires First-Aid treatment, the injured employee is to self-administer. If they are unable to self-administer and if the injury is substantial, then Emergency Services may be required.
- The latest information and updates to company operating procedures and precautions regarding COVID - 19 shall be discussed at all safety meetings/pre-work assessments and incorporated into the HASP, JSAs and Job Safety Analysis (JSEA's).
- Upon completion of work, ensure all PPE has been either cleaned/decontaminated or properly disposed of.

Sanitary Facilities

- Project manager must ensure field staff have access to washroom facilities with adequate soap and water and/or alcohol based hand sanitizer for proper hygiene in accordance with local jurisdictional requirements.
- Washroom facilities must be serviced often as required and supplies are to be maintained. (e.g., hand sanitizer (at least 60% alcohol), hand soap, paper towels, water, disinfectant spray/wipes, waste receptacle, etc.).
- Wash your hands with soap and water for at least 20 seconds.
- Post signage on hygiene in English and in the majority workplace language (where jurisdictionally required).

Reporting

- All GHD employees are to self-monitor for flu-like symptoms (cough and shortness of breath) and an increase in their temperature.
- If you or a GHD subcontractor, client or client contractor feel unwell or develop flu-like symptoms, contact your supervisor immediately and email using the Contact Table below to notify your assigned contact persons for your Region. Once notified, an HSE or PT member will then conduct a risk assessment and recommend appropriate preventative measures. Recommend seeking medical evaluation guided by Public Health.

ED_014247_00001508-00170

- Notify your Supervisor and Regional GM (using the Contact Table below) if you have had close contact with an individual who tested positive for COVID-19. Once notified, an HSE or PT member will conduct a risk assessment and recommend appropriate preventative measures.

Meals/Breaks

- Prohibit food/coffee trucks from accessing work sites.
- Where there are frequent touch points (e.g. water cooler lid), paper towels should be provided to allow users to avoid skin contact.
- Bring water, meals and snacks with you to avoid stopping at a store or restaurant (where possible). Dine in your vehicle or outside alone. Avoid using the project trailer or site facilities.
- Wash your hands frequently with soap and water for at least 20 seconds, especially after you have been in a public place, blown your nose, coughed, sneezed, or used the rest room, and before eating, drinking or smoking.
- Meals shall be eaten alone or at a minimum distance of approximately 2 m/6 ft., and not in groups.
- Project teams should consider staggering break and lunch schedules to minimize the number of people in close proximity to one another.

Hotel/Accommodations

- Project managers and staff shall avoid independent hotels (where possible) and alternative accommodations. Book rooms at reputable hotel chains and should verify with the hotel appropriate protocols are in place to limit the potential exposure and spread of the virus.
- If an overnight stay is required in a hotel, disinfectant shall be available to clean common contact surfaces in the hotel room (i.e. light switches, remote control, doorknobs, thermostat, toilet handle etc.).

Return to Personal Residence

- Wash/Sanitize hands before entering the home or as soon as you enter.
- Upon return to personal residence remove clothing and launder; wash/shower self in order to practice proper and effective hygiene.
- Remove/change clothing in the same location at home each day to avoid spreading any potential exposure of work apparel in multiple areas of your home (bedding, furniture, etc.).

Canada: Additional Requirements

If fieldwork requires travel between other Provinces and Territories, verify with your RHSEM if the Province/Territory has imposed a mandatory 14-day isolation requirement. If so, this may impede fieldwork.

Contact Table

Canada Regions

Region	e-mail Group	HSE Contact	Regional People Leader
Eastern (Francais)	GMQAR@ghd.com	marylene.provost2@ghd.com	teresa.mambro@ghd.com
Eastern(English)	GMQAR@ghd.com	marylene.provost2@ghd.com	teresa.mambro@ghd.com
Ontario	GMOntario@ghd.com	sandy.serena@ghd.com	alison.bondy@ghd.com mirella.perri@ghd.com
Northwest	malcolm.dixon@ghd.com	wayne.stdenis@ghd.com	alison.bondy@ghd.com

ED_014247_00001508-00171

US Regions

	e-mail Group	HSE Contact	Regional People Leader
Mid-Con	midcongmdirect@ghd.com	vicky.pickard@ghd.com	nikki.mcghee@ghd.com
Mid-West	ihsan.alfayyomi@ghd.com	craig.gebhardt@ghd.com	janell.goskey@ghd.com
South East	steven.davie@ghd.com	alan.gallaway@ghd.com	sandra.mcjilton@ghd.com
North East	tom.klin@ghd.com	john.maurer@ghd.com	jennifer@carney@ghd.com
West	ted.whiton@ghd.com	ken.chavez@ghd.com	jim.klein@ghd.com

ED_014247_00001508-00172

Job Safety Analysis (JSA)

COVID-19 Precautions – Field Work

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	March 27, 2020	**Client:**			
Project number:		**Created by**	Micheal Dixon	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:					
Specific task	Field Work				
Key equipment:	Alcohol-Based Hand sanitizer >60% Alcohol, Disinfectant (e.g. spray bottle/paper towels, wipes, etc.) Nitrile gloves., Surgical or cloth style face coverings				
Task-specific training:					

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☒ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

ED_014247_00001508-00173

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Sandy Serena			Wayne St. Denis	3-26-2020
		Sandy Serena	Wayne St. Denis	4-06-2020
		Sandy Serena	Wayne St. Denis	5-13-2020
		Wayne St Denis		08-12-2020

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
1	Travel to GHD Jobsite	• Transmission/exposure on client site • Transmission/exposure across provinces and territories • Transmittal/exposure of COVID-19 between passengers • Transmittal/exposure of COVID-19 from previous occupants (rental and fleet vehicles) • Transmittal/exposure of COVID-19 while refueling/rest stop • Transmittal/exposure of COVID-19 while traveling by air	• Complete GHD Boarding Pass Application for Field daily. • Check with the GHD Project Manager to ensure the project site work is continuing. Ensure to follow all client guidelines and policies. • All travel via land, air, or water requires RGM approval. • Canada - If fieldwork requires travel between other Provinces and Territories, verify if the Province/Territory has imposed a mandatory 14-day isolation requirement. If so, this may impede fieldwork. • Where more than one staff member is travelling to a project site, staff members must travel in separate vehicles to ensure social distancing is maintained. This includes on-site vehicle use to complete work tasks. • The interior (cab) vehicle surfaces (i.e., steering wheel, dash, gearshift, door handles, etc.) of all GHD fleet, leased or owned vehicles must be disinfected prior to each entry into the cab and upon return. Wiped over with disinfectant solution/wipe (use manufacturer recommended PPE). • When traveling by vehicle, ensure to wear gloves when refueling and sanitize hands once complete. • Make as few stops as possible during travels to limit exposure to public spaces; and adhere to Journey Management Plan requirements. • Avoid close contact with anyone experiencing flu like symptoms during your rest/fuel stops. • When traveling by air, print and carry a boarding pass rather than electronic boarding pass to prevent airport staff from handling a personal phone. • When traveling by plane, disinfect the trays and arm rests prior to use.	Field personnel
2	Conduct Tailgate Safety Meeting/Pre-work assessment & Complete H&S Paperwork	• Transmittal/exposure of COVID-19 between meeting participants	• Surgical style or cloth face coverings must be worn in the field at all times. • All GHD subcontractors must participate in the completion of the GHD Project Site COVID-19 Screening Questionnaire. Those subcontractor employees who do not pass the screening assessment must immediately leave the site. • Practice physical distancing, maintaining at least 2 metres/6 feet of distance between yourself and others. • Hold meetings outside and keep in mind wind direction. To the extent possible, remain cross-wind from other people. • Do not circulate the daily tailgate/pre-work assessment sign in sheet. Designate one person to document those in attendance on the sheet.	Field personnel

ED_014247_00001508-00174

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
			• The latest information and updates to company operating procedures and precautions regarding COVID - 19 shall be discussed at all tailgate meetings and incorporated into the HASP JSAs	
3	All Activities	• Transmittal/exposure of COVID-19	• Ask yourself and your Project Managers – is this work essential? Can this be done remotely? Can it be rescheduled? • Ensure project team follow all client guidelines and policies. • Where required by local jurisdiction, post the current version of the "COVID-19 Guidance for GHD Field Personnel" or where no trailer is available maintain a copy in the HASP or JSEA. • Carry nitrile gloves, alcohol-based hand sanitizer, and disinfectant wipes/spray during fieldwork. • Carry a supply of facial tissues and properly dispose in a receptacle after use. • Avoid social greetings (e.g. shaking hands). • Avoid touching your face. The mucus membranes in your eyes nose and mouth are the primary pathways for the virus to gain entry into your body. • Know the symptoms of COVID-19 (Symptoms include fever, cough, and difficulty breathing). • Stay home from work if sick or presenting flu like symptoms or symptoms of COVID-19 • Practice social distancing, maintaining at least 2 metres/ 6 feet of distance between yourself and others. • Cover your mouth and nose with a tissue when you cough, sneeze or use the inside of your elbow. • Clean and disinfect frequently touched surfaces daily, for example, cell phones, computer equipment, headsets, tables, doorknobs, light switches, countertops, handles, railings, desks, toilets, faucets, sinks, and/or other frequent contact surfaces. Wipe over with disinfectant solution/wipe (use manufacturer recommended PPE). If visibly dirty, clean visible dirt/debris before disinfecting. Monitor supply of disinfectant solution/wipes and PPE to ensure an adequate supply.	Field personnel
4	Conduct Site Work	• Transmittal/exposure of COVID-19 between site workers and public.	• Avoid close contact with anyone experiencing flu like symptoms. • Wear gloves while on site and wash and or/sanitize their hands upon removing them. Properly dispose of gloves. • Do not touch your face with gloved hands. Take care when removing gloves. • Carry a supply of facial tissues and properly dispose in a receptacle after use. • Discontinue face-to-face Site Meetings. Alternate meeting methods must be used in place of face-to-face meetings, such as conference calls, WebEx, Skype or MS Teams. • Practice social distancing between GHD field staff, GHD subcontractors, client and client contractors. In-person meetings will be eliminated where possible. • If multiple work crew are conducting work tasks, evaluate the need to stagger work schedules/shifts to maintain physical distancing (2 meters/ 6 feet). • Where workers cannot maintain physical distance (2 meters/6 feet) to conduct a work task; in addition to nitrile gloves; a half face respirator with N95 cartridges and safety glasses must be worn. Workers required to wear respiratory protection must complete respiratory protection	Field personnel

ED_014247_00001508-00175

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
			training (inspection, fit, care, use, cleaning and limitations) and have a current fit test. Adequate supply of cleaning and disinfecting products must be available for sanitation of respirator. • Face coverings are not substitutes for respiratory protection (e.g. half face respirator and N95 cartridge). Workers who choose to wear face coverings must understand the limitation of use as they do not provide protection from the COVID-19 virus inhalation hazard. Workers who choose to wear a face covering must maintain physical distancing (2meters/ 6 feet) from other workers while wearing them. Sites with stairway access to work task locations, establish one-way staircases where practicable to minimize worker's contact. • Communicate with onsite personnel via text messages, emails, phone calls or two-way radio. • If site meetings are required, request they be conducted outdoors while maintaining social/physical distancing. • Mobile and stationary equipment interior (cab) surfaces shall be disinfected prior to entering the cab and when exiting the cab. • Tools and equipment shall be disinfected often and at the end of use. If tools must be shared, they must be sanitized before use by the next user. Wiped over with detergent/disinfectant solution/wipe before and after each use (use manufacturer recommended PPE). If visibly dirty, clean visible dirt/debris before disinfecting. • To the extent possible, do not interact with the public. If it is necessary, politely explain you are practicing social distance and request they stay at least 2m/ 6 feet away and they do not attempt to pass objects to you. Ensure work zone demarcation is in place to avoid them entering your work space • Do not share personal items such as pen/pencils, phones, notebooks or other equipment between project personnel unless they have been disinfected. • Teams working under a HASP must not circulate the daily tailgate sign in sheets. Designate one person to document those in attendance on the sheet. • Teams working under a JSEA must not circulate the pre-work assessment sheet. Designate one person to document those in attendance on the sheet. As an alternate, staff may document their pre-work assessment using the HSE SMART App (pre-work assessment button). • Due to N-95 respirators being in short supply and social distancing, if an employee requires First Aid treatment, the injured employee should self-administer. If they are unable to self-administer and if the injury is substantial, then Emergency Services may be required. • During receipt of deliveries at the project site, workers must ensure physical distancing is maintained. Request delivery personnel place the package down rather than handing the item directly to the GHD Receiver to maintain physical distancing. The GHD Receiver will provide their name to the Delivery personnel to log GHD's receipt of the items. The GHD Receiver will not sign or provide a record of sample receipt as a precaution to reduce exposure to contact surfaces (e.g., pens, clipboard, paper, etc.). • If required to sign, wear gloves and use your own pen. After signing, remove gloves, dispose of in waste receptacle and wash/sanitize hands. Do not share pens. • Wear gloves when handling/opening delivery packages. Wipe down all exterior surfaces with disinfectant spray/wipes. Dispose of the packaging (as applicable) and gloves in a waste receptacle. Wash/sanitize hands.	

ED_014247_00001508-00176

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
			• Upon completion of work ensure all PPE has been either cleaned/decontaminated or properly disposed of. Wash/sanitize hands. • At the conclusion of the work day/shift before GHD field staff, GHD subcontractors, visitors, clients, client contractors leave the worksite, inquire if they have any flu-like symptoms. • All GHD field staff, GHD subcontractors, visitors, clients, client contractors must wash/sanitize hands before leaving the worksite.	
5	Sanitary Facilities	• Transmittal/exposure of COVID-19	• Project manager must ensure staff have access to washroom facilities with soap and water or alcohol based hand sanitizer for proper hygiene in accordance with local jurisdictional requirements. • Washroom facilities must be serviced as often as required and supplies maintained. • Ensure adequate clean-up supplies are available (e.g., hand sanitizer (at least 60% alcohol), hand soap, paper towels, water, disinfectant spray/wipes, waste receptacle, etc.). Remove garbage often. • Clean your hands frequently with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, sneezing, or before using the rest room or eating and drinking or smoking. • If soap and water are not available, apply alcohol-based (at least 60%) hand sanitizer and remove visible soiling with paper towels, then re-apply alcohol-based hand sanitizer. Cover all surfaces of your hands and rub them together until they feel dry. • Post signage on hygiene in English and in the majority workplace language (where jurisdictionally required).	
6	Use of Construction Trailers/site office	• Transmittal/exposure of COVID-19 between site workers and others.	• Discontinue entering contractor's project site office/trailer. All meetings/discussions are to be completed by telephone or teleconference/videoconference. If in-person meetings are required, request they be conducted outdoors. • Discontinue face-to-face Site Meetings. Alternate meeting methods must be used in place of face-to-face meetings, such as conference calls, WebEx, Skype or MS Teams. • Practice social distancing between GHD field staff, GHD subcontractors, client and client contractors. In-person meetings will be eliminated where possible. Where onsite meeting are required they are to be held outdoors while maintaining social distance. • The on-site trailer/facilities (at GHD controlled sites) shall be cleaned on a daily basis with surfaces disinfected several times a day on an ongoing basis. Personal sanitation and cleaning supplies shall be made available on site (i.e. hand sanitizer and sanitizing wipes) and used frequently to wipe down surfaces such as handles on doors, desks, fridges, microwaves, light switches, thermostats, surfaces in and on portable bathrooms and other equipment that they come in contact with. Wiped over with detergent/disinfectant solution/wipe (use manufacturer recommended PPE).	Field personnel
7	Meals and Breaks	• Transmittal/exposure of COVID-19 from food establishment, customers, staff, surfaces.	• Prohibit food/coffee trucks from accessing work sites. • Where there are frequent touch points (e.g. water cooler lid) paper towels should be provided to allow users to avoid skin contact. • Bring water, meals and snacks with you to avoid stopping at a store or restaurant. Dine in your vehicle or outside alone. Avoid using the project trailer or site facilities. • Wash hands and sanitize, before and after eating.	Field personnel

ED_014247_00001508-00177

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
			• Meals shall be eaten alone or at a minimum distance of approximately 2 m (6 ft.) and not in groups. • Project teams should consider staggering break and lunch schedules to minimize the number of people in close proximity to one another. • If you must visit a restaurant, call ahead for take-out or "contactless delivery". Do not dine in. • Use drive-through when this is an option.	
8	Return to personal residence	• Transmittal/exposure of COVID-19 at personal residence	• Wash/Sanitize hands before entering the home or as soon as you enter. • Upon return to personal residence remove clothing and launder; and wash/shower to practice proper hygiene. • Remove change clothing in the same location at home each day to avoid exposure of work apparel to multiple areas with your home (bedding, furniture, etc.) • Place removed work clothes in a bag to keep separate, then wash with detergent prior to re-use. • Maintain regular and thorough hand hygiene while at home.	Field personnel
9	Laboratory Sample Drop	• Transmittal/exposure of COVID-19	• During sample deliveries to laboratories, workers must follow the laboratory COVID-19 protocols. Workers must ensure physical distancing is maintained at all times. Request a copy of the chain of custody be emailed to confirm sample receipt as a precaution to reduce exposure to contact surfaces (e.g., pens, clipboard, paper, etc.). • If required to sign paper work, wear gloves and use your own pen. After signing, remove gloves, dispose of in waste receptacle and wash/sanitize hands.	Field personnel
10	Hotel Stay	• Transmittal/exposure of COVID-19 from occupants, previous occupants, hotel staff, common areas.	• Avoid independent hotels and alternative accommodations and book rooms at reputable hotel chains and should verify with the hotel that appropriate protocols are in place to limit the potential exposure and spread of the virus. • Verify the hotel chain/brand has modified cleaning procedures to reflect risk of COVID-19. Most hotel companies have issued statements on their websites and in email blasts reflecting these new procedures. • Use the front door, and not peripheral entrances. Front doors of hotels are generally automatic. • Request ground floor room to avoid elevator use. • If elevator use is required, do not directly touch elevator buttons with your hands. Do not ride elevators with other people, to the extent possible. • Bring disinfecting wipes or sanitizing spray. Upon arrival, disinfect high "hand-traffic" areas of the hotel room: Door handles, light switches, shower/sink faucet handles, TV remote, curtain/blind handles or other surfaces. Clean these surfaces daily. • Place the "Do Not Disturb" Sign on your door to prevent people (housekeeping) from entering your room. • Practice social distancing. Maintain a distance of 2 m or 6 ft. Avoid common spaces and hotel sponsored events where crowds will be present. • Confirm hotel cleaning procedures have been modified to address COVID-19. Confirm no COVID-19 cases have occurred in hotel. • Avoid close contact with anyone experiencing flu like symptoms.	Field personnel

ED_014247_00001508-00178

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
			• Upon return to hotel at end of shift, remove clothing and launder; and wash/shower to practice good hygiene.	
11	Reporting	• Illness • Exposure to COVID-19	• All GHD employees are to self-monitor for flu-like symptoms (cough and shortness of breath) and an increase in their temperature. • If you or a GHD subcontractor, client or client contractor feel unwell or develop flu-like symptoms, contact your supervisor immediately and email using the Contact Table below to notify your assigned contact persons for your Region. Once notified, an HSE or PT member will then conduct a risk assessment and recommend appropriate preventative measures. Recommend seeking medical evaluation guided by Public Health. • Notify your Supervisor and Regional GM (using the Contact Table below) if you have had close contact with an individual who tested positive for COVID-19. Once notified, an HSE or PT member will conduct a risk assessment and recommend appropriate preventative measures.	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00179

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SAFE YOU ME GHD
ENVIRONMENT & PEOPLE

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/Time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

ED_014247_00001508-00180

Job Safety Analysis (JSA)

Insert Name : Construction-Heavy Equipment Fueling

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:17:18	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Pickup truck with fuel tank or stationary fuel tank, fire extinguisher, Chemical resistant gloves				
Task-specific Training:					

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☑ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☐ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*

ED_014247_00001508-00181

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

ED_014247_00001508-00182

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	If appropriate, meet with owner's representative to determine if there is a designated fueling area	• Fueling in hazardous or environmentally sensitive area	• Perform fueling in designated or appropriate area	All Personnel
2	Proceed to fueling area and make safety preparations	• Traffic hazard • Slip/trip/fall hazards • Short service employees • Potential for fire during refueling	• Be aware of site traffic hazards • Perform STAR process • Refer to equipment manufacturer's operating manual before using any machinery • Verify personnel training is sufficient for scheduled task(s); is job instruction (hands on) training necessary? • Have two 20 pound fire extinguishers within 25 feet of the fueling area positioned upwind of fueling area • No cell phone use allowed on site • No cell phone use allowed in fueling area • No smoking allowed • No fueling allowed during storm events • No fueling allowed in areas of dense brush or vegetation; there must be 25 foot diameter area of bare ground around fuel pump • Wear appropriate PPE	All Personnel
3	Dispense fuel	• Property damage and personal injury from fire • Fire potential from static/contact spark • Personal injury due to skin/eye contact with fuel due to splash/ spills of fuel • Environmental damage from spill	• Switch off equipment • Remove cap • Grounding – hook up ground to equipment from task • Insert nozzle securely in fuel tank • Do not use fuel cap as a wedge to keep nozzle open • Turn on fuel pump • Stay upwind when fueling equipment • Be aware of your surroundings • Do not rush • Remain in attendance of nozzle at all times during fueling • Avoid overfilling • Release pressure from fuel hose into fuel tank before removing nozzle to prevent drips and spills • Turn off pump • Securely return nozzle to proper location	All Personnel
4	Leave fueling area	Slip/trip/fall hazards Traffic hazard	Pick up tools, equipment, and trash Be aware of site traffic hazards	All Personnel

ED_014247_00001508-00183

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00184

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Heavy Equipment Operation – Hydraulic Track Excavator

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	7/14/2021]	**Client:**	International Paper		
Project number:	11215702	**Created by**	Phillip Young		**SSE on site? Yes/No**
Project address:	Market Street, Channelview				
Specific task	Hydraulic Track Excavator				
Key equipment:	Hydraulic excavator (appropriately sized);fire extinguisher				
Task-specific training:	Heavy Equipment Operation; 40 Hour HAZWOPER, WHMIS,				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

ED_014247_00001508-00186

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Phillip Young			Wayne St. Denis	03/16/2021

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
1	Discuss STAR and SWA	• Failing to identify hazardous conditions resulting in losses or near losses	• Determine the hazards of performing the task and survey the work area. • Consider weather conditions such as fog that could reduce visibility. • Always consider the worst case scenario. • Analyze the hazards determined. • Decide a plan of action to eliminate or reduce the hazards and act on it.	Project Team
2	Inspect equipment	• Equipment malfunction or damage • Hydraulic fluid, fuel, oil leaks/spills • Loss of steering, loss of brakes, etc.; accidents, decreased visibility • Fire • Slip/trip/fall hazards • Unexpected operation of equipment • Swing radius signage missing	• Follow GHD Daily Equipment Inspection Form/Tag Out if malfunction found. • Wear required PPE. • Grease moving parts. • Check all fluids. • Ensure that fluids are not too low or too full. • Walk around equipment and look for leaking fluids. • Ensure that tracks are acceptable (no unacceptable wear and no objects present). • Ensure that windows and mirrors are clean. Adjust mirrors! • Remove trash or other debris from cab. • Ensure that back up alarm and horn are operational. • Correct any problems immediately and inform supervisor. • If equipment appears as though it has been tampered with or vandalized, do not start it. • Ensure that fire extinguisher is in place and functioning. • Inspect the fire extinguisher monthly. • Use three point mount/dismount at all times. • Be cautious of where you step and be aware of your surroundings. • Ensure that ignition key is in your pocket, equipment is in neutral and parking brake is engaged. • Use interlock safety mechanism any time equipment is not conducting a productive and/or controlled activity.	Operator

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible
3	Entering equipment	• Reduced visibility • Uncomfortable seating - back strain • Debris on floor getting stuck under pedals • Unexpected movement of excavator	• Adjust seat and mirrors so that you are able to see where traveling. • Adjust controls and seat to your comfort and safety. • Ensure that all materials inside cab are secured. • Be cautious of where you step and be aware of your surroundings. • Ensure steps are clear of water, mud, and other debris. • Ensure parking brake is engaged and gear is in neutral. • Use interlock safety mechanism any time equipment is not conducting a productive and/or controlled activity.	Operator
4	Configure controls and seating	• Ergonomics/unnecessary physical stress/ back injury • Incapable of reaching controls • Visual blocks	• Upon sitting, adjust seat fully to accommodate reach and comfort zone. • Fasten seat belt. • Make certain all controls are set in neutral positions. • Adjust mirrors.	Operator
5	Starting and warming up	• Unanticipated rolling or movement, engine fire, or mechanical/electrical faults	• Review operator's manual if new to this particular machine. • Start engine and check controls to ensure all are in working conditions. • Allow a minimum of 2 minutes to warm up.	Operator
6	Moving equipment work area	• Other equipment, personnel, or objects in work area • Uneven terrain	• Perform STAR – be aware of surroundings. • Know the daily task and other people and equipment in the area. • Make eye contact with other operators and site personnel in the immediate vicinity. • Inspect pathway prior to moving equipment to ensure clear pathway.	Operator
7	Performing tasks	• Other equipment (collision) • Slopes, ground conditions possible injuries to personnel and equipment, buried obstacles, underground and overhead utilities • Dust	• Perform STAR. • Know where utilities are located – know where your bucket is in relation to any underground/overhead utilities at all times. • Be aware of the scope of work to be performed. • Use a spotter. • Know the paths of other equipment or persons entering and leaving your work area. • Communicate with supervisors and other operators throughout the day with any questions. • Stop work immediately and contact a supervisor if you are uncertain of your task, experience equipment failure, or personal injury or near loss. • Wear dust mask if conditions warrant.	Operator
8	Stopping at end of day	• Slip/trip/fall hazards • Overnight parking of equipment	• Be cautious of where you step and be aware of your surroundings. • Park in designated area. • Set brake/control locks. • Idle for 2 minutes if engine is hot. • Lower bucket to ground – zero energy state. • Turn equipment off; remove keys. • Use three point dismount. • Secure inside instruments (i.e., fire extinguisher).	Operator

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SAFE YOU ME GHD
ENVIRONMENT & PEOPLE

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Construction-Heavy Equipment Operation-Forklift

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:17:18	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Forklift; Daily Inspection Checklist;Use leather gloves as necessary.				
Task-specific Training:	Forklift Operation certification				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek

ED_014247_00001508-00190

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

ED_014247_00001508-00191

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Perform STAR Process and review SWA policy	• Inadequate STAR/hazard assessment	• Perform STAR Process prior to beginning work to identify any possible hazards/corrective actions • Utilize SWA if encountering an unsafe act or condition • For every hour of continuous operation the operator shall exit the equipment and refocus on the task at hand. This micro break shall consist of (i.e., walk around the equipment, kick the tires, obtain a drink of water, etc.).	Forklift Operator
2	Equipment Inspection	• Damaged/malfunctioning equipment • Injury to appendages caught in pinch points, moving parts, or hot surfaces • Slip/trip/fall hazards • Danger to ground personnel due to malfunctioning equipment or poor visibility	• Review the operating manual, conduct and document forklift inspection utilizing equipment inspection form • If leaks or deficiencies are noticed, report immediately to supervisor. Do not start the piece of equipment until authorized by supervisor or certified mechanic. • Operators will have absorbent pads ready and available in the event of a leak or spill • In the event of a leak or spill, notify supervisor or mechanic immediately • Identify pinch points with stickers, wear appropriate PPE, and do not place any body appendage near moving parts • Turn engine off prior to inspecting potentially hot surfaces • Be aware of wet, muddy, or slippery work surfaces • Clear mud from steps before mounting equipment • Maintain three points of contact, at all times, when mounting/dismounting equipment • Prior to use, verify backup alarm/warning system is in proper working condition • Adjust seat and mirrors as needed	Forklift Operator
3	Moving adjustable forks to correct position	• Injury to appendages caught in pinch points • Back injury • Dropping forks • Over exertion	• Turn off engine and place parking brake on prior to adjusting forks • Never place your body or fingers near a potential pinch point when moving forks. Fork adjustment will be done from one side of the forklift so that all body parts remain free and clear of contact with pinch points. • Wear required PPE (leather gloves, hard hat, etc.) • If lifting fork over 50 pounds get assistance from a co worker	Forklift Operator/Ground Persons

ED_014247_00001508-00192

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
4	Operating/transporting loads with forklift- When picking up or setting down a load, drive slowly under load or into a pallet. Raise, lower, and tilt forks as needed in order to safety raise the load (use a spotter to do this). Center the load and keep it as low to the ground as possible	• Equipment damage from under qualified operators • Equipment/property damage from exceeding maximum load of forklift • Material/property damage when picking up or dropping a load • Personal/property damage from transporting loads (striking personnel/property) • Hearing loss	• Forklift operators will have documented certification of proper training • Be aware of any ground personnel who would be working in the same area as forklift • If forklift is not equipped with back up alarms, operator will sound horn three times prior to backing forklift • Ensure path of travel is free and clear of obstructions • Do not operate forklift with forks and/or load in a position that could potentially obstruct operator's view point in direction of travel • Do not over load the forklift (proper load size will be defined in operating manual and load charts) • For extendable forks, check the load, fork extension and lift height restrictions • Ensure unstable loads are secured prior to transportation. Ground personnel contact with the load while moving is prohibited. • Use a spotter to navigate around obstructions or blind spots • Wear hearing protection if necessary	Forklift Operator
5	Backing forklift	• Personal injury • Equipment/property damage	• Always look in the direction of travel • Ensure a clear view in mirrors. If obstructed in any way, utilize SWA and re evaluate/correct working conditions prior to continuing work • Use a spotter to back around obstructions or blind spots	Forklift Operator
6	Exiting forklift	• Suspended load hazards • Slip/trip/fall hazards	• Lower forks to the ground before dismounting (forklift must be in a zero energy state) • Always use three points of contact while mounting/dismounting equipment • Ensure landing area is clear of any obstructions prior to exiting equipment	Forklift Operator
7	End of the day	• Soft material • Equipment damage • Personal injury • Slip/trip/fall hazards	• Park the forklift in a designated area • Clean off excess mud from equipment steps • Use proper PPE during manual activities • Ensure a clear walking path when leaving equipment staging area	Forklift Operator

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00194

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Construction-Office Trailer Installation and Inspection

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:21:41	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Portable stairways, hand tools, electrical				
Task-specific Training:					

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*

ED_014247_00001508-00196

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

ED_014247_00001508-00197

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Perform STAR process: Review the trailer vendor's equipment rental terms and conditions	• Situational risks • Short service employees	• Verify personnel training is sufficient for scheduled task(s) • Is Job Instruction (hands on) Training necessary?	All Personnel
2	Placement of office trailer - Pre determine best placement option(s) prior to placing	• Uneven terrain • Too close to/too far from work zone	• Perform pre-installation site walkaround and determine in advance best location for trailer • Consult with Project Manager/Site Supervisor	Site Supervisor
3	Installation of portable stairways	• Uneven terrain • Slipped/loose leg bolts • Slip/trip/fall hazards	• Set stairs on level ground or support with flat surface (such as plywood) • Ensure that toe boards and railings are present and not damaged • Ensure that trailer vendor adjusts stair height and tightens all leg bolts • Anchor stair legs with steel pins	Site Supervisor
4	Exterior inspection	• Rolling of trailer • Failure of support legs • Biological hazards/insect infestations • Electrical fire • Vandalism	• Make sure wheels are chocked or somehow prevented from rolling • Ensure that trailer vendor adjusts carriage supports properly • Inspect underside and corners for wasp/hornet/bird/rat nests • Check any external wiring and hookups; make sure they are insulated • Check for corrosion, wear, burn spots, or damage • Inspect windows/screens for damage/tampering • Make sure underside is clear of debris/materials and items are not leaning against carriage supports	Site Supervisor
5	Interior inspection – Document trailer condition after inspections are completed	• Biological hazards/insect infestations • Broken window glass • Poor ventilation/odors	• Check for ants/wasps/hornets • Inspect windows/screens for damage/tampering • Identify source(s) of odors, if possible; notify vendor as soon as possible	Site Supervisor
6	Turn on electricity – Note: Electrical connections to trailer from power source are to be made by a qualified electrician	• Faulty wiring/short fuses • Electrical fire • No heating/ventilation/air conditioning or working improperly	• Check fuse box for corrosion, wear, burn spots, or damage • Check lights (inside and outside) and contacts • Check and clean HVAC coils, condenser unit, contacts monthly	Site Supervisor

ED_014247_00001508-00198

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00199

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Working Within 10 Feet Around Water

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:24:17	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market Street, Channelview				
Key Equipment:	CSA approved life jacket or PFD that fits the operator and occupants; Sunglasses; Sunscreen				
Task-specific Training:	Towing and Trailering, Boating Safety				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☐ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☒ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☐ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☒ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☑ Other*

ED_014247_00001508-00201

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Setting up work site	• Inclement weather • Lifting hazards • Manual material handling • Back injury • Pinch points • Slip/trip/fall hazards • Fuel spill	• Practice STAR • Monitor weather forecasts • Make sure grip is adequate; wear protective gloves • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Refuel in appropriate location; no sparks or static buildup	Operator
2	Construction activity near water	• Slippery banks • Drowning • Overgrowth • Differing elevations to water's edge • Recovery of a person in the water	• Practice STAR • Make sure area is clear of tripping hazards • Position retrieval and rescue equipment as appropriate for the task • Use tie-off points and travel restraint if appropriate • Review JSAs for all tasks to be performed • Wear appropriate PFD vest	Operator

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00203

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Environmental-Soil Sampling

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:32	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Air monitoring equipment, PPE Additional PPE: Tyvek if Level C initiated; gloves dependent on the task and chemical contamination present or suspected present				
Task-specific Training:	GHD Field Method Training on Soil Sampling Procedures				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek

ED_014247_00001508-00205

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre job safety meeting • Use SWA to stop any work that is unsafe	Site Personnel
2	Inspect and calibrate sampling and monitoring equipment	• Lost time from improperly functioning equipment • Incorrect sampling procedures/ collection due to malfunctioning equipment	• Ensure all equipment is functioning properly • Complete Quality Control documents	Sampling Technician
3	Prepare to collect soil samples	• Lifting hazards • Back injury • Manual material handling • Pinch points • Cuts • Punctures • Sample misidentification	• Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing • No bending or twisting while under load • Refer to the HASP for additional lifting information • Avoid placing hands/fingers in pinch point locations • Use proper tools when opening container packaging • Do not use fixed open blade knives when opening boxes or containers • Ensure the sample id label matches sample location with site plan/GHD site supervisor/subcontractor	Sampling Technician
4	Opening the sample sleeve (if applicable)	• Cuts due to sharp edges of sample sleeve • Contaminant exposure	• Use sleeve cutter for opening the sample sleeves • Keep hands clear of the sleeve when cutting • Wear nitrile gloves • Maintain awareness of sharp edges of sample sleeve	Sampling Technician
5	Sample collection	• Contaminant exposure • Cuts from container breakage • Sample misidentification	• Wear nitrile gloves and replace between soil samples • Inspect glass bottles for breaks/cracks • Do not attempt to use any suspect containers • Close glass sample containers carefully to avoid breakage • Check sample labels for accuracy prior to placing in cooler	Sampling Technician
6	Headspace screening of samples	• Contaminant exposure • Incorrect headspace readings	• Wear nitrile gloves • Ensure proper calibration of equipment	Sampling Technician
7	Sample selection	• Bottle breakage • Contaminant exposure • Pinch points • Lost time due to incorrect sample selection	• Wear nitrile gloves when handling sample containers • Confirm selected samples are correct based on work plan selection criteria, PID readings, and soil boring logs • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid)	Sampling Technician

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
8	Packing samples in cooler(s)	• Bottle breakage • Contaminant exposure • Cuts • Pinch points • Lifting hazards • Back injury • Manual material handling • Lost time due to incorrect sample packaging or hold time exceedances	• Wear nitrile gloves when handling sample containers • Pack glass containers in bubble wrap • Check COC against sample labels and SSOW for accuracy before shipping • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Use proper lifting techniques as discussed in step 3 • If possible use a dolly or cart if cooler is heavy or has to be moved over a long distance • Ensure equipment and supplies are loaded correctly and do not shift during transport	Sampling Technician
9	Investigation derived waste (IDW) management	• Contaminant exposure • Lifting hazards • Back injury • Manual material handling • Pinch points • Slips/trips/fall hazards • Mislabeled waste	• Wear nitrile gloves when handling IDW • Use proper lifting techniques as discussed in step 3 • Avoid placing hands/fingers in pinch point locations • Maintain awareness of walking surfaces • Label IDW with generator, a contact number, identification of contents, and site location • Specify IDW as either hazardous or non hazardous material	Sampling Technician

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

ED_014247_00001508-00209

Job Safety Analysis (JSA)

Insert Name : Environmental-Decontamination of Sampling Equipment and Personnel (PPE Level D)

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:32	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Alconox/Liquinox, brushes				
Task-specific Training:	Decontamination/Site Control; Quality Control/Sampling Plan				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☑ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☐ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☑ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☑ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)

ED_014247_00001508-00210

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Decontamination of sampling equipment (including pumps, bailers, tubing, etc.)	• Contaminant exposure • Pinch points • Slip/trip/hit/fall hazards • Lifting hazards • Back injury • Manual material handling	• Set up decon station to capture any spills to avoid cross contamination and manage wastes • Wear appropriate PPE • Scrub equipment clean then rinse and verify it is clean and free of contamination • Avoid putting hands in or near pinch points • Maintain good housekeeping and be aware of surroundings • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical means, such as a dolly, cart, or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Refer to the HASP for additional lifting techniques	Sampling Personnel
2	Decontamination of personnel	• Contaminant exposure • Slip/trip/hit/fall hazards	• Refer to the HASP for specific procedures but in general start with most contaminated article and remove until inner gloves are the last item left • Dispose of used PPE in accordance with site requirements • Wash hands and face before eating, drinking, or using tobacco products • Take care when removing PPE (boots, gloves, etc.); sit down to remove/change boots as necessary	Sampling personnel
3	Management of waste derived from decontamination activities	• Contaminant exposure • Lifting hazards • Back injury • Manual material handling	• Containerize decon waste (e.g., water, used PPE) as required • Properly dispose of decon fluids (e.g., sediments) • Refer to step 1 and the HASP for additional lifting information	Sampling personnel

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00212

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Motor Vehicle - Driving

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:33	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Vehicle, valid driver's license, 360-degree topper; seatbelt				
Task-specific Training:	Defensive Driving				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☐ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☐ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☐ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☐ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☐)Industrial Grade Safety Boot	☐ Other*	☐ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*

ED_014247_00001508-00214

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Discuss route, concerns, and alternate routes with passenger and drivers of other vehicles • Use SWA to stop any work that is unsafe • Ensure proper vehicle selected for travel (use a truck if going to construction site or area with rough conditions that would damage a small vehicle?)	Driver and passenger
2	Check weather	• Unexpected storm • Fog; rain; snow; lightning/thunder • Heat/cold stress	• Check local weather forecast • Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting • If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightning/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Driver or Passenger

ED_014247_00001508-00216

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
3	Complete GHD Daily Operator Vehicle Checklist	• Damaged vehicle lights, tires, windows, mirrors, horn • Inadequate vehicle documents and/or safety items	• Check for fluid leaks under vehicle • Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers • Visually check the pressure/wear of tires • Ensure the vehicle has a properly inflated spare tire and associated tools to install • Assure windshield and window glass is clean and free from obstructions • Assure all fluids are topped off (e.g., windshield wiper fluid) and scheduled routine maintenance has occurred (e.g., oil changes). • Test the windshield wipers and horn • Verify vehicle registration, insurance card, and inspection sticker is present and valid • If the vehicle contains a first aid kit, fire extinguisher, and road hazard kit, verify that all items with expiration dates are current and that fire extinguisher has had documented monthly check • Do not use vehicle if any safety device is found not functioning	Driver or Passenger
4	Check and adjust seat, steering wheel, headrest, and mirrors	• Back/body strain • Blind spot • Impaired vision	• Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach • Ensure mirrors are properly adjusted	Driver or Passenger
5	Fasten seat belt(s) and ensure passengers' seat belts are fastened	• Serious injury, ejection, or death from collision and/or traffic citation	Verify driver and passenger(s) seat belts are in good condition and properly latched	Driver or Passenger

ED_014247_00001508-00217

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
6	Ensure vehicle doors are locked	• Serious injury, ejection, or death from collision • Unwanted intrusion • Lost equipment	Manually lock all doors to vehicle prior to starting the vehicle	Driver
7	Start engine and check gauges and warning lights	• Vehicle breakdown	Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit	Driver
8	Driving – Use defensive driving techniques and stay alert	• Arriving late • Collision • Blind spots of other vehicles • Injury or death to occupants or other parties	• Acknowledge and comply with all traffic regulations, laws, and ordinances • Do not use two-way communicating devices or perform other distracting activities while vehicle is in motion • Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale) • Recognize other vehicle's blind spots and minimize time spent within these zones • Maintain safety cushion around vehicle (front, sides, and rear) and 4-second following distance (add an extra second for each hazardous condition, triple following distance in poor weather conditions) • Signal well in advance before changing lanes or turning • Utilize all driving defensive techniques	Driver
9	Arrive at site	• Pedestrian injury • Collision	• Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone	Driver

ED_014247_00001508-00218

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
10	Park vehicle – assign a spotter if necessary (when in doubt use a spotter)	• Pedestrian injury • Collision • Property damage • Equipment theft	• Maintain awareness of pedestrian/vehicular traffic • Park vehicle in pull-through parking space or facing the exit • Parking in a parking space that is not a designated parking space will require the placement of the 360-degree topper on the hood of the vehicle • Use a spotter when backing up a vehicle • If no spotter available when backing up a vehicle, complete a 360-degree walk around vehicle. Ensure there are no hidden obstacles (e.g. pot holes, rocks, stumps, broken tree branches hidden by vegetation/foliage, etc.) that could be struck – look up and down. Stop, park and exit vehicle to check rear clearance as necessary when backing up to ensure travel pathway remains clear • Use caution and mirrors/spotter when backing vehicle • Set parking brake • Never leave field equipment in a vehicle unprotected • Never miss use and and always care for all field equipment • Never leave expensive equipment in your vehicle overnight • Always take expensive equipment with you into your hotel room/ house • Never miss use and always care for all field equipment	Driver
11	Demobilization – conduct a vehicle walk around inspection paying particular attention to path(s) of travel	• Collision • Injury or death to occupants or other parties	• Perform perimeter vehicle check • Maintain awareness of pedestrian/vehicular traffic when exiting site • Utilize defensive driving techniques • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Driver or Passenger

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
12	Report maintenance or mechanical problems upon returning vehicle	• Conditions worsen leading to mechanical failure resulting in collision and injury	• Report vehicle problems immediately to company representative or rental car agency • Schedule and/or perform repairs as soon as possible	Driver

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00220

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Environmental-Drum Sampling for Non Hazardous Material

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:34	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:					
Task-specific Training:	Hand Tools; Air Monitoring; RCRA/DOT Awareness Training				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☐ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*

ED_014247_00001508-00222

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of stop work authority	• Project team (GHD) discuss importance of and document procedures for SWA during pre job safety meeting • Use SWA to stop any work that does not comply with the GHD or Client policies	
2	Tailgate Safety Meeting/Safe Performance Self Assessment (SPSA)	• Not identifying all hazards • Property damage • Injury	• Discuss work to be performed and associated hazards • Open communication among team members; have all team members sign safety meeting form • Discuss any new or unknown hazards; Include discussion on SWA, hospital route, evacuation procedures, emergency contact(s), etc. • Identify personnel responsible for respective JSA critical actions for job steps	
3	Opening drums	• Cuts • Hand injury • Pinch point	• Wear leather/cotton gloves and use proper tool (e.g., box end wrench or socket wrench) • Avoid placing hands/fingers in pinch point locations	
4	Sample collection	• Contaminant exposure • Cuts from container breakage • Sample misidentification	• Wear nitrile gloves while collecting soil sample • Inspect container for breaks/cracks • Do not attempt to use any suspect containers • Close containers carefully to avoid breakage • Check sample labels for accuracy prior to placing in cooler	
5	Sample packing	Bottle breakage Contaminant exposure Cuts Pinch points Lifting hazards • Back injury • Manual material handling • Lost time due to incorrect sample packaging or hold time exceedances	• Wear nitrile gloves when handling sample containers • Pack glass containers in bubble wrap • Check COC against sample labels and SSOW for accuracy before shipping • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back • If the object is in excess of 50 pounds (23 kg) then assistance (mechanical such as a cart, dolly or a buddy lift) will be required • Make sure grip is adequate; use gloves to enhance grip when necessary • Reduce distance needed to travel when handling materials • Ensure equipment and supplies are loaded correctly and do not shift during transport	
6	Closing drums	• Cuts • Hand injury • Pinch point	• Wear leather/cotton gloves and use proper tool (e.g., box end wrench or socket wrench) • Avoid placing hands/fingers in pinch point locations	

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00225

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Remediation-Derived Waste Drum Moving and Handling

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:34	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Empty drums, spill kit, dolly, ratchet set, or box end wrench for loosening and tightening drum band, bung cap tool				
Task-specific Training:	40 Hour HAZWOPER or 8 Hour Refresher, HAZComm, PPE, Hand and Power Tools				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☐ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek

ED_014247_00001508-00227

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Walk the path to and from the drum storage area	• Slip/trip/fall hazards	• Review HASP and client requirements and implement • Use the STAR process to identify and correct any obvious hazards • Remove trip hazards in the area around the drums before moving hazards	
2	Set up staging area	• Slip/trip/fall hazards • Traffic hazards • Spills	• Remove trip hazards in the area around the drums before moving hazards • Select and demarcate area if necessary to prevent un-authorized personnel and vehicle entry • Ensure emergency spill materials are readily available	
3	Inspect all equipment and hand tools before use	• Hand injuries • Back Injuries • Lacerations	• Inspect dolly to ensure that it is operating properly (wheels turning freely, proper air pressure in wheels, no cracks in welds, sharp edges or burrs) • Select and inspect ratchet and socket or box end wrench • Do not use adjustable wrench or screw driver to loosen or tighten band • Ensure bung caps on drums are in place and secure if provided	
4	Remove drum lid	• Contaminant exposure • Pinch points • Hand injury	• Select and inspect ratchet and socket or box end wrench • Do not use adjustable wrench or screw driver to loosen or tighten band • Wear appropriate gloves as identified in PPE section	
5	Fill drum to appropriate level with derived waste material (i.e., soil cuttings, waste absorbent material, PPE Tyvek suits, etc.)	• Contaminant exposure • Pinch points • Hand injury • Lifting hazards	• Reduce risk of contaminant exposure by wearing proper PPE when handling waste materials (i.e., safety glasses, leather gloves, Tyvek suit, respirator, and appropriate gloves as identified in PPE section) • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • If an object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Fill drums ONLY to 75% capacity with soil and 85% capacity with water. DO NOT fill drums to full capacity.	
6	Properly seal the drum prior to moving	• Contaminant exposure • Pinch points • Hand injury	• Select and inspect ratchet and socket or box end wrench • Do not use adjustable wrench or screw driver to loosen or tighten band • Wear appropriate gloves as identified in PPE section • Ensure band is placed and secured properly to prevent lid from opening	

ED_014247_00001508-00229

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
7	Attach drums to dolly and move filled containers to designated staging area.	• Pinch points • Hand injury • Slip/trip/fall hazards • Lifting hazards • Manual material handling • Back injury	• Ensure that drums are sealed properly before maneuvering • Reduce travel distance when there is a need to carry/lift materials • Ensure that drum is properly fastened to dolly prior to moving • Make sure grip is adequate; wear leather gloves • Use moving/lifting device (drum dolly/forklift) to move 55 gallon drums; if an object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or buddy lift) is required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing • Place drum in drum storage/staging area in careful, controlled manner • If available, place drums on pallet for easier loading and unloading • Keep hands and feet out of pinch points and crush points	
8	Managing waste drums (55 gallon drums)	• Mislabeling waste	• Label waste appropriately (generator, contact number, identification of contents, and site location); specify type of contents; arrange for disposal	

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00230

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

ED_014247_00001508-00231

Job Safety Analysis (JSA)

Insert Name : Surveying-Land Surveying

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:34	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Flag or paddle Additional PPE: Class II vest; leather gloves to mob/demob equipment				
Task-specific Training:	Flagger Safety; Traffic Control Devices; Personal Protective Equipment				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☐ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Rubber Boots (industrial grade)		☑ Required	☐ Hazard Category 4	☐ R95		☐ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Mob equipment to surveying area with GHD vehicle	• Lifting hazards • Manual material handling • Back injury • Pinch points • Moving or flying projectiles inside vehicle while transporting equipment • Slip/trip/fall hazards • Biological hazards	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing • Review JSA and HASP • Practice STAR • Properly secure all equipment inside the vehicle	Survey Team
2	Note traffic flow	• Struck by oncoming traffic • Slip/trip/fall • Biological hazards • Threatening dogs	• Stage the GHD vehicle to aid in the protection of the survey crew if they need to set up a Temporary Traffic Control Zone (TTCZ) • Review JSA and HASP • Practice STAR	Survey Team
3	Develop the Temporary Traffic Control Plan (TTCP) and set up the Temporary Traffic Control Zone (TTCZ)	• Struck by oncoming traffic • Slip/trip/fall • Biological hazards • Threatening dogs • Lifting hazards • Manual material handling • Back injury • Heat/cold stress	• Review the requirements of the TTCP ahead of time • Make sure that all temporary traffic control equipment (signs/cones/etc.) is available • Carefully set up TTCZ using the buddy system • Refer to step 1 and HASP for additional lifting methods/information • Position truck with flashers on for added protection • Follow hot/cold stress procedures presented in the HASP • Review JSA and HASP • Practice STAR	Survey Team
4	General use of tools	• Struck by oncoming traffic • Slip/trip/fall hazards • Biological hazards • Threatening dogs • Potential injuries from misuse of tools or use of tools in disrepair	• Wear ANSI Class II reflective safety vest, safety toed boots, and hard hat • Do not use old or faded PPE • Inspect tools • Repair/replace tools as necessary • Review JSA and HASP • Practice STAR	Survey Team
5	Conduct survey activities	• Struck by oncoming traffic • Slip/trip/fall hazards • Biological hazards • Threatening dogs	• Surveyor will enter roadway after clearance from flag person • Surveyor will maintain contact with flag person during survey • Make sure that proper PPE is being worn • Review JSA and HASP • Practice STAR	Survey Team
6	Exit roadway	• Struck by oncoming traffic • Slip/trip/fall hazards • Biological hazards • Threatening dogs	• Surveyor should exit roadway first, followed by flag person nearest oncoming traffic (spotter) • Review JSA and HASP • Practice STAR	Survey Team

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00235

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

Job Safety Analysis (JSA)

Insert Name : Mobilization-Demobilization

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:35	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	#360 degree topper				
Task-specific Training:	#				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☐ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☐ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☐ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☐ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*

ED_014247_00001508-00237

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre job safety meeting • Use SWA to stop any work that is unsafe	
2	Check weather	• Unexpected storm • Fog, rain, snow; lightening/thunder • Heat/cold stress	• Check local weather forecast • If adverse weather conditions are likely, prepare a contingency plan for lodging, etc. with project manager • Discuss weather issues and precautions to take while driving and on site during the pre job safety meeting • If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightening/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	
3	Load equipment into vehicle	• Lifting hazards • Manual material handling • Back injury • Cuts • Pinch points • Hand/foot injury • Forgotten or damaged equipment	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Maintain neutral back posture - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and make sure to shift with the feet rather than twisting at the back • Maintain neutral wrist posture when lifting, carrying, pushing or pulling. The wrist is the strongest and most stable when it is straight. • Avoid one handed carrying if possible; maintain awareness of footing • Avoid placing hands/fingers in pinch point locations • Wear safety toed boots • Verify requested equipment against warehouse form • Load equipment in an organized manner to prevent shifting during transport or use cargo netting	

ED_014247_00001508-00239

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
4	Complete GHD Daily Operator Vehicle Checklist	• Damaged vehicle lights, tires, windows, mirrors, horn • Inadequate vehicle documents and/or safety items	• Check for fluid leaks under vehicle • Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers • Visually check the pressure/wear of tires • Ensure the vehicle has a spare tire • Assure windshield and window glass is clean and free from obstructions • Test the windshield wipers and horn • Verify vehicle registration, insurance card, and inspection sticker is present and valid • Ensure the vehicle contains a first aid kit, fire extinguisher, and road hazard kit • Check immediate vehicle perimeter and initial path of travel for obstructions	
5	Check and adjust seat, steering wheel, headrest, and mirrors	• Back/body strain • Blind spot • Impaired vision	• Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach • Ensure mirrors are properly adjusted	
6	Fasten seat belt(s) and ensure passenger(s) seat belts are fastened	• Serious injury, ejection, or death from collision and/or traffic citation	• Verify driver and passenger(s) seat belts are in good condition and properly latched	
7	Ensure vehicle doors are locked	• Serious injury, ejection, or death from collision • Unwanted intrusion • Lost equipment	• Manually lock all doors to vehicle	
8	Start engine and check gauges and warning lights	• Vehicle breakdown	• Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit	
9	Mobilize to site	• Arriving late • Collision • Injury or death to occupants or other parties	• Do not use cell phones or perform other distracting activities while vehicle is in motion • Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale) • Maintain safety cushion around vehicle (front, sides, and rear) and 4 second following distance • Utilize all driving defensive techniques	
10	Arrive at site	• Pedestrian injury • Collision	• Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone	

ED_014247_00001508-00240

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
11	Park vehicle	• Pedestrian injury • Collision • Property damage	• Maintain awareness of pedestrian/vehicular traffic • Park vehicle in pull through parking space or facing the exit • Parking in a parking space that is not a designated parking space will require the placement of the 360 degree topper on the hood of the vehicle • Use caution and mirrors/spotter when backing vehicle • Set parking brake	
12	Demobilization	• Collision • Injury or death to occupants or other parties	• Check immediate vehicle perimeter and initial path of travel for obstructions • Maintain awareness of pedestrian/vehicular traffic when exiting site • Utilize defensive driving techniques	

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

ED_014247_00001508-00242

Job Safety Analysis (JSA)

Insert Name : Environmental-Oversight of Monitoring Well Installation and/or Soil Boring

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:36	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Air monitoring equipment; safety cones/fencing/barricades (not needed in vacant, fenced areas)				
Task-specific Training:					

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☑)Industrial Grade Safety Boot	☐ Other*	☐ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☑ Required	☐ Hazard Category 4	☐ R95		☐ Other*

ED_014247_00001508-00243

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

ED_014247_00001508-00244

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Markout underground utilities	• Property damage • Explosion • Electrocution • Injury • Death	• Call public underground utility agency (One Call) at least 5 or more days prior to work activities • Review State Law pertaining to underground pipe line safety and have private utility mark out performed • Expose lines if warranted (i.e., hand dig, test pit, or daylight)	Project Manager and Site Supervisor
2	Conduct site walk,identify unsafe conditions and determine sample point locations	• Traffic hazard • Slip/trip/fall hazards • Biological hazard • Overhead/underground hazards • Property damage	• Maintain awareness of on site traffic and walking surfaces • When selecting soil boring locations, be aware of biological hazards (e.g., ants, poison ivy, wasps) and overhead/underground hazards (e.g., overhead utilities, concrete scarring, station canopy) • Use a walking stick, probe, or other such device to check for soil integrity/softness	Site Personnel
3	Equipment inspection	• Pinch points • Property damage • Lost time due to damaged equipment/parts	• Discuss pinch points on equipment (e.g., drill rig, air knife, pressure washer, etc.) • Familiarize all personnel with location/operation of fire extinguisher(s) and kill switch on drill rig • Visually inspect equipment/parts for damage and document inspections	Site Personnel
4	Set up work zone for drilling	• Traffic hazard • Slip/trip/fall hazards • Property damage • Overhead hazards • Environmental impact • Unstable ground conditions • Property damage	• Maintain awareness of on site traffic, work zones, walking surfaces, overhead hazards (e.g., canopy and low hanging overhead lines) • Utilize barricades/cones/caution tape to define work zone and direct traffic • Wear leather/cotton when setting up barricades • Be aware of any potential sensitive receptors and verify all personnel are aware of the location of spill kit • Inspect soil for loose, soft or unstable conditions under rig jacks or outriggers • Place mats or plywood in areas where drill rig will make ruts or depressions (i.e., under tracks or outriggers)	Site Personnel

ED_014247_00001508-00245

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
5	Set up staging area	• Traffic hazard • Slip/trip/fall hazards • Lifting hazards • Back injury • Manual material handling • Pinch points • Heat/cold stress	• Maintain awareness of on site traffic and walking surfaces • Utilize barricades/cones/caution tape to define work zone and direct traffic • Reduce distance needed to travel when carrying materials and or equipment • Wear leather/cotton gloves when setting up barricades • Size up the load, If the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required. • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing • Avoid placing hands/fingers in pinch point locations • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Site Personnel
6	Contractor oversight/ management of hole clearance/drilling activities	• Traffic hazard • Slip/trip/fall hazards • Lifting hazards • Back injury • Manual material handling • Damage to underground utilities • Contaminant exposure • Heat/cold stress • Injury to personnel and public • Cross contamination • Equipment failure	• Maintain awareness of on site traffic and practice good housekeeping • Perform a prestart meeting, inform subcontractor of safe lifting practices • Refer to step 5 and the HASP for additional lifting information • Ensure subcontractors don proper PPE (e.g., face shield, leather/cotton gloves, hearing protection). No loose clothing. • Complete and sign off utility clearance. If non native material (e.g., pea gravel, sand, fill material) or underground utilities are observed, utilize SWA and assess situation. • Monitor breathing zone and refer to HASP for action levels • Monitor all personnel for signs and symptoms of heat/cold stress and refer to HASP for recommendations • Be aware of unsafe hoisting and material handling practices • Be aware of proper augering and auger handling techniques. Visually monitor performance and functioning of drill rig for signs of failure. Monitor safe drill movement/positional setup. • Decontaminate sampling equipment after collecting a sample and decontaminate drilling equipment after each borehole • Watch where you step, look for debris which may be covered by brush or rubble	Site Personnel

ED_014247_00001508-00246

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
7	Construct well	• Lifting hazards • Back injury • Manual material handling • Cross contamination • Non approved construction • Slip, trip, and fall hazards • Eye injury • Cuts	• Use proper lifting techniques as discussed in Step 5 and HASP • Prior to going into the borehole, inspect casing and other materials to ensure they are free of jagged/sharp edges • Confirm construction with project manager • Ensure presence or other authorization by any required inspectors for well installation/grouting • Keep pathways and work area clean of debris and possible tripping hazards • Use PPE and monitoring in accordance with the JSA • Use safe cutting tools (no fixed open blade knives)	
8	Site/boring security, clean site, demobilize	• Traffic hazard • Slip/trip/fall hazards • Lifting hazards • Back safety • Manual material handling	• Use buddy system as necessary to remove traffic control • Do not work with your back to traffic • Wear leather/cotton gloves when moving barricades • Maintain awareness of on site traffic and walking surfaces • Maintain proper lifting techniques as described in Step 5 and HASP. • Ensure good house keeping methods are practiced. Work area is kept clean of debris. • Leave site clean of refuse and debris • Clearly mark/barricade any borings that need later topping off or curing • Notify property personnel of departure • Secure boring location if open overnight	

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00247

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

ED_014247_00001508-00248

Job Safety Analysis (JSA)

Insert Name : Environmental- Monitoring Well Sampling

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:36	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market Street, Channelview				
Key Equipment:					
Task-specific Training:					

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☑ Chemical Protective (ie.Nitrile)	☐ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☐ Class II (standard)	☐ Coveralls
☐ Type 2 (Side Impact)	☐ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☐ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)
☐)Industrial Grade Safety Boot	☐ Other*	☐ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☐ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

ED_014247_00001508-00249

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

ED_014247_00001508-00250

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Coordinate site access	• Delays or added work	• Notify Station Manager of schedule • Notify other required personnel if applicable (city, regulators, private property owners, etc.)	
2	Mobilize with proper equipment/ supplies for sampling	• Delay or improper/unsafe performance of work due to improper equipment on site • Cross contamination of wells	• Review work plan to determine equipment/supply needs • Make sure all sampling/gauging equipment is decontaminated • Bring ice for sample storage • Review THE HASP and gather necessary PPE	
3	Notify other personnel on site	• Unknown traffic or other work hazards • Lack of communication between all interested parties	• Meet with station attendant or other site personnel and explain planned activities	
4	Determine sampling order	• Cross contamination of samples and wells due to incomplete decontamination of sampling equipment	• Review prior analytical results and set sampling order from lowest to highest concentration wells	
5	Perform STAR and tailgate safety meeting upon arrival at site	• Consider worst case scenario (including weather conditions)	• Review HASP with co workers • Highlight aspects identified by HASP and, if necessary, add to HASP • Get signature of all co workers on HASP	
6	Set up exclusion zone(s)	• Injury or exposure to public or other on site personnel • Slip/trip/fall hazards	• Implement exclusion zone setup instructions of THE HASP (barricades, caution tape, cones, etc.) • Set up work area free of trip hazards	
7	Gauge water levels and product thickness (where applicable) in wells	• Back strain • Inhalation or dermal exposure to chemical hazards	• Don any additional PPE and initiate air quality monitoring in accordance with the HASP • Maintain safe distance from well head • Bend at knees, not waist	

ED_014247_00001508-00251

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
8	Purge well(s) and collect purge water	• Cross contamination • Lifting hazards • Back injury • Manual material handling • Inhalation or dermal exposure to chemicals • Slip/trip/fall hazards • Spilling contaminated water	• Decontaminate purging equipment between each sampling location • Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing • Use PPE and monitoring in accordance with the HASP • Keep work area clear of tripping or slipping hazards • Store purge water in appropriate containers	
9	Collect samples in accordance with sampling plan	• Cross contamination • Lifting hazards • Back injury • anual material handling • Inhalation or dermal exposure to chemical hazards • Slip/trip/fall hazards • Improper labeling or storage • Injury due to acid burn (unsealed or leaking sample bottle) • Injury from broken sample bottle (cuts or acid burn)	• Use PPE in accordance with the HASP • Use PPE whenever handling or labeling samples • Decontaminate sampling equipment between each well (unless disposable) • Refer to step 9 and the HASP for additional lifting methods • Label samples in accordance with sampling plan • Keep samples stored in proper containers, at correct temperature, and away from work area • Wear nitrile gloves when handling bottles • Handle bottles carefully	
10	Dispose or store purge water onsite	• Lifting hazards • Back injury • Manual material handling • Exposure to chemicals • If disposing through on site treatment system, damage or injury from improper use of equipment • Improper storage or disposal	• Use proper equipment to transport water (pumps, drum dollies, etc.) • Refer to step 9 and the HASP for additional lifting methods • Where PPE in accordance with the HASP • Review any necessary instructions for use of on site treatment systems • Label storage containers properly and locate in isolated area away from traffic and other site functions • Coordinate off site disposal (where applicable)	
11	Clean site/demobilize	• Traffic • Nuisance or safety hazard left on site • Back strain	• Use buddy system as necessary to remove traffic control • Leave site clean of refuse and debris • Notify station personnel of departure, and note any purge water left on site • Exercise caution when lifting coolers out of the trunk of a car; use the buddy system if justified	

ED_014247_00001508-00252

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
12	Package and deliver samples to lab	• Bottle breakage • Improper temperature • Exceeding hold times • Improper completion of Chain of Custody (COC)	• Pack samples in ice, use bubble wrap/bags for sample bottles • Use standard COC forms and labels • Submit samples to lab as soon as possible (no more than 3 days, but check sampling plan for any special requirements such as rush turnaround or special hold time restrictions)	

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00253

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SAFE YOU ME GHD
ENVIRONMENT & PEOPLE

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

ED_014247_00001508-00254

Job Safety Analysis (JSA)

Insert Name : Environmental-Site Recon and Walkthrough

Field staff must review job specific work plan and coordinate with project manager to verify that all up front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).** Review this JHA initially and in the field prior to initiating the job, using the P66 RM "Go Card" to assist in identifying specific site hazards. Document by "dirtying" this JHA.

Date Issued/Revised:	06/03/2021 13:25:38	**Client:**	International Paper		
Project Number:	11215131	**Created By:**	cra\mwillis2	SIM OPS? YES/NO	SSE on site? YES/NO
Project Address:	Market St, Channelview				
Key Equipment:	Basic PPE, hand/power tools based on site condition, site inspection checklist or notebook, JSA forms, pens, flashlight. Additional PPE: Insect repellant. Coveralls may be necessary based on type of brush/plants/insects in work area(s) being inspected. Leather gloves if overgrown vegetation or rundown buildings.				
Task-specific Training:	SMART Safety training (STAR), JSA development, Poison Plant Identification				

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☐ Type 1 (Top Impact)	☐ Chemical Protective (ie.Nitrile)	☑ ANSI/CSA Safety Glasses	☐ Harness	☐ Full Face Mask	☑ Class II (standard)	☑ Coveralls
☐ Type 2 (Side Impact)	☑ Level 1 - Light Duty	☐ Goggles/Spoggles	☐ Shock Absorbing Lanyard	☐ Half Face Mask	☐ Class III (Night or Highway Traffic)	☐ Fire Retardent Clothing (FRC)
☑ Class E (standard)	☐ Level 2 - Light Duty with Protection	☐ Face Shields	☐ Lifeline		☐ Anti-Static	☐ High Viz Clothing
☐ Class G	☐ Level 3 - Medium Duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long Pants
	☐ Level 4 - Heavy Duty			☐ N95	☐ PFD	☐ Long Sleeve Shirts
Foot Protection	☐ High Viz	**Hearing Protection**	**Arc Flash/Shock Protection**	☐ P100		☐ Paper Tyvek (disposible)

ED_014247_00001508-00255

Hard Hat	Gloves (ANSI/EN 388)	Eye Protection	Fall Protection	APR	Vest	PPE Clothing
☑)Industrial Grade Safety Boot	☐ Other*	☑ NOT Required for this task	☐ Hazard Category 2	☐ P95		☐ Polyethyene Tyvek
☐ Rubber Boots (industrial grade)		☐ Required	☐ Hazard Category 4	☐ R95		☑ Other*
☐ Hip Waders				☐ Organic Vapour		
	* see key equipment			☐ Speciality*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			
Jane (janie) Smith				

ED_014247_00001508-00256

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe	All persons on project team
2	Check weather	• Unexpected storm, fog; rain; snow; lightening, thunder • Heat/cold stress, including frostbite and sunburn	• Check local weather forecast • Discuss weather issues and precautions to take while driving and on site during the pre job safety meeting • If weather conditions (e.g., fog, rain, snow) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightning/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, which includes either a helmet liner or hat/mask that will cover exposed skin on one's face and ears, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers) • Implement the "Buddy System." The site supervisor shall also keep close tabs on all project personnel working in extreme temperatures.	Assessor
3	Sign in	• Site Manager and Operator not aware of GHD staff presence in facility or on grounds	• Sign in at front desk • Ask to speak to Site Manager or alternate designate	
4	Don necessary GHD and client required PPE	• Contact with recyclable material or equipment	• Wear all required PPE (hard hat, vest, boots, and glasses) at all times while in the facility	
5	Unload equipment from vehicle	• Lifting hazards • Back injury • Manual material handling • Cuts • Pinch points • Hand/foot injury • Forgotten equipment • Damaged equipment	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing • Wear leather/cotton gloves and avoid placing hands/fingers in pinch point locations • Wear steel toed boots • Verify requested equipment against warehouse form • Load equipment in an organized manner to prevent shifting during transport or use cargo netting	Assessor

ED_014247_00001508-00257

Job steps[1]	Task activity	Potential hazard(s)[2]	Corrective measure(s)[3]	Person responsible (Print first and last names)
6	Complete site inspection and walkover of the property and work areas – Note any hazards that will impact site personnel and/or their operations	• Slip/trip/fall hazards • Insects/reptiles • Pedestrian injury • Poison plants	• Check in with site personnel and sign appropriate visitor or safety log (may require watching safety video [i.e., plant]) • Check with site contact to determine safely accessible areas and areas where PPE are required • Wear PPE as directed by site personnel or dependent upon your evaluation of conditions • If building(s) looks dilapidated or in poor condition, do not enter • Watch for vehicles or other mobile equipment moving around • Make sure areas are well lit and you are accompanied by a site representative (if applicable) • Watch where you step on pavement (potholes, dips, or obstructions) and in vegetated/wooded areas (dips, holes, branches, vines, etc.) • Do not take photographs while walking • Do not talk on cell phone while walking • If in vegetated or wooded areas, watch for beehives, wear insect repellent (if area and season dictate) as needed, be mindful of gopher holes/tunnels, small animal dens, snakes, stray dogs/cats, transient/homeless individuals, poison ivy/oak/sumac, etc.	Assessor
7	Sign out	• Site Manager and Operator not aware that GHD staff have left facility	• Sign out at front desk • Ask to speak to Site Manager or alternate designate	
8	Demobilization	• Collision • Injury or death to vehicle occupants or other parties	• Perform perimeter vehicle check • Maintain awareness of pedestrian/vehicular traffic when exiting the site • Utilize defensive driving techniques • Complete post departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Assessor

1. Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
2. A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
3. Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00258

Site Personnel Participating in JSA Review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a Stop Work Authority (SWA) if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter Signature: _____ Date/Time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.
Supervisor Signature: _____ Date/Time: _____

Location of Mustering Point: _____ Wind direction (current): _____

GHD Emergency contact (Name and verified phone number): _____

Supervisor Signature documenting Daily Debrief has been completed: _____

ED_014247_00001508-00259

Job Safety Analysis (JSA)

Working Around Water

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:		**Client:**	IPC		
Project number:	11215131	**Created by**	GHD	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	18003 Market St. Channelview, TX				
Specific task					
Key equipment:					
Task-specific training:					

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☐ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

ED_014247_00001508-00260

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)

ED_014247_00001508-00261

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SAFE YOU ME GHD
ENVIRONMENT & PEOPLE

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Attachment C

Safety Data Sheets

Dioxins, Furans and Dioxin-Like Polychlorinated Biphenyls Factsheet

Dioxins, furans, and dioxin-like polychlorinated biphenyls (PCBs) are the abbreviated names for a family of chemicals that have similar toxicity and shared chemical characteristics. The dioxins and furans are not manufactured or produced intentionally but are created when other chemicals or products are made. These chemicals may be created during burning of forests or household trash; chlorine bleaching of pulp and paper; or manufacturing or processing of certain types of chemicals, such as pesticides. Until banned in 1979, PCBs were manufactured as insulator fluids in heat-exchangers and transformers, as hydraulic fluids, and as additives to paints, oils, and caulks. All of these chemicals remain in the environment even though they are no longer manufactured. They enter the food chain and build up in larger animals.

How People Are Exposed to Dioxins, Furans, and Dioxin-Like PCBs

People can be exposed to these chemicals by eating high-fat foods such as milk products, eggs, meat, and some fish. Workplace exposures can occur in industries that burn waste matter or that manufacture other chemical products containing these substances.

How Dioxins, Furans, and Dioxin-Like PCBs Affect People's Health

Human health effects from low environmental exposures are unclear. People who have been unintentionally exposed to large amounts of these chemicals have developed a skin condition called chloracne, liver problems, and elevated blood lipids (fats). Laboratory animal studies have shown various effects, including cancer and reproductive problems.

Levels of Dioxins, Furans and Dioxin-Like PCBs in the U.S. Population

In the *Fourth National Report on Human Exposure to Environmental Chemicals (Fourth Report)*, CDC scientists measured 26 of these chemicals in the blood serum (the clear part of blood) of at least 1,800 participants aged 12 years and older who took part in the National Health and Nutrition Examination Survey (NHANES) during 2003–2004. Prior survey periods of 1999–2000 and 2001–2002 are also included in the *Fourth Report*. By measuring these chemicals in serum, scientists can estimate the amounts of these chemicals that have entered people's bodies.

- In the *Fourth Report*, CDC researchers found low levels of these 26 chemicals in the U.S. population.
- The findings are consistent with other studies that found that the levels of most of these chemicals have decreased by more than 80% since the 1980s.

Finding a measurable amount of one or more of these chemicals in serum does not imply that the level of one or more of these chemicals causes an adverse health effect. Biomonitoring studies of these chemicals provide physicians and public health officials with reference values so that they can determine whether people have been exposed to higher levels than are found in the general population. Biomonitoring data can also help scientists plan and conduct research on exposure and health effects.

Additional Resources

Agency for Toxic Substances and Disease Registry (ATSDR)

- ToxFAQs for Chlorinated Dibenzo-*p*-Dioxins
- Public Health Statement for Chlorinated Dibenzo-*p*-Dioxins
- ToxFAQs for Chlorodibenzofurans
- Public Health Statement for Chlorodibenzofurans

Environmental Protection Agency

ED_014247_00001508-00264

- Dioxins and Furans

U.S. National Library of Medicine, National Institutes of Health

- ToxTown–Dioxins
- ToxTown–Polychlorinated Biphenyls

Food and Drug Administration

- Questions and Answers About Dioxins

Page last reviewed: April 7, 2017

ED_014247_00001508-00265

Synonyms & Trade Names

Dioxin, Dioxine, TCDBD, TCDD, 2,3,7,8-TCDD [Note: Formed during past production of 2,4,5-trichlorophenol, 2,4,5-T & 2(2,4,5-trichlorophenoxy)propionic acid.]

CAS No.	RTECS No.	DOT ID & Guide
1746-01-6	HP3500000	

Formula	Conversion	IDLH
$C_{12}H_4Cl_4O_2$		Ca [N.D.] See: IDLH INDEX

Exposure Limits

NIOSH REL
Ca See Appendix A
OSHA PEL
none

Measurement Methods

None available
See: NMAM or OSHA Methods

Physical Description

Colorless to white, crystalline solid. [Note: Exposure may occur through contact at previously contaminated worksites.]

Molecular Weight	Boiling Point	Melting Point	Solubility	Vapor Pressure	Ionization Potential
322.0	Decomposes	581°F	0.00000002 %	(77°F): 0.000002 mmHg	?

Specific Gravity	Flash Point	Upper Explosive Limit	Lower Explosive Limit		
?	?	?	?		

Incompatibilities & Reactivities

UV light (decomposes)

ED_014247_00001508-00266

Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms

irritation eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects; In Animals: liver, kidney damage; hemorrhage; [potential occupational carcinogen]

Target Organs

Eyes, skin, liver, kidneys, reproductive system

Cancer Site

[in animals: tumors at many sites]

Personal Protection/Sanitation

(See protection codes)
Skin:Prevent skin contact
Eyes:Prevent eye contact
Wash skin:When contaminated/Daily
Remove:When wet or contaminated
Change:Daily
Provide:Eyewash, Quick drench

First Aid

(See procedures)
Eye:Irrigate immediately
Skin:Soap flush immediately
Breathing:Respiratory support
Swallow:Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.
Click here for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

See also

INTRODUCTION ICSC CARD: 1467

Page last reviewed: October 30, 2019

ED_014247_00001508-00267

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Liquinox
Synonyms:
Product number: Liquinox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer	Supplier
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Alcohol ethoxylate
Sodium alkylbenzene sulfonate
Sodium xylenesulphonate
Lauramine oxide

2.2 Label elements:

Eye irritation, category 2A.
Skin irritation, category 2.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Additional information: None.

Hazard description

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	10-25
CAS number: 1300-72-7	Sodium Xylenesulphonate	Eye Irrit. 2; H319	2.5-10
CAS number: 84133-50-6	Alcohol Ethoxylate	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	2.5-10
CAS number: 1643-20-5	Lauramine oxide	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	1-2

3.4 Additional Information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.
Conditions for safe storage, including any incompatibilities:
Store closed upright and in a cool dry place, should be 15 - 30 deg C or 60 - 90 deg F.

7.2 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

8 Exposure controls/personal protection

8.1 Control parameters :

No applicable occupational exposure limits

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	Pale yellow liquid	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or not available.
pH-value:	8.5 as is	**Relative density:**	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities:**	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water):**	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature:**	Not determined or not available.

Evaporation rate:	Not determined or not available.	**Decomposition temperature:**	Not determined or not available.
Flammability (solid, gaseous):	Not determined or not available.	**Viscosity:**	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox	
Density at 20°C:	Not determined or not available.

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 >5000 mg per kg Rat, Oral) - product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Alcohol Ethoxylate: May cause mild to moderate skin irritation.

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Lauramine oxide: Causes skin irritation.

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation.

Alcohol Ethoxylate: Causes moderate to severe eye irritation and conjunctivitis.

Sodium xylenesulphonate: Rabbit: irritating to eyes.

Lauramine oxide: Causes serious eye damage.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Lauramine oxide: Fish, LC0 24.3 mg/l, 96h [Killifish (Cyprinodontidae)]
Lauramine oxide: Aquatic invertebrates, (LC50): 3.6 mg/l 96 hours [Daphnia (Daphnia)].
Lauramine oxide: Aquatic plants, EC50 Algae 0.31 mg/l 72 hours [Algae]
Alcohol Ethoxylate: Aquatic invertebrates, (LC50): 4.01 mg/l 48 hours [Daphnia (daphnia)].

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.
Comments: None

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.
Comments: None

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

14.4 Packing group: ADR, ADN, DOT, IMDG, IATA	None
14.5 Environmental hazards :	None
14.6 Special precautions for user:	None
Danger code (Kemler):	None
EMS number:	None
Segregation groups:	None

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

14.8 Transport/Additional information:

Transport category:	None
Tunnel restriction code:	None
UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017 **Revision** : 05/17/2017

Trade Name: Liquinox

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling,

use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

HMIS: 1-0-0

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **NO. 2 DIESEL FUEL**
Product Description: Hydrocarbons and Additives
Product Code: 123455-22, 123455-29, 152017-00
Intended Use: Diesel engine fuel, Heating Oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	www.exxon.com, www.mobil.com

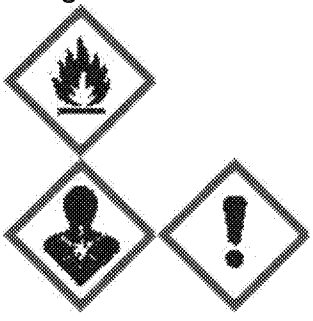
SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 3.
Acute inhalation toxicant: Category 4. Skin irritation: Category 2. Carcinogen: Category 2. Specific target organ toxicant (repeated exposure): Category 2. Aspiration toxicant: Category 1.

LABEL:
Pictogram:



Signal Word: Danger

Hazard Statements:
H226: Flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H332: Harmful if inhaled. H351: Suspected of causing cancer. H373: May cause damage to organs through

prolonged or repeated exposure. Bone marrow, Liver, Thymus

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: DIESEL OIL..C9-20

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS
Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS
May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. May be irritating to the eyes, nose, throat, and lungs.

ENVIRONMENTAL HAZARDS
Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	2	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
DIESEL OIL..C9-20	68334-30-5	80 - > 99%	H226, H304, H332, H351, H315, H373, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL BENZENE	100-41-4	0.1 - 1%	H225, H332, H373, H401, H412
NAPHTHALENE	91-20-3	0.1 - 1%	H302, H351, H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: Composition may contain up to 0.5% performance additives and / or dyes.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Flammable. Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Do not siphon by mouth. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage containers, transfer

containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
DIESEL OIL..C9-20	Stable Aerosol.	TWA	5 mg/m3		Skin	ExxonMobil
DIESEL OIL..C9-20	Vapor.	TWA	200 mg/m3		Skin	ExxonMobil
DIESEL OIL..C9-20 [total hydrocarb, vapor&aerosol]	Inhalable fraction and vapor	TWA	100 mg/m3		Skin	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: If contact with material is likely, chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.81 - 0.87
Density (at 15 °C): 810 kg/m³ (6.76 lbs/gal, 0.81 kg/dm³) - 876 kg/m³ (7.31 lbs/gal, 0.88 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)
Boiling Point / Range: 145°C (293°F) - 370°C (698°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa

Vapor Pressure: 0.067 kPa (0.5 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 1.7 cSt (1.7 mm2/sec) at 40 °C - 4.1 cSt (4.1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: < -6°C (21°F)

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Strong Bases, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 4100 mg/m3 (Vapor and aerosol)	Moderately toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 434
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	

Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475
Carcinogenicity: Data available.	Caused cancer in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Test(s) equivalent or similar to OECD Guideline 414
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: Data available.	Concentrated, prolonged or deliberate exposure may cause organ damage. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 413

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Target Organs Repeated Exposure: Bone marrow, Liver, Thymus

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Diesel fuel: Caused cancer in animal tests. Caused mutations in vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.

Diesel exhaust fumes: Carcinogenic in animal tests. Inhalation exposures to exhaust for 2 years in test animals resulted in lung tumors and lymphoma. Extract of particulate produced skin tumors in test animals. Caused mutations in vitro.

Contains:

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
High molecular wt. component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 1000 mg/l: data for similar materials
Aquatic - Acute Toxicity	96 hour(s)	Fish	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella	EL50 1 - 100 mg/l: data for similar

		subcapitata	materials
Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 10 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: DIESEL FUEL
Hazard Class & Division: COMBUSTIBLE LIQUID
ID Number: NA1993
Packing Group: III
Marine Pollutant: Yes
ERG Number: 128
Label(s): NONE
Transport Document Name: NA1993, DIESEL FUEL, COMBUSTIBLE LIQUID, PG III, MARINE POLLUTANT

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid. This material is not regulated under 49 CFR in a container of 119 gallon capacity or less when transported solely by land, as long as the material is not a hazardous waste, a marine pollutant, or specifically listed as a hazardous substance.

LAND (TDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III

SEA (IMDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1202
Packing Group: III
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III, (>38°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, IECSC, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE GHS HAZARD CLASSES: Acute Toxicity (any route of exposure), Aspiration Hazard, Carcinogenicity, Flammable (gases, aerosols, liquids, or solids), Skin Corrosion or Irritation, Specific Target Organ toxicity (single or repeated exposure)

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ETHYL BENZENE	100-41-4	0.1 - 1%
NAPHTHALENE	91-20-3	0.1 - 1%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
DIESEL OIL..C9-20	68334-30-5	1, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 17, 19
NAPHTHALENE	91-20-3	1, 4, 10, 17, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Section 05: Fire Fighting Measures - Fire Fighting Instruction information was modified.
Section 05: Fire Fighting Measures - Unusual Fire Hazards information was modified.
Section 10: Conditions to Avoid information was modified.
Section 14: DOT Footnote information was modified.
Section 15: SARA (311/312) REPORTABLE GHS HAZARD CLASSES information was added.

Section 15: SARA (311/312) REPORTABLE HAZARD CATEGORIES information was deleted.
Section 16: HCode Key information was modified.
Section 16: Standard phrases for California Proposition 65 information was modified.
THIS MSDS COVERS THE FOLLOWING MATERIALS: DIESEL EFFICIENT | DIESEL NO. 2 | ESSO DIESEL FUEL | EXXON DIESEL FUEL | EXXON SYNERGY DIESEL EFFICIENT | LOW SULFUR DIESEL | MARINE DIESEL FUEL | MOBIL DIESEL EFFICIENT | MOBIL DIESEL FUEL | MOBIL SYNERGY DIESEL EFFICIENT | ULTRA LOW SULFUR DIESEL | WINTERIZED DIESEL FUEL

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only
MHC: 1A, 0B, 2, 0, 4, 1 PPEC: C

DGN: 7079307XUS (1012398)

Copyright 2002 Exxon Mobil Corporation, All rights reserved

SAFETY DATA SHEET

SECTION 1 IDENTIFICATION

PRODUCT

Product Name: UNLEADED GASOLINE
Product Description: Hydrocarbons and Additives
SDS Number: 8522

Intended Use: Fuel

Trade Names	Trade Names
AUTOMOTIVE GASOLINE	ESSO EXTRA GASOLINE
ESSO MIDGRADE GASOLINE	ESSO PREMIUM GASOLINE
ESSO REGULAR GASOLINE	ESSO SUPREME GASOLINE
EXXON MIDGRADE GASOLINE	EXXON PREMIUM GASOLINE
EXXON REGULAR GASOLINE	GASOLINE MIDGRADE UNLEADED MUL89
GASOLINE MIDGRADE UNLEADED MUL89 DCA	GASOLINE MIDGRADE UNLEADED MUL89 DCA DYED
GASOLINE MIDGRADE UNLEADED MUL89 LDCA	GASOLINE MIDGRADE UNLEADED MUL89 LDCA DYED
GASOLINE PREMIUM UNLEADED PUL91	GASOLINE PREMIUM UNLEADED PUL91 DCA
GASOLINE PREMIUM UNLEADED PUL91 DCA DYED	GASOLINE PREMIUM UNLEADED PUL91 LDCA
GASOLINE PREMIUM UNLEADED PUL91 LDCA DYED	GASOLINE RBOB BLENDSTOCK P91
GASOLINE RBOB BLENDSTOCK R87	GASOLINE REGULAR UNLEADED RUL87
GASOLINE REGULAR UNLEADED RUL87 DCA	GASOLINE REGULAR UNLEADED RUL87 DCA DYED
GASOLINE REGULAR UNLEADED RUL87 DYED	GASOLINE REGULAR UNLEADED RUL87 LDCA
GASOLINE REGULAR UNLEADED RUL87 LDCA DYED	

COMPANY IDENTIFICATION

Supplier: **Imperial Oil Downstream**
P.O. Box 2480, Station M
Calgary, ALBERTA T2P 3M9 Canada

24 Hour Emergency Telephone	1-866-232-9563
Transportation Emergency Phone Number	1-866-232-9563
Product Technical Information	1-800-268-3183
Supplier General Contact	1-800-567-3776

SECTION 2 HAZARD IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines.

This product has been classified in accordance with hazard criteria of the Hazardous Products Regulations (HPR) SOR/2015-17 and the SDS contains all the information required by the HPR SOR/2015-17.

CLASSIFICATION:

Flammable Liquids — Category 1

Skin Irritation — Category 2
Germ Cell Mutagenicity — Category 1B
Carcinogenicity — Category 1B
Reproductive Toxicity (Developmental) — Category 2
Reproductive Toxicity (Fertility) — Category 2
Specific Target Organ Toxicity — Single Exposure (Central Nervous System) — Category 3
Aspiration Hazard — Category 1

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H224: Extremely flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness. H340: May cause genetic defects. H350: May cause cancer. H361: Suspected of damaging the unborn child. H361: Suspected of damaging fertility.

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P233: Keep container tightly closed. P240: Ground and bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use non-sparking tools. P243: Take action to prevent static discharges. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: Benzene; GASOLINE; n-Hexane; Toluene

Other hazard information:

Health Hazards Not Otherwise Classified: None as defined under HPR SOR/2015-17.

Physical Hazards Not Otherwise Classified: None as defined under HPR SOR/2015-17.

PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. May cause central nervous system depression. Exposure to benzene is associated with cancer (acute myeloid leukaemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	3	Reactivity: 0
HMIS Hazard ID:	Health:	2*	Flammability:	3	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) in Hazardous product

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL ALCOHOL	64-17-5	0 - 1%	H225, H319(2A)
GASOLINE	86290-81-5	98 - 100%	H224, H304, H336, H340(1B), H350(1B), H361(D), H315, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s)

Name	CAS#	Concentration*	GHS Hazard Codes
Benzene	71-43-2	0 - 1.5%	H225, H303, H304, H340(1B), H350(1A), H315, H319(2A), H372, H401
CUMENE	98-82-8	0 - 1%	H226, H304, H335, H351, H401, H411
CYCLOHEXANE	110-82-7	0 - 1.5%	H225, H304, H336, H315, H400(M factor 1), H410(M factor 1)
ETHYL BENZENE	100-41-4	0 - 3.5%	H225, H332, H373, H401, H412
n-Hexane	110-54-3	0 - 5%	H225, H304, H336, H361(F), H315, H373, H401, H411
Naphthalene	91-20-3	0 - 1%	H302, H351, H400(M factor 1), H410(M factor 1)
Toluene	108-88-3	0 - 20%	H225, H304, H336, H361(D), H315, H373, H401, H412
XYLENES	1330-20-7	0 - 20%	H226, H304, H312, H332, H335, H315, H320(2B), H373, H401

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

NOTE: The concentration of the components shown above may vary substantially. In certain countries, benzene content may be limited to lower levels. Oxygenates such as tertiary-amyl-methyl ether, ethanol, di-isopropyl ether, and ethyl-tertiary-butyl ether may be present. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane, and isopentane. The reportable component percentages, shown in the composition/information on ingredients section, are based on API's evaluation of a typical gasoline mixture.

SECTION 4 FIRST-AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This light hydrocarbon material, or a component, may be associated with cardiac sensitisation following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop a leak. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Extremely Flammable. Vapour is flammable and heavier than air. Vapour may travel across the ground and reach remote ignition sources, causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulphur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: -40°C (-40°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and

speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid breathing mists or vapour. Avoid all personal contact. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put petrol into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapour and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices etc) in or around any fuelling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Substance Name	Form			Limit/Standard	Note	Source
Benzene		STEL	1 ppm			Supplier
Benzene		TWA	0.5 ppm			Supplier

Benzene		STEL	2.5 ppm		Skin	ACGIH
Benzene		TWA	0.5 ppm		Skin	ACGIH
CUMENE		TWA	50 ppm			ACGIH
CYCLOHEXANE		TWA	100 ppm			ACGIH
ETHYL ALCOHOL		STEL	1000 ppm			ACGIH
ETHYL BENZENE		TWA	20 ppm			ACGIH
GASOLINE		STEL	200 ppm			Supplier
GASOLINE		TWA	100 ppm			Supplier
GASOLINE		STEL	500 ppm			ACGIH
GASOLINE		TWA	300 ppm			ACGIH
n-Hexane		TWA	50 ppm		Skin	ACGIH
Naphthalene		TWA	10 ppm		Skin	ACGIH
Toluene		TWA	20 ppm			ACGIH
XYLENES		STEL	150 ppm			ACGIH
XYLENES		TWA	100 ppm			ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No protection is ordinarily required under normal conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Colour: Clear (May Be Dyed)
Odour: Petroleum/Solvent
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.74
Flammability (Solid, Gas): N/A
Flash Point [Method]: -40°C (-40°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)
Boiling Point / Range: > 20°C (68°F) - 225°C (437°F)
Decomposition Temperature: N/D
Vapour Density (Air = 1): 3.2 at 101 kPa
Vapour Pressure: > 26.6 kPa (200 mm Hg) at 20ºC | 76 kPa (570 mm Hg) at 38 °C - 103 kPa (772.5 mm Hg) at 38°C
Evaporation Rate (n-butyl acetate = 1): > 10
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3
Solubility in Water: Negligible
Viscosity: <1 cSt (1 mm2/sec) at 40ºC
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Alkalies, Halogens, Strong Acids, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m3 (Vapour)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation: No end point data for material.	Irritating to the skin. Based on test data for structurally similar materials.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitisation	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Caused genetic effects in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar

	materials. Test(s) equivalent or similar to OECD Guideline 471 475 476
Carcinogenicity: Data available.	Caused cancer in laboratory animals. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Caused damage to fertility in laboratory animals, but the relevance to humans is uncertain. Caused damage to the fetus in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 416 421
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	May cause drowsiness or dizziness.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412 453

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapour) (Rat); Oral Lethality: LD 50 3.5 g/kg (Rat)
Naphthalene	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD 50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapours in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk. Vapour concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anaesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies.

CUMENE: Repeated inhalation exposure of cumene vapour produced damage in the kidney of male rats only. These effects are believed to be species specific and are not relevant to humans. ETHANOL: Prolonged or repeated exposure to high concentrations of ethanol vapour or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring. GASOLINE UNLEADED: Carcinogenic in animal tests. Chronic inhalation studies resulted in liver tumours in female mice and kidney tumours in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations in-vitro or in-vivo. Negative in inhalation developmental studies and reproductive tox studies. Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing). NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown. TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects. ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

CMR Status:

Chemical Name	CAS Number	List Citations
Benzene	71-43-2	1, 4, 5
CUMENE	98-82-8	3, 4
CYCLOHEXANE	110-82-7	4
ETHYL ALCOHOL	64-17-5	4
ETHYL BENZENE	100-41-4	3, 4
GASOLINE	86290-81-5	3, 4
n-Hexane	110-54-3	4
Naphthalene	91-20-3	3, 4
Toluene	108-88-3	4
XYLENES	1330-20-7	4

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Majority of components -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II

Marine Pollutant: Yes
Special Provisions: 17

Footnote: Marine Pollutant designation is applicable only if shipped over water.

LAND (DOT)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
ID Number: 1203
Packing Group: II
ERG Number: 128
Label(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

SEA (IMDG)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1203
Packing Group: II
Marine Pollutant: No
Label(s): 3
Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-40°C c.c.)

AIR (IATA)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Label(s) / Mark(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Class B, Division 2: Flammable Liquids Class D, Division 2, Subdivision A: Very Toxic Material

CEPA: All components of this product are either on the Domestic Substance List (DSL) or are exempt.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, KECI, PICCS, TSCA

The Following Ingredients are Cited on the Lists Below:

Chemical Name	CAS Number	List Citations

Benzene	71-43-2	6
CUMENE	98-82-8	6
CYCLOHEXANE	110-82-7	6
ETHYL BENZENE	100-41-4	6
n-Hexane	110-54-3	6
Naphthalene	91-20-3	6
Toluene	108-88-3	6
XYLENES	1330-20-7	6

--REGULATORY LISTS SEARCHED--

1 = TSCA 4
2 = TSCA 5a2
3 = TSCA 5e
4 = TSCA 6
5 = TSCA 12b
6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H224: Extremely flammable liquid and vapor; Flammable Liquid, Cat 1
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapour; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H312: Harmful in contact with skin; Acute Tox Dermal, Cat 4
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
H320(2B): Causes eye irritation; Serious Eye Damage/Irr, Cat 2B
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H335: May cause respiratory irritation; Target Organ Single, Resp Irr
H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
H340(1B): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B
H350(1A): May cause cancer; Carcinogenicity, Cat 1A
H350(1B): May cause cancer; Carcinogenicity, Cat 1B
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H361(D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)
H361(F): Suspected of damaging fertility; Repro Tox, Cat 2 (Fertility)
H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Updates made in accordance with implementation of GHS requirements.

The information and recommendations contained herein are, to the best of Imperial Oil's knowledge and belief, accurate and reliable as of the date issued. Imperial Oil assumes no responsibility for accuracy of information unless the document is the most current available from an official Imperial Oil distribution system. The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, republication or retransmission of this document, in whole or in part, is not permitted.

DGN: 5007481 (1006754)

Copyright 2002 Imperial Oil Limited, All rights reserved

SAFETY DATA SHEET

E112

Section 1. Identification

Product name : Spray Paint

Product code : E112

Other means of identification : Not available.

CAS # : Not applicable.

Product type : Aerosol.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : SHERWIN-WILLIAMS CANADA, INC.
8500 Leslie St., Suite 220
Thornhill, ON L3T 7M8

Emergency telephone number of the company : (216) 566-2917

Product Information Telephone Number : (905) 761-9185

Regulatory Information Telephone Number : (216) 566-2902

Transportation Emergency Telephone Number : (800) 424-9300

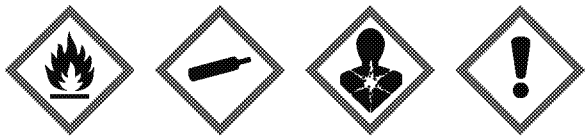
Section 2. Hazards identification

Classification of the substance or mixture : FLAMMABLE AEROSOLS - Category 1
GASES UNDER PRESSURE - Compressed gas
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
SKIN SENSITIZATION - Category 1
CARCINOGENICITY - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
ASPIRATION HAZARD - Category 1

Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 27.9%
Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 84.4%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 50.5%

GHS label elements

Hazard pictograms :



Signal word : Danger

Section 2. Hazards identification

Hazard statements : Extremely flammable aerosol.
Contains gas under pressure; may explode if heated.
Causes serious eye irritation.
Causes skin irritation.
May cause an allergic skin reaction.
Suspected of damaging the unborn child.
Suspected of causing cancer.
May be fatal if swallowed and enters airways.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not spray on an open flame or other ignition source. Use only outdoors or in a well-ventilated area. Do not breathe dust or mist. Wash hands thoroughly after handling. Contaminated work clothing must not be allowed out of the workplace. Pressurized container: Do not pierce or burn, even after use.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN: Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

Please refer to the SDS for additional information. Keep out of reach of children. Keep upright in a cool, dry place. Do not discard empty can in trash compactor.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

Ingredient name	% by weight	CAS number
Acetone	32.74	67-64-1
Toluene	20.77	108-88-3
Propane	13.6	74-98-6
Butane	13.07	106-97-8
Ethyl 3-Ethoxypropionate	2.91	763-69-9
Titanium Dioxide	1.28	13463-67-7
Methyl Ethyl Ketoxime	0.19	96-29-7

Section 3. Composition/information on ingredients

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo

Section 4. First aid measures

unconsciousness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
nausea or vomiting
reduced fetal weight
increase in fetal deaths
skeletal malformations

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Extremely flammable aerosol. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion. Bursting aerosol containers may be propelled from a fire at high speed.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. In the case of aerosols being ruptured, care should be taken due to the rapid escape of the pressurized contents and propellant. If a large number of containers are ruptured, treat as a bulk material spillage according to the instructions in the clean-up section. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Protect from sunlight. Store locked up. Eliminate all ignition sources. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Ingredient name	Exposure limits
Acetone	**ACGIH TLV (United States, 3/2016).** TWA: 250 ppm 8 hours. STEL: 500 ppm 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 250 ppm 10 hours. TWA: 590 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 1000 ppm 8 hours. TWA: 2400 mg/m³ 8 hours.
Toluene	**OSHA PEL Z2 (United States, 2/2013).** TWA: 200 ppm 8 hours. CEIL: 300 ppm AMP: 500 ppm 10 minutes. **NIOSH REL (United States, 10/2016).** TWA: 100 ppm 10 hours. TWA: 375 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 560 mg/m³ 15 minutes. **ACGIH TLV (United States, 3/2016).** TWA: 20 ppm 8 hours.
Propane	**NIOSH REL (United States, 10/2016).** TWA: 1000 ppm 10 hours. TWA: 1800 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 1000 ppm 8 hours. TWA: 1800 mg/m³ 8 hours.
Butane	**NIOSH REL (United States, 10/2016).** TWA: 800 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2016).** STEL: 1000 ppm 15 minutes.
Ethyl 3-Ethoxypropionate	None.
Titanium Dioxide	**ACGIH TLV (United States, 3/2016).** TWA: 10 mg/m³ 8 hours. **OSHA PEL (United States, 6/2016).** TWA: 15 mg/m³ 8 hours. Form: Total dust
Methyl Ethyl Ketoxime	**AIHA WEEL (United States, 10/2011). Skin sensitizer.** TWA: 10 ppm 8 hours.

Occupational exposure limits (Canada)

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Acetone	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 1200 mg/m³ 8 hours. 15 min OEL: 1800 mg/m³ 15 minutes. 8 hrs OEL: 500 ppm 8 hours. 15 min OEL: 750 ppm 15 minutes. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 250 ppm 8 hours. STEL: 500 ppm 15 minutes. **CA Ontario Provincial (Canada, 7/2015).** TWA: 500 ppm 8 hours. STEL: 750 ppm 15 minutes. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 500 ppm 8 hours. TWAEV: 1190 mg/m³ 8 hours. STEV: 1000 ppm 15 minutes. STEV: 2380 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 750 ppm 15 minutes. TWA: 500 ppm 8 hours.
toluene	**CA Alberta Provincial (Canada, 4/2009). Absorbed through skin.** 8 hrs OEL: 50 ppm 8 hours. 8 hrs OEL: 188 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 20 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 20 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014). Absorbed through skin.** TWAEV: 50 ppm 8 hours. TWAEV: 188 mg/m³ 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013). Absorbed through skin.** STEL: 60 ppm 15 minutes. TWA: 50 ppm 8 hours.
Propane	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 1000 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 1000 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 1000 ppm 8 hours. TWAEV: 1800 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 1000 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours.
Butane	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 1000 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 600 ppm 8 hours.

	STEL: 750 ppm 15 minutes. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 800 ppm 8 hours. TWAEV: 1900 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 800 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours.
Methyl Ethyl Ketoxime	**AIHA WEEL (United States, 10/2011). Skin sensitizer.** TWA: 10 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
Acetone	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 500 ppm 8 hours. STEL: 750 ppm 15 minutes.
toluene	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 20 ppm 8 hours.
Propane	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 1000 ppm 8 hours.
Butane	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 1000 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Section 8. Exposure controls/personal protection

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Not available.

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Melting point : Not available.

Boiling point : Not available.

Flash point : Closed cup: -29°C (-20.2°F) [Pensky-Martens Closed Cup]

Evaporation rate : 5.6 (butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 1%
Upper: 12.8%

Vapor pressure : 101.3 kPa (760 mm Hg) [at 20°C]

Vapor density : 1.55 [Air = 1]

Relative density : 0.75

Solubility : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Kinematic (40°C (104°F)): <0.205 cm^2/s (<20.5 cSt)

Molecular weight : Not applicable.

Aerosol product

Type of aerosol : Spray

Heat of combustion : 27.778 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Section 10. Stability and reactivity

Conditions to avoid : Avoid all possible sources of ignition (spark or flame).

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Acetone	LD50 Oral	Rat	5800 mg/kg	-
Toluene	LC50 Inhalation Vapor	Rat	49 g/m³	4 hours
	LD50 Oral	Rat	636 mg/kg	-
Butane	LC50 Inhalation Vapor	Rat	658000 mg/m³	4 hours
Ethyl 3-Ethoxypropionate	LD50 Oral	Rat	3200 mg/kg	-
Methyl Ethyl Ketoxime	LD50 Oral	Rat	930 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Acetone	Eyes - Mild irritant	Human	-	186300 parts per million	-
	Eyes - Mild irritant	Rabbit	-	10 microliters	-
	Eyes - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
	Eyes - Severe irritant	Rabbit	-	20 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	395 milligrams	-
Toluene	Eyes - Mild irritant	Rabbit	-	0.5 minutes 100 milligrams	-
	Eyes - Mild irritant	Rabbit	-	870 Micrograms	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 milligrams	-
	Skin - Mild irritant	Pig	-	24 hours 250 microliters	-
	Skin - Mild irritant	Rabbit	-	435 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
	Skin - Moderate irritant	Rabbit	-	500 milligrams	-
Ethyl 3-Ethoxypropionate	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
Titanium Dioxide	Skin - Mild irritant	Human	-	72 hours 300 Micrograms Intermittent	-
Methyl Ethyl Ketoxime	Eyes - Severe irritant	Rabbit	-	100 microliters	-

Sensitization

Not available.

Mutagenicity

Section 11. Toxicological information

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
Toluene	-	3	-
Titanium Dioxide	-	2B	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Acetone	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Toluene	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Propane	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Butane	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Acetone	Category 2	Not determined	Not determined
Toluene	Category 2	Not determined	Not determined
Propane	Category 2	Not determined	Not determined
Butane	Category 2	Not determined	Not determined

Aspiration hazard

Name	Result
Toluene	ASPIRATION HAZARD - Category 1
Propane	ASPIRATION HAZARD - Category 1
Butane	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
nausea or vomiting
reduced fetal weight
increase in fetal deaths
skeletal malformations

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : Suspected of damaging the unborn child.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	2146.7 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Acetone	Acute EC50 7200000 µg/l Fresh water	Algae - Selenastrum sp.	96 hours
	Acute LC50 6000000 µg/l Fresh water	Crustaceans - Gammarus pulex	48 hours
	Acute LC50 6900 mg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 5600 ppm Fresh water	Fish - Poecilia reticulata	96 hours
	Chronic NOEC 4.95 mg/l Marine water	Algae - Ulva pertusa	96 hours
	Chronic NOEC 0.016 ml/L Fresh water	Crustaceans - Daphniidae	21 days
	Chronic NOEC 0.1 ml/L Fresh water	Daphnia - Daphnia magna - Neonate	21 days
	Chronic NOEC 0.1 mg/l Fresh water	Fish - Fundulus heteroclitus	4 weeks
Toluene	Acute EC50 12500 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 11600 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus - Adult	48 hours
	Acute EC50 6000 µg/l Fresh water	Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 5500 µg/l Fresh water	Fish - Oncorhynchus kisutch - Fry	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Titanium Dioxide	Acute LC50 >1000000 µg/l Marine water	Fish - Fundulus heteroclitus	96 hours
Methyl Ethyl Ketoxime	Acute LC50 843000 µg/l Fresh water	Fish - Pimephales promelas	96 hours

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Acetone	-	-	Readily
Toluene	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Toluene	-	90	low
Methyl Ethyl Ketoxime	-	2.5 to 5.8	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN1950	UN1950	UN1950	UN1950	UN1950
UN proper shipping name	AEROSOLS	AEROSOLS	AEROSOLS	AEROSOLS, flammable	AEROSOLS
Transport hazard class(es)	2.1	2.1	2.1	2.1	2.1
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.
Additional information	- **ERG No.** 126	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2. 13-2.17 (Class 2). **ERG No.** 126	- **ERG No.** 126	-	**Emergency schedules** F-D, S-U

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.

Ship type : Not available.

Pollution category : Not available.

Section 15. Regulatory information

SARA 313

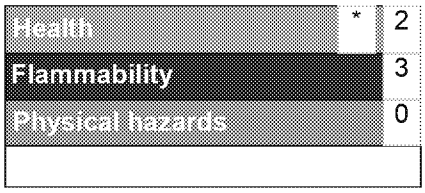
SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

Not applicable.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE AEROSOLS - Category 1	On basis of test data
GASES UNDER PRESSURE - Compressed gas	Calculation method
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A	Calculation method
SKIN SENSITIZATION - Category 1	Calculation method
CARCINOGENICITY - Category 2	Calculation method
TOXIC TO REPRODUCTION (Unborn child) - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Calculation method
ASPIRATION HAZARD - Category 1	Calculation method

History

Date of printing : 8/25/2017

Date of issue/Date of revision : 8/25/2017

Date of previous issue : 7/28/2017

Version : 6

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

Section 16. Other information

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

Attachment D

Journey Management Plan

PURPOSE

The purpose of this Journey Management Plan (JMP) is to prevent losses associated with motor vehicle related incidents including injuries to drivers, passengers and pedestrians, damage to motor vehicles and damage to third party property. By communicating potential safety risks before mobilizing to a site, a motor vehicle operator will be able to prepare for and avoid potential hazards.

SCOPE

This JMP applies to all vehicles assigned for the support of site operations, including company owned and personal use vehicles. This JMP does not apply to vendors (such as UPS, FedEx. etc.). This JMP does not address hazards that are external to the site access/egress and on the onsite project operations.

SPECIAL NOTE

Because the site, weather and traffic conditions may change frequently the JMP shall be maintained and updated separate from the Site Health and Safety Plan (HASP).

RESPONSIBILITIES

CONTRACT PROJECT MANAGER

The contract project manager is responsible to ensure that the site has a current JMP.

SITE SUPERVISOR

The Site Supervisor is responsible to create and keep current a JMP that is appropriate for the site conditions. It is also the Site Supervisor's role to ensure each vehicle operator has a JMP that describes the conditions for his vehicle and equipment prior to mobilizing to the site. A common JMP may be used for several vehicles or as conditions dictate a separate JMP may be specific or unique to an individual vehicle.

VEHICLE OPERATOR

The assigned vehicle operator shall not mobilize to the site without first receiving and reviewing the JMP. It is the vehicle operator's responsibility to read and become familiar with the description and stipulations of the JMP prior to mobilizing to the site. DO NOT mobilize to the site to get clarification to the JMP. Because driving conditions may vary, vehicle operators shall also notify the Site Supervisor of any hazards not identified on the JMP so that the Site Supervisor can update the JMP. Because traffic conditions may change frequently on a project, the JMP shall be maintained and updated separate from the Site Health and Safety Plan.

SCOPE OF THIS JMP

This JMP shall include the operation and use of the following vehicles and equipment: GHD and subcontractor trucks/vans and personal vehicles.

All vehicle operators shall be responsible for ensuring their vehicles are maintained and being familiar with and obeying all laws related to vehicle operation.

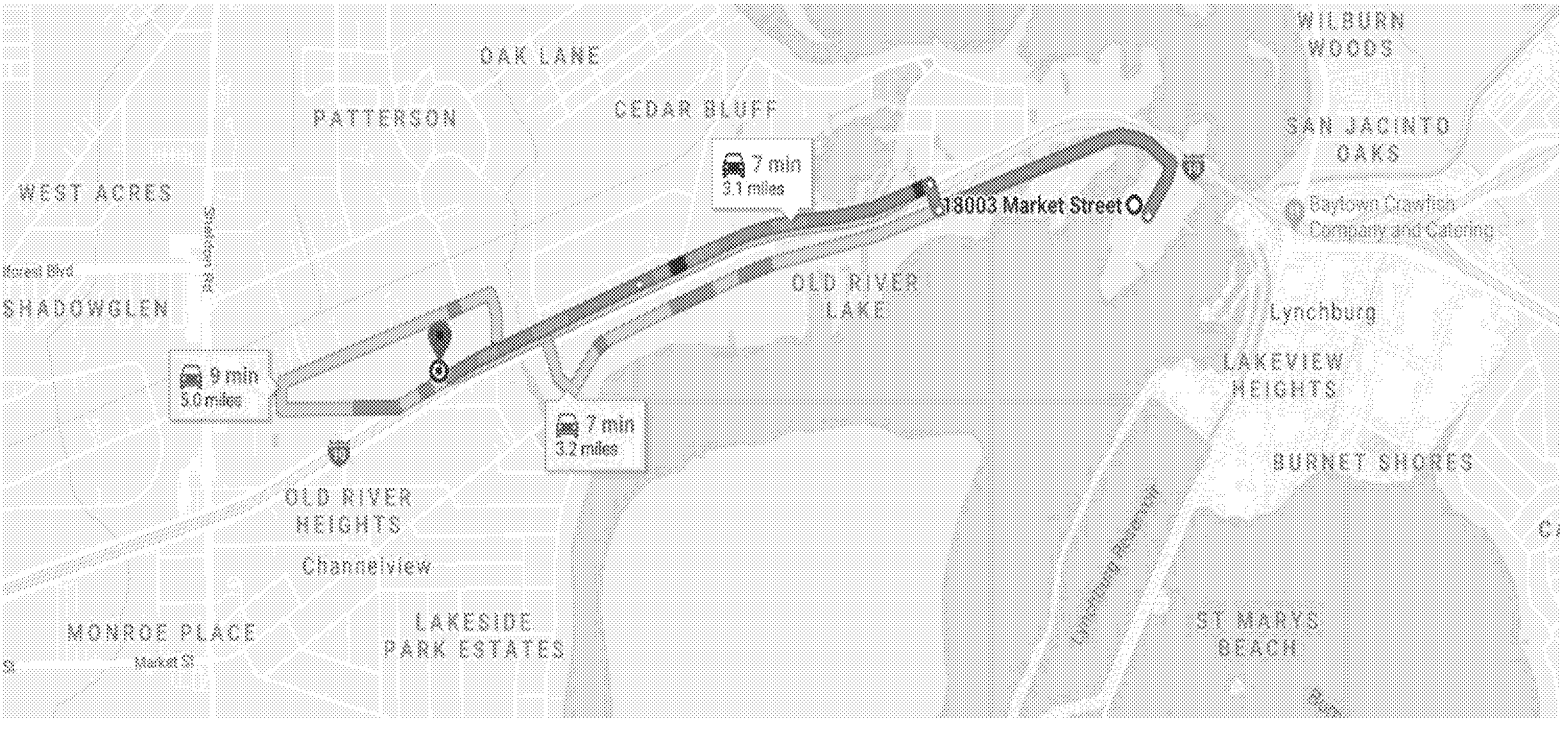
ED_014247_00001508-00322

The route to Holiday Inn East in Channelview, Texas from the San Jacinto River Waste Pits South Impoundment

- Head NORTHEAST on Market Street
- Turn RIGHT onto Monmouth Street
- Turn LEFT onto E. Freeway Service Road
- Continue STRAIGHT onto E. Freeway Service Road
- Destination will be on the RIGHT.
- Arrive at Holiday Inn Houston East-Channelview.

The route from the Holiday Inn Express to the San Jacinto River Waste Pits Superfund Southern Impoundment in Channelview, Texas:

- Head SOUTHWEST toward E Freeway Service Road
- Drive along I-10 E.
- Merge onto I-10 E.
- Take Exit 786 from I-10 E
- Turn RIGHT onto Monmouth Drive
- Drive to Market Street
- Turn LEFT at the first cross street onto Market Street
- Arrive at San Jacinto River Waste Pits Superfund Site



GENERAL HAZARDS

It is the vehicle operator's sole responsibility to read and become familiar with the description and stipulations of the JMP prior to mobilizing to the Site. All drivers will avoid distractions including but not limited to using cell phones in any form.

High volume facility with heavy traffic flow at peak driving times (early morning, mid-day, and evening rush hour).

The driver should anticipate hazards, maintain a safety cushion around the vehicle, and adjust their driving speed. Weather conditions will be monitored throughout the day and prior to mobilization. Rain or mist reduces visibility and wet pavement reduces traction. Turn headlights on to increase visibility regardless of weather conditions. Make sure windshield wipers are in proper working condition. Reduce speed so that stopping can be made safely and obey posted speed limits. Use turn signals appropriately.

SITE SPECIFIC HAZARDS

Specific hazards include heavy traffic on expressways, state roadways, residential neighborhoods, semi-trucks, sudden stops and merging traffic.

DIRECTIONS: ACCESS TO THE SITE

Ingress can be made to the San Jacinto River Waste Pits Superfund Site at 18003 Market Street.

DIRECTIONS: LEAVING THE SITE

Egress from the San Jacinto River Waste Pits Superfund Site can be made by following the East Freeway access road to I-10 W. entrance ramp.

SITE SPECIFIC RESTRICTIONS AND CONTROLS

Use proper highway driving techniques and maintain proper highway speeds. Use proper parking lot driving procedures. Maintain a low speed at all times when driving in the office parking lots. Utilize turn signals and proper parking methods.

This Journey Management Plan will be implemented during field activities at the San Jacinto River Waste Pits Superfund Site. This Journey Management Plan was created and will be maintained by GHD.

CHANGES TO THE JOURNEY MANAGEMENT PLAN

Date	Name	Change/Comment (be specific)

Manager Review and Approval

Signature: _____

Date: _____

ED_014247_00001508-00326

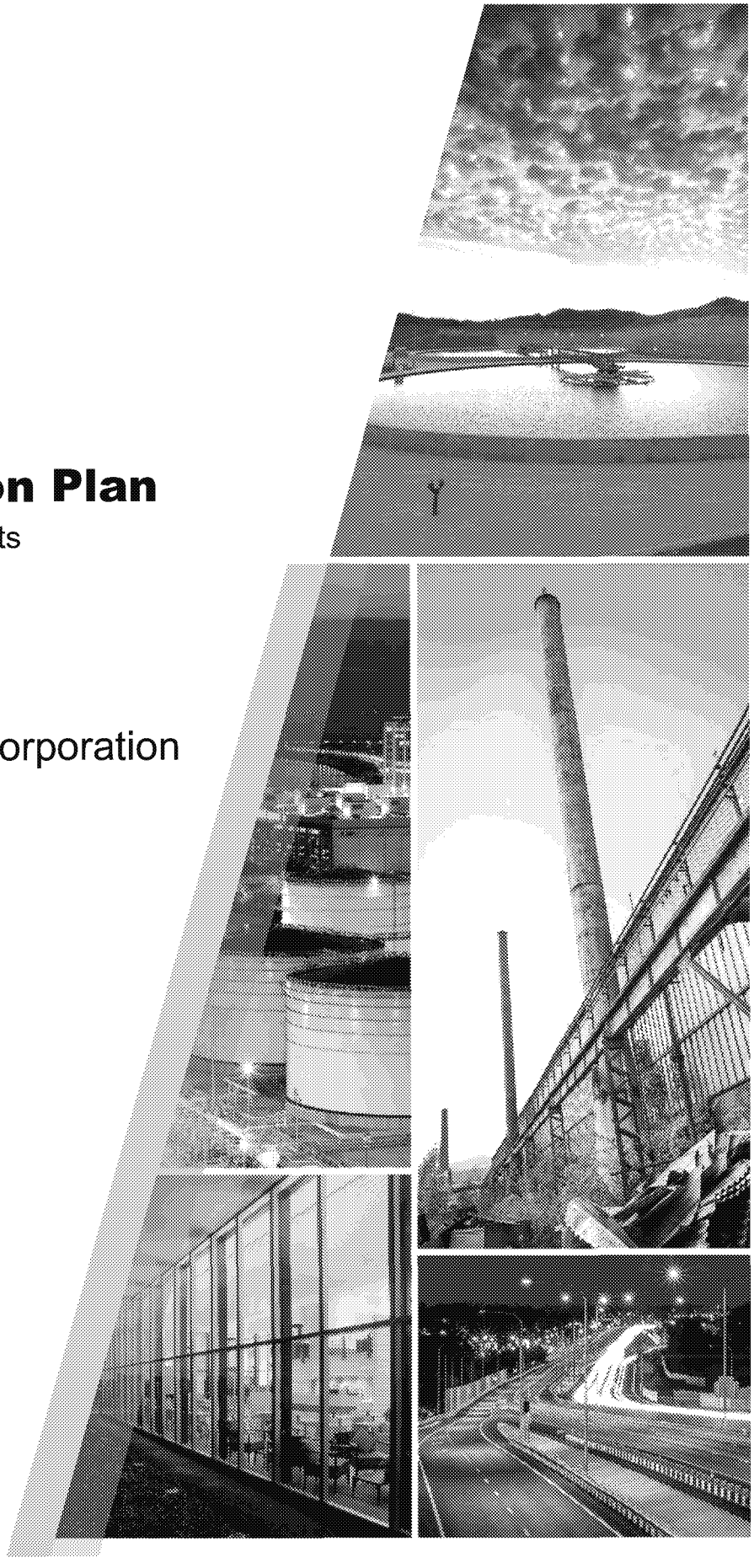
Attachment E

Decontamination Plan

Decontamination Plan

San Jacinto River Waste Pits
South Impoundment
Harris County, Texas

International Paper Corporation



GHD | 8551 Corporate Boulevard Suite 200 Baton Rouge Louisiana 70809 USA | 11215121 | Report 4 | October 14, 2021

ED_014247_00001508-00328

Table of Contents

1. Introduction 1
2. Personnel Decontamination Procedures 1
3. Hand Tools and Recovery Equipment Decontamination Procedures 1
4. Heavy Equipment Decontamination Procedures 2
5. Decontamination Waste Disposal Procedures 2

Appendix Index

Appendix A - Job Safety Analyses

ED_014247_00001508-00329

1. Introduction

This Decontamination Plan is designed to aid in the prevention of cross contamination, public/worker health and safety, and efficient demobilization of equipment and personnel at the San Jacinto River Waste Pits Site in Harris County, Texas.

2. Personnel Decontamination Procedures

All PPE will be disposed of and/or decontaminated at the conclusion of each workday as described below. Decontamination procedures will follow the concept of decontaminating the most contaminated PPE first. Refer to the JHA found in Appendix A covering specific decontamination procedures and required PPE.

All disposable equipment shall be removed placed in the proper receptacle (drums) before breaks and at the conclusion of the workday and will be replaced with new equipment prior to commencing work.

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure:

- **Personnel:** Decontamination will be initiated prior to exiting the contaminated work area and completed prior to exiting the decontamination area.
- **Modified Level D**: Long shirt, pants, steel toe boots, hard hat, safety glasses, high visibility vests, nitrile gloves, and Tyvek and face shields when decontaminating field equipment. Remove gloves and Tyvek (as required) and properly dispose in designated waste container. Wash hands and face.

3. Hand Tools, Drill Rods, and Sampling Equipment Decontamination Procedures

All hand tools and product removal equipment must be decontaminated or discarded upon exit from the contaminated area. A temporary decontamination pad with a high-pressure washer will be set up on land during project operations.

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure:

- **Hand Tools, Drill Rods, and Remedial Equipment**: Remove solid debris by method of dry decontamination, wash and rinse with low-volume high-pressure washer within the temporary decontamination pad.

ED_014247_00001508-00330

- **Safety Precautions:** Proper PPE should be utilized by all personnel conducting decontamination procedures, please see JSA attached as Appendix A. There shall be no release of impacted materials to waterways at any time. All investigation derived materials must be containerized, as well as any residual solids from sampling activities.

4. Heavy Equipment Decontamination Procedures

All heavy equipment must be decontaminated upon exit from the contaminated area. A temporary decontamination pad with a low-volume high-pressure washer will be set up on land during project operations.

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure:

- **Dry Decontamination**: Remove solid debris by method of dry decontamination, this method will minimize decontamination waste water. For heavy equipment the use of hand tools (i.e., shovels, scrapers, pry bars, etc.) should be utilized to remove the majority of solid debris from the heavy equipment (i.e., tracks buckets, blade, rollers, etc.).
- **Low-Volume High-Pressure:** Wash and rinse equipment that has come in contact with the impacted soil/sediments ONLY. This process will involve a low-volume high-pressure washer within the temporary decontamination pad to remove any residual product from the heavy equipment.
- **Recovery of Decontamination Waste:** Throughout the decontamination process solid and liquid levels will be monitored to determine the degree of waste removal. Liquid waste will be removed from the decontamination pad via vacuum truck and transferred to a frac tank for disposal pending analytical results. Evaporation will remove most of the liquids from the decontamination process. All residual solids will be removed via hand tools or mechanical means and stored in the appropriate container pending laboratory analysis.
- **Inspection of Decontamination Pad:** The decontamination pad should be inspected daily any and all residual liquids should be removed from the decontamination pad. In the event of a rain event, the decontamination pad should be secured in a way that no added rain water is collected.
- **Safety Precautions:** Proper PPE should be utilized by all personnel conducting decontamination procedures, please see JHA attached as Appendix A.

5. Decontamination Waste Disposal Procedures

Decontamination waste water and solids will be managed as waste and will be disposed of at an approved accredited facility.

ED_014247_00001508-00331

Appendices

ED_014247_00001508-00332

Appendix A
Job Safety Analyses

ED_014247_00001508-00333

Job Safety Analysis (JSA)

Decontamination of Sampling Equipment

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:		**Client:**			
Project number:		**Created by**		**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:					
Specific task	Decontamination of sampling equipment and personnel (PPE Level D Modified)				
Key equipment:	Alconox/Liquinox, brushes, pressure washer, Nitrile gloves to be worn when decontaminating reusable equipment.				
Task-specific training:	Decontamination/Site Control; Quality Control/Sampling Plan, 40 Hour HAZWOPER				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☒ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☒ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒ Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

ED_014247_00001508-00334

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Decontamination preparation	• Slip/trip/fall hazards • Heavy lifting • Awareness	• Project team to discuss importance of and documentation procedures for SWA during pre-job safety meeting; use SWA to stop any work that is unsafe • Project team to discuss documented procedures for decontamination procedures • Inspect all equipment prior to donning, use buddy system to inspect after donning to ensure proper isolation from potential contaminants • Use proper lifting techniques, buddy lift when appropriate • Inspect decon station to ensure no egress of contaminant will occur	Site personnel	
2	Decontamination of sampling equipment.	• Contaminant exposure • Pinch points • Slip/trip/hit/fall hazards • Heavy lifting	• Wear appropriate PPE during decon activities (nitrile gloves, Tyvek, etc.); use buddy system to re-inspect periodically to ensure proper isolation from potential contaminants • Avoid putting hands in or near pinch points • Maintain good housekeeping, be aware of surroundings, watch footing • Use proper lifting techniques, buddy lift when appropriate	Site personnel	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Decontamination of heavy equipment, shovels, etc.	• Contaminant exposure • Pinch points • Slip/trip/hit/fall hazards • Heavy lifting	• Wear appropriate PPE during decon activities (nitrile gloves, Tyvek, etc.); use buddy system to re-inspect periodically to ensure proper isolation from potential contaminants • Avoid putting hands in or near pinch points • Maintain good housekeeping, be aware of surroundings • Use proper lifting techniques, buddy lift when appropriate	Site personnel	
4	Decontamination of personnel	• Contaminant exposure • Slip/trip/hit/fall hazards	• Wear appropriate PPE during decon activities (nitrile gloves, Tyvek, etc.); use buddy system to re-inspect periodically to ensure proper isolation from potential contaminants • Dispose of used PPE in accordance with site requirements • Wash hands and face before eating, drinking, or using tobacco products • Take care when removing PPE (boots, gloves, etc.); sit down to remove/change boots as necessary	Site personnel	
5	Management of waste derived from decontamination activities	• Contaminant exposure • Heavy lifting	• Containerize decon waste (water, decon pad, used PPE, etc.) as required • Use proper lifting techniques, use buddy lifting or mechanical means when necessary	Site personnel	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00336

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

ED_014247_00001508-00337

Job Safety Analysis (JSA)

Heavy Equipment Decontamination - Pressure Washing (Cold Water Only)

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	/ /	**Client:**			
Project number:		**Created by**		**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:					
Specific task	Pressure washing - portable (cold water only)				
Key equipment:	2,000 to 4,000 psi pressure washer - portable (gasoline) powered; Use of splash shield. Use of Nitrile gloves. Tyvek				
Task-specific training:	40-Hour HAZWOPER, 8-Hour Refresher, Hand and Power Tool Training				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☒ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☒ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☒ Required	☐ Haz cat 4	☐ R95		☒ Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

ED_014247_00001508-00338

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2]. Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA • Property damage • Personal injury • Cross contamination	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA if unsafe conditions exist • Discuss all potential hazards based on location, utilities, terrain, and waste water disposal		
2	Review Manufacturer's Operation and Maintenance Manual (prior to initial operations of pressure washer)	• Improper inspection procedures • Lack of recognition/ knowledge of specific manufactured model • High pressure (>2,000 psi)	• Review manufacturer's Operation and Maintenance Manual • Utilize the STAR process and discuss with site supervisor on the operations of the washer		
2A	Rental Units		• Make sure rental company provides a copy of the manual or have them illustrate proper operating procedures including daily checks • Important: Read manufacturer's warning labels on the pressure unit itself for step by step operations (DOs and DON'Ts)		

ED_014247_00001508-00339

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Inspect equipment	• Equipment malfunction • Leaks • Missing/broken components • Personal injury • Property damage • Spills	• Complete a daily equipment checklist – Report all NR (Needs Repair) or items in question to your site supervisor – Do not use until repairs/parts have been completed • Thoroughly check hose, hose fitting, pressure wand, o-rings, leaks, pressure tips, engine oil, fuel type, etc. • Reference Manufacturer's Operation and Maintenance Manual for specific daily checks • Wear hand protection (leather) • Fuel unit using gasoline only; review site JSA on Fueling Operations • Avoid overfilling and immediately clean up spills using absorbent pads, towels, and shovel or combination of all three and dispose of properly • Review MSDS for use of gasoline (i.e., Flammable and Health risks) • Use an approved OSHA safety can (red) for dispensing needs; remove can from service if severely dented or having missing or broken components; tag out of service immediately • Keep gasoline can away from heat sources; label and place in OSHA- approved storage cabinet or in a fenced-off secondary spill containment area		

ED_014247_00001508-00340

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Mobilize washer into position	• Slip/trip/fall hazards • Back strain • Property damage • Unsecured • Uneven terrain • Heavy lifting	• Get assistance (buddy system) when moving washer either physically or means of powered equipment • Use proper lifting techniques; keep back straight and knees slightly bent when placing unit into the decon area • Keep hose(s) and wand securely on unit • Place washer on solid, level ground • Determine your route of travel to work area; avoid uneven ground, slopes, and inclines • Secure washer if transporting by truck, trailer, or loader using nylon ratchet straps; DO NOT use chains or bungee cords • Determine best place to position washer to account for length of hose to reach all points of washing		
5	Connect water source to pressure washer	• Splashing • Slip hazard • Pinch points • Improper fittings • Water pressure • Property damage • Personal injury • Electrical - electrocution	• Don appropriate PPE (poly coated Tyveks, rubber gloves, rubber overboots, splash shield, hard hat, hearing protection, etc.) • Check water hose condition and connections • Install one end of hose to unit first and then to water source • Slowly release water into pressure washer unit; avoid excessive splashing and don't leave unit unattended • Keep hands and fingers clear of pinch points • Minimize water pooling; tighten connections as necessary to avoid slip hazards • Keep water away from electrical panels, outlets, and power cords		

ED_014247_00001508-00341

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
6	Operate pressure washer In this Order: 1. Select proper wash tip 2. Start the washer unit 3. Move into position 4. Hold pressure wand and handle firmly with both hands 5. Point wand in area to begin wash 6. Pull trigger and begin washing	• High pressure (>2,600 psi) • Infections – bacteria • Eye, hand, foot Injury • Flying debris • Slip/trip hazards • Hose whipping • Kink in hose • Equipment malfunction • Property damage • Hand and wrist fatigue/numb • Noise • Poor visibility • Windy conditions • Clogged pressure tips • Poor communications	• Wear splash shield and hearing protection! • Determine wind direction and place back to the wind to avoid over spray of water back into the operator's face • Install proper washing tip on the end of wand; turn unit off, relieve pressure from unit, and let it cool down before changing tips • Keep both hands on the wand at all times to avoid excessive fatigue and numbness in hand and wrists • Keep hands off metal section of wand to avoid a burn to the hand • Do not point the spray towards others, ground, or hose • Position your body off to one side during washing to prevent deflection of material debris back in your direction; keep a safe distance between surface to be washed and the spray • Keep hoses free and clear to avoid trips; be aware of your surroundings • Keep face shield clear as best as you can; stop washing and wipe off as needed • Never unclog a tip while the unit is running; shut off unit, depressurize hose and wand, then remove tip for cleaning • Keep hands, feet, and eyes out of the "line of fire" of the spray – High pressure can cut through gloves, boots, and severely and cause bodily injury; infections can occur if cut into the skin		

ED_014247_00001508-00342

Job steps[1]	Task activity	Potential hazard(s)[2]. Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
7	End of task 1. Relieve pressure 2. Turn off water supply to unit and disconnect 3. Shut off pressure washer 4. Allow to cool down 5. Storage	• Burns (muffler) • Hose damage • Equipment damage • Theft • Slips • Back strain	• Doff PPE and dispose of properly • Relieve pressure on hose and drain the water from hose and unit • Avoid placing hands on muffler section of washer unit; allow unit to cool down before handling and or filling with gasoline • Drain hose and wrap up to unit; inspect hose for excessive wear or blistering • During cold temperatures, winterize unit using environmentally safe anti-freeze • Secure unit inside connex trailer or use chain and padlock to prevent theft • Check unit over and make sure all components (tips, wand, hose) are in good condition • Turn gasoline valve to off/close when not in use or in storage • Use proper lifting techniques when moving unit and get assistance (buddy system)		
8	Collect a wipe sample (if necessary)	• Cross contamination • Liability	• Confirm with site supervisor if a wipe sample is needed prior to demobilization of equipment from the site (rental and GHD owned equipment)		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

ED_014247_00001508-00343

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

ED_014247_00001508-00344

Attachment F

Fatigue Management Plan

NA-HSE-G-230 Working in Extreme Temperatures

Note: Wherever there is a difference between the standard represented by this Guide and that of the relevant jurisdiction or client - the more stringent standard applies.

1. Definition

For this purposes of this Hazard Guide, extreme temperatures are heat or cold stress which occurs when the thermal environment directly causes harm to a person. This harm falls into the following categories, both of which can be very serious and even fatal:

- Non-life threatening medical conditions such as:
  - Dehydration (excessive loss of body fluids) or heat exhaustion in hot environments.
  - Frostbite in cold environments.
- Life threatening conditions such as severe dehydration, hyperthermia (a rise in core body temperature), or hypothermia (a fall in core body temperature), occurring when the thermal environment causes a breakdown in a person's temperature control mechanisms.

The effects that heat or cold have on the body are not based on air temperature alone. For example:

- Heat stress is possible if the work process involves heavy physical activity and/or high humidity or radiant heat. It also affects older people and/or those on certain types of medications more rapidly.
- Cold stress is possible if the work environment is cold and/or wet, there is a wind chill factor; or where a person is required to work in artificially cold environments.

2. Minimum requirements

GHD will implement measures to control and/or minimize the risks associated with staff working in extreme temperatures. To manage these risks, GHD will:

- Identify the activities likely to be undertaken and the maximum recommended workloads set out in Table 1 of this guide.
- Consider intensity, frequency, and duration of the activities.
- Identify seasons or weather conditions that may affect the safety of staff, e.g., high temperatures and humidity, low temperatures with high winds.
- Monitor weather conditions and stop work in extreme temperatures to prevent heat and cold stress.

3. Hazardous activities

Staff may be exposed to extreme temperatures while undertaking activities in and near the following environments:

- Heat - road paving, construction, forestry and agriculture, oil and gas plants, water and sewerage plants.
- Cold - cold storage facilities and work in and around water, including commercial diving.

4. Risk management

A **HASP** must be developed by the project team, and reviewed and approved by the Project Manager for all site activities. Identification and control of the hazards associated with working in extreme temperatures should form part of the plan. The HASP is to be approved by the HSE team prior to being used for site activities.

A Job Safety Analysis (JSA) and/or Pre-Work Assessment will be developed in consultation with the project team prior to any person undertaking activities which involve exposure to extreme temperatures.

Risk management activities will be undertaken using the principles identified in the site specific HASP). Documentation is to be kept on hand while on site and full records maintained in the project file.

5. Risk controls

Where it is not practical to ***eliminate*** the need to work in extreme temperatures, risks are to be controlled to as low as reasonably practical (ALARP) by working through the hierarchy of controls as per the following examples and with multiple controls used where necessary:

- ***Substitute*** – schedule tasks to be conducted during seasons where extreme temperatures are not experienced or are milder and change starting and finishing times to avoid working in extreme hot or cold parts of the day.
- ***Engineering*** – establish heating or cooling stations or provide shelter from sun or wind.
- ***Administrative*** – provide training, appropriate work instructions and job planning.
- ***Personal Protective Equipment (PPE)*** – provide appropriate PPE such as hats, sunscreen, gloves and footwear.

Other risk controls that should be considered are:

Clothing

The following should be considered to prevent ***heat*** stress:

- Tightly woven, light colored, loose cotton clothes are preferable to protect trunk and limbs.
- Hats with brims should be of at least 8 cm/3 inches to protect face, neck and ears. Where practical, hard hats are to be fitted with broad brims and neck flaps.
- An appropriate water-resistant sunscreen is to be selected in accordance with individual skin type and working conditions.
- Sunglasses that meet or exceed ANSI/CSA Standards.

The type of clothing selected should be balanced against other needs, for example, types of PPE (hard hats, coveralls, impermeable clothing, gloves, etc.) may be necessary to protect from other hazards, but this clothing

ED_014247_00001508-00346

or equipment will increase the heat stress burden experienced by an individual.

The following should be considered to prevent ***cold*** stress:

- Multiple thin layers of clothing help to create air pockets that retain body heat. Layering clothing also makes adapting to changes in weather and level of physical exertion easier because layers can be removed and then added back as conditions and work effort changes. An exterior layer of water resistant fabric is recommended.
- Fingers and hands lose their dexterity at colder temperatures and feet, hands and the head including face and ears cool quickly and should be protected against frostbite by using hats, balaclavas, scarves, gloves, and socks, etc. Care should be taken when wearing gloves or scarves that can get caught in moving parts of machinery and equipment.

Design

The risks associated with extreme temperatures can be minimized through designing engineering controls. Examples include:

- Reducing heavy physical activity by mechanizing the task will reduce the risk of heat stress in hot environments, e.g., using trolleys, conveyors or mechanical lifting devices.
- Using fans to increase air movement and help encourage sweat evaporation. This control method is only effective when the air temperature is less than the skin temperature (approximately 35°Celsius/ 95°Fahrenheit). When extremely hot air is blown on a person, heat exhaustion can occur faster.
- In indoor environments, use local exhaust to remove hot air or steam produced by processes, or use air conditioning to control the temperature and amount of humidity in the workspace.
- On-site source of heat such as air heaters, radiant heaters, or contact warm plates may be used. However, heaters that emit carbon monoxide should only be used in well ventilated areas.
- Provide a climate controlled shelter for staff to do their work. As a minimum, provide shelter for warm-up and cool down periods, where possible.

Fitness for work

Fitness for work is a significant consideration when working in extreme temperatures. There are a number of factors that can affect a person's fitness to perform work such as lifestyle habits, pre-existing medical conditions, general fitness, pregnancy or use of over the counter and prescription medications such as cold and flu medications, codeine, antihistamines, etc. Staff must:

- Advise the Job Manager/Project Manager if they are unsure about their own fitness for work as required by *NA-HSE-SOP-002 CAD/US Non-DOT Drug, Alcohol and Contraband*. Speak with their doctor about any concerns they have in relation to their fitness for work or medications they are taking.
- Minimize drinking alcohol prior to or following work in extreme temperatures.

Work programming

- Program heavy, physical work, for the early or cooler times of the day during extreme heat. Refer to *Table 1* for maximum recommended workloads.
- Program heavy, physical work for the warmer times of the day during extreme cold and take into consideration the wind chill factor. Refer to *Table 2* for the effect of wind chill and risk of frostbite.
- Schedule training programs and meetings in climate controlled areas during times of the day when extreme temperatures are experienced.
- Alternate tasks to share more thermally stressful work.
- Provide regular rest periods and ensure they are taken at intervals appropriate to the work conditions and in climate protected areas.
- Reduce the physical effort needed for the task by lowering the pace and intensity of work and shortening the duration.
- Establish a "buddy system" and increase the number of staff so that more people share the workload.
- Minimize activities that reduce blood circulation, such as sitting or standing for long periods of time in the cold.

Table 1 Maximum recommended work loads

Ambient temperature		Relative humidity			
(°C)	(°F)	20%	40%	60%	80%
27 to31	80 to 89	H	H	H	M
32 to 37	90 to 100	H	H	M	L
38 to 42	101 to 109	M	M	L	NR
43 to 48	110 to 120	L	L	NR	NR
49+	121+	NR	NR	NR	NR

Classifications for relative humidity

- ***NR***: Not recommended without approval by PM or RSHM as per ALARP reporting framework.
- ***Light (L)***: Desk work, inspections (short duration), driving.
- ***Medium (M)***: Plant/machinery operation, inspections (long duration), sampling, medium manual masks, e.g., <10 kg/22 lbs. lifting or low frequency or duration lifting.
- ***Heavy (H)***: Digging, hot work, heavy manual tasks, e.g., >10 kg/22 lbs. lifting or high frequency or duration lifting.

Table 2 Wind chill chart

Perceived temperature with wind chill		Risk of frostbite
(°C)	(°F)	
0 to -9	32 to 15	Low
-10 to -27	14 to -16	Low
-28 to -39	-17 to -39	Increasing risk: exposed skin can freeze in 10 to 30 minutes
-40 to -47	-40 to -53	High risk: exposed skin can freeze in 5 to 10 minutes*
-48 to -54	-54 to -65	**WARNING LEVEL** - High risk: exposed skin can freeze in 2 to 5 minutes*

Signs and symptoms of exposure

Medical assistance should be sought immediately if any signs or symptoms of severe heat or cold exposure listed in *Tables 3 and 4* are recognized.

Heat exposure victims:

- Move the person to a cooler area where they can rest.
- Remove excess clothing.
- Give water to the person if they are able to drink themselves.

ED_014247_00001508-00347

- Cool the person with cold compresses or rapid fanning.

Cold exposure victims:

- Move the person to a warm area.
- Use blankets to return the body temperature gradually. Do not use hot water bottles or electric blankets as these can heat the person too quickly.
- Give warm, sweet, non-caffeinated drinks unless the victim is losing consciousness.

Frostbite victims:

- Cover the affected area with sterile dressing and place gauze between affected fingers and toes to prevent them from sticking together.
- Gently place the affected area in a warm (40°Celsius/ 105°Fahrenheit) water bath and monitor the water temperature to slowly warm the affected area.
- Do not pour warm water directly on the affected area, as it will warm the tissue too fast causing tissue damage. Warming takes approximately 25 to 40 minutes.
- Do not rub the affected area, as this can cause skin and tissue damage.

Hydration

Dehydration is a significant risk in both hot and cold weather. Drinking 100 ml/3.38 oz. to 200 ml/6.76 oz. of water frequently will maintain hydration. Electrolyte drinks such as Gatorade can be used in moderation to assist in keeping the body hydrated.

Table 3 Signs and symptoms of heat exposure

Condition	Symptoms
Sunburn	Skin redness and pain, possible swelling, blisters, fever, headaches
Heat cramps	Painful muscle spasms
Heat exhaustion	Excessive sweating, rapid pulse, dizziness, nausea, vomiting, headaches, exhaustion, fainting/collapse. **Note:** normal body temperature is possible but will likely rise
Heat stroke	High body temperatures, hot, red, dry skin; rapid weak pulse and rapid shallow breathing, possible unconsciousness

Table 4 Signs and symptoms of cold exposure

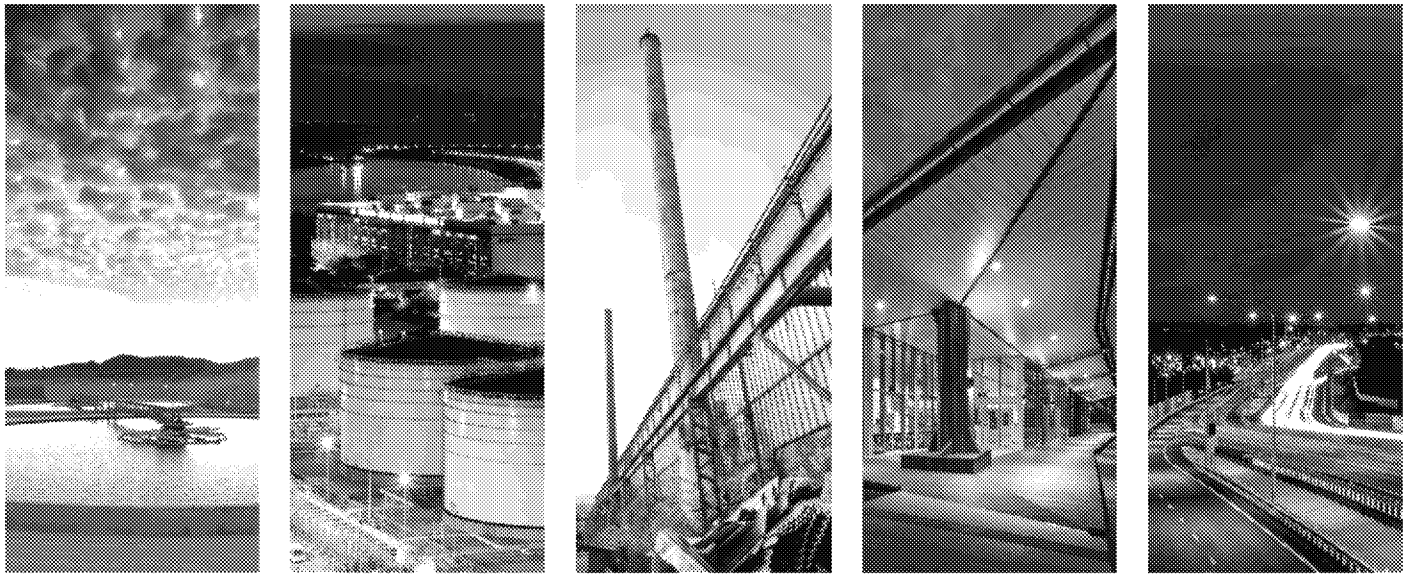
Condition	Symptoms
Frostbite	Skin freezes and becomes pale, waxy-white, numb and hard
Mild hypothermia*	Normal shivering may begin, victim feels cold, goose bumps, unable to perform complex tasks with hands or has numb hands
Moderate hypothermia*	Shivering is intense, loss of muscular coordination, movements slow and laboured, mild confusion, difficulty speaking, amnesia, signs of depression and withdrawal
Severe hypothermia*	Muscle rigidity, semi-unconsciousness or unconsciousness, stupor, loss of awareness, decrease in pulse or respiration rate, possible heart and breathing failure

***Note:** Hypothermia can occur even when temperatures are above freezing. Special care should be taken in cool, rainy conditions as water increases the rate of body heat loss by up to 25 percent.

6. Incident reporting

If an incident occurs call the Hotline at 1-866-529-4886 immediately.

ED_014247_00001508-00348



GHD NA - Standard Operating Procedure - HSE

Fatigue Management - 032

Rev. 0 | July 01 2015

Table of Contents

1. Purpose 1
2. Scope 1
3. Roles and Responsibilities 1
   - 3.1 Management 1
   - 3.2 Corporate HSE Manager 1
   - 3.3 Site Supervisor (SS) 2
   - 3.4 Employees and Subcontractors 2
4. Fatigue – Recognition and Control Measures 3
5. Work/Rest Balance 4
   - 5.1 Standard 4
   - 5.2 Variance to Standard 5
6. Drugs and Alcohol 5
7. Fatigue Management Reporting 6
8. Training 6
   - 8.1 Safety Orientation 6
9. Program Monitoring and Review 7
   - 9.1 Project Level 7
   - 9.2 Corporate Level 7

Attachments

Attachment A Fatigue Management Program (FMP) Variance Request (NA-FM-HSE-150)

ED_014247_00001508-00350

1. Purpose

This document establishes the Fatigue Management Program (FMP) for GHD. This program has been developed and implemented to ensure that GHD employees are fit for duty to reduce potential injuries and achieve our overall safety goals and objectives.

2. Scope

This FMP sets the minimum criteria for GHD employee fatigue management in the workplace. The FMP includes the following elements:

- Roles and responsibilities
- Training and information
- Incident reporting
- Program monitoring and review

3. Roles and Responsibilities

GHD has initiated a FMP as part of our current safety program. The individual roles and responsibilities for the program are identified below.

3.1 Management

Management's role is to demonstrate its support and commitment to having the safest workplace possible by leadership and by adequately funding the safety programs. Management will be responsible for the following with respect to the FMP:

- Ensure adequate resources are provided to implement the FMP.
- Ensure employees have been trained and are familiar with the program and its requirements.
- Include measures to adequately manage fatigue during project planning.
- Provide documented variances for the Standard Work/Rest balance.
- Participate in the incident investigation process and ensure adequate corrective measures are implemented.

3.2 Corporate HSE Manager

GHD's Corporate HSE Manager will have the following responsibilities for the FMP:

- Ensure the Site Supervisor or Project Manager has the necessary tools and skills to implement the FMP at the project level.
- Ensure there are training and educational programs established for the FMP.

ED_014247_00001508-00351

- Review the overall effectiveness of GHD's FMP.

3.3 Site Supervisor (SS)

The SS is a full time position that is assigned to each field project and has the following responsibilities for the FMP:

- Evaluate the potential for fatigue at the project level and communicate fatigue management requirements to GHD employees and subcontractors.
- Implement safety systems to ensure project staff have the appropriate level of training for the tasks they are assigned.
- Monitor activities and behaviors of all persons on site to determine if employees exhibit symptoms related to fatigue or unsafe behaviors.
- Implement safety systems to manage the fatigue of staff to minimize the potential for injuries and illness.
- Implement appropriate actions when an employee or subcontractor reports that they are fatigued to prevent loss. Arrangements will be made to allow the employee or subcontractor to rest before returning to tasks.
- Implement procedures for investigating, reporting, and controlling unsafe actions and unsafe conditions, near losses, occupational injuries and illnesses.

3.4 Employees and Subcontractors

GHD employees and subcontractors are an integral part of the FMP. They must be responsible for ensuring they are both physically and mentally fit to perform their job function safely. Personnel must take responsibility for their own safety, including not reporting to work in a condition as to endanger the safety of their co-workers. GHD employees and subcontractors have the following responsibilities to effectively implement this program:

- Follow the FMP policies and procedures.
- Take reasonable care of your health so you can report to work rested and alert.
- Follow safe work practices and procedures
- Monitor activities and behaviors of all persons on site to determine if employees exhibit symptoms related to fatigue or unsafe behaviors.
- Stop all unsafe work.
- Cooperate in implementing control measures put in place to manage fatigue.
- Report to your SS and supervisor if you are fatigued and unable to perform your duties safely.
- Report all unsafe actions and unsafe conditions, near losses and incidents to your manager or SS.

ED_014247_00001508-00352

4. Fatigue – Recognition and Control Measures

GHD has established safe work practices and job safety analyses (JSAs) that provide the foundation for project success. GHD will ensure their employees and subcontractors follow safe work practices through training, employee observations and inspections. These established safe work practices are outlined in the respective sections of the safety manual and site-specific Health and Safety Plan.

GHD will use the following methods, tools, and control measures to implement the FMP:

- Training on the recognition and signs of fatigue as indicated in this program
- JSAs
- Work scheduling and planning
- Fatigue management reporting and investigation

GHD will use the JSA process for each task to be performed in order to identify potential physical demands of the job and identify fatigue control methods to be implemented. GHD develops the JSA using a team approach that includes the SS, foreman, field crew, and subcontractors as applicable.

GHD will use the following control measures to minimize fatigue during the project:

- Alter the work schedule to reduce the overall time a worker will perform physically demanding work.
- Provide ergonomic equipment to reduce impact, duration and awkward postures and improve overall work station conditions. This could include fatigue matting, lifting devices, and proper lighting.
- Monitoring employee behaviors for signs of fatigue.
- Organize the work to ensure physically demanding work is conducted during the middle of a work shift.
- Eliminate or reduce where practicable the need to work extended hours, night shifts, or overtime.
- Use work-rest patterns during repetitive tasks to control fatigue and increase mental fitness. For longer projects or ones with the potential to be highly impacted by fatigue, the SS will establish specific break areas to protect workers from the elements and allow them to remove their Personal Protective Equipment. Break areas will have seating to allow personnel the opportunity to rest and provide access to water and food.
- Alter the work schedule to reduce potential heat stress and cold conditions.

The SS, GHD project employees, and GHD's subcontractors will review the JSAs prior to working on a specific task. The SS will include this review as part of the project tailgate safety meetings.

ED_014247_00001508-00353

5. Work/Rest Balance

5.1 Standard

Employees and supervisors must manage the work/rest balance to address fatigue management in a proactive manner. Many GHD employees work independently and are responsible for setting their work, travel, and rest schedules. The work/rest balance outlined below is for employees that drive a vehicle weighing less than 10,000 lbs/4,536 kg; this also includes vehicles and trailer combinations[1]. The work time includes the time conducting work in the field, office and/or traveling for business purposes by road or air. An employee's standard commute to and from work is not included in these requirements, but should be considered by the employee.

Due to transportation regulations, GHD's work/rest balance requirements are referenced based on weight of the vehicle. The standard still applies even if an employee's work time does not involve driving outside of their standard commute.

Driving Vehicles Less than 10,000 lbs/4,536 kg (this also includes vehicles and trailer combinations):

Maximum working time and/or driving and working time within one work day:

- 14 hours (extendable up to 16 hours if drive time < 4 hours and/or airplane travel is involved; this approach can be taken three times in a 7 day period).

Maximum continuous drive time:

- 3 hours followed by a 15 minute break.

Maximum drive time per day:

- 9 hours (extendable up to 10 hours twice in 7 day period).

Employees are responsible to know if their client fatigue management requirements are more stringent and must be followed.

Employees must never operate motor vehicles and/or heavy equipment while excessively fatigued. Employees must implement Stop Work Authority and contact their supervisor to report their condition.

All employees have the right and obligation to implement Stop Work Authority for themselves or others if they believe they are fatigued and require rest.

Variances to this standard are described in Section 5.2.

[1] Typically vehicles weighing less than 10,000 lbs. include passenger cars, pick-up trucks, and light trucks. The vehicle weight is clearly posted on a sticker inside the driver's door. For this standing, the total weight of the vehicle and trailers needs to be addressed.

ED_014247_00001508-00354

Driving Vehicles Greater than 10,000 lbs/4,536 kg (this also includes vehicles and trailer combinations):

Employees that drive vehicles greater than 10,000 lbs/4,536 kg must meet the requirements of the transportation agency for which they work and travel. The regulations are very specific regarding the work/rest balance.

5.2 Variance to Standard

Based on the nature of our work, including emergency response situations, client requirements, and potential public safety impacts, a variance is available for GHD employees that may need to work more hours in one day than provided for in the standard work/rest balance.

Management, as represented by an employee's manager, Project Manager or any Principal, may grant a documented variance to the standard work/rest balance for specific employees for a period covering no longer than one week. Additional variances can be issued after for each week.

The employee and management representative must agree upon proactive fatigue management steps that will be implemented to maintain an appropriate level of safety for the employee and public. These steps shall be documented on the FMP variance form (Attachment A). For field work, the form shall be maintained in the project file and for non-field work it will be retained by the employee.

Employees must remember they **ALWAYS** have the authority and responsibility to stop work if changing conditions impact their fatigue level.

6. Drugs and Alcohol

GHD prohibits the possession and use of "prohibited substances" on its premises and job sites while performing company business, or while operating company equipment and company vehicles. GHD expressly forbids its employees and subcontractors from working while under the influence of all illegal or non-prescribed drugs and alcohol.

GHD has a comprehensive drug and alcohol program which is documented with a program specific to meet DOT requirements, non-DOT requirements, and host facility requirements.

The drug and alcohol programs include the following testing requirements where allowed by law:

- Pre-employment
- Post-accident
- For cause
- Random
- Annual (for non-DOT employees)

GHD recognizes that a person's use of prescription drugs could pose significant risk to the safety of the employee, other employees, clients, and the general public. Therefore, only prescription drugs

ED_014247_00001508-00355

prescribed by a licensed physician which do not impair an employee's mental judgment or physical dexterity are permitted for GHD employees' use in the work place. In order for GHD to assess potential job related consequences, ALL personnel using prescription drugs that could have an impact on personal and site safety shall notify their SS of such use and shall provide written authorization from their physician for such use, if the SS requests it.

Over-the-counter medications can also impair a person's ability to work safely. All personnel using over-the-counter drugs have the potential to alter their ability to work safely, such as allergy and cold medication, or drugs to increase mental alertness shall inform their SS. The SS can request further documentation regarding use and GHD employees must comply with these requests in order to be permitted to work on the project site. The SS may consult with GHD's third party medical administrators if the SS has any questions regarding the potential impairment effects of an over-the-counter medication.

7. Fatigue Management Reporting

GHD will use our current reporting and investigation system to identify fatigue related unsafe acts, unsafe conditions, Stop Work Authorities, Near Misses, and/or Incidents. If fatigue is found to be a root cause or contributing factor in any of these incidents, GHD will amend this FMP with the mitigation and control measures identified in the root cause analysis.

8. Training

GHD shall provide initial and annual training on the FMP to prevent potential impacts on site personnel and workplace injuries/illnesses. The training will include the following:

- FMP Principles and expectations
- How to recognize fatigue
- How to incorporate rest breaks into the daily operations
- The defined overall work/rest balance of the policy
- How to control fatigue through appropriate work and personal habits and the importance of maintaining fitness to conduct work activities
- How to report issues related to fatigue to an SS and employee's manager

8.1 Safety Orientation

GHD will provide site personnel with initial project safety orientation training. This training will include the elements of the FMP that relate to work on each particular site.

ED_014247_00001508-00356

9. Program Monitoring and Review

9.1 Project Level

The SS will evaluate the site and conditions of the site workers to minimize worker fatigue based on this policy. The SS will consult with the Corporate HSE Manager as necessary.

9.2 Corporate Level

The CMSH will evaluate this FMP for its effectiveness at a minimum frequency of once every two years. The CMSH will report the results of this evaluation and necessary corrective actions to the GHD Safety Stewards. The Safety Stewards will review and approve modifications to the FMP.

ED_014247_00001508-00357

Attachments

ED_014247_00001508-00358

Fatigue Management Program Variance Request

Request Date:		Project Number:	
Name of Employee Performing Inspection:			
GHD PM:		GHD RSHM:	

Affected Employees: (List all employees covered by this variance)
Justification: (Describe why a variance is needed for this work task)
Proactive Mitigation Steps: (Describe how fatigue will be mitigated, i.e., break areas, access to water and food, etc.)

Stop, Think, Act, and Review (STAR) must be used prior to any activity.

GHD personnel have the authority and responsibility to use Stop Work Authority (SWA).

Variance Submitted By:		Date:	
Variance Review Approval:		Date:	

ED_014247_00001508-00359

GHD.com

The Power of Commitment

Appendix C

Pre-Construction Field Sampling Emergency Response Plan

Pre-Construction Field Sampling Emergency Response Plan

Southern Impoundment

San Jacinto River Waste Pits Superfund Site

Appendix C of Remedial Action Work Plan

International Paper Company

October 14, 2021

→ The Power of Commitment

Contents

1. Introduction **1**

2. Pre-Emergency Planning **1**

2.1 Coordination with Outside Parties 1

2.2 Initial Notification Procedures 2

2.3 Emergency Contacts 2

3. Emergency Recognition and Prevention **3**

3.1 Emergency Recognition 3

3.2 Release Prevention Measures 3

4. Personnel Roles **4**

4.1 Site Supervisor 4

4.2 Health and Safety Officer 4

4.3 On-Site Personnel 5

5. Severe Weather **6**

5.1 Preparation 6

5.2 Re-Entry Procedure 7

5.3 Site Inspection 7

6. Evacuation Route and Procedures **7**

6.1 Minor Releases Requiring Limited Evacuation 8

6.2 Major Release Requiring Evacuation of the Site 8

6.3 Site Evacuation Route 8

6.4 Evacuation Route 8

7. Emergency Site Security and Control **9**

7.1 Delineation of Work Zones 9

7.2 Communication Systems 9

7.2.1 Internal Communication 10

7.2.2 External Communication 10

8. Emergency First Aid and Medical Treatment **10**

8.1 Emergency Medical Actions 10

8.2 First Aid 10

8.3 Emergency Numbers 11

9. Emergency Alerting and Response Procedures for On-Site Incidents **11**

9.1 Emergency Alerting Procedures 11

9.2 Emergency Response Procedures 11

10. Personal Protection and Emergency Equipment **12**

10.1 Personal Protective Equipment 12

10.2 Emergency Equipment 12

10.2.1 Air Monitoring Equipment 12

ED_014247_00001508-00363

Contents

10.2.2 Emergency Response Clean-Up Equipment 12
10.2.3 Emergency Safety Equipment 13

11. Response Follow-Up 13

12. References 13

Table index

Table 1 Emergency Contact Information 2
Table 2 Criteria for Hazardous Material Spill/Release Incidents 8

ED_014247_00001508-00364

1. Introduction

This Pre-Construction Field Sampling Emergency Response Plan (ERP) was prepared by GHD Services Inc. (GHD), on behalf of International Paper Company (IPC), for the Southern Impoundment of the San Jacinto River Waste Pits Site in Harris County, Texas. This ERP is an updated version of an ERP included as one of the supporting deliverables with respect to the Final 100% Remedial Design - Southern Impoundment (Amended April 2021) (Southern Impoundment 100% RD) and was prepared in accordance with the United States Environmental Protections Agency (EPA) Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 Code of Federal Regulations (CFR) 1910 and 1926. It is part of the Southern Impoundment Remedial Action Work Plan (RAWP) being submitted on behalf of IPC to meet requirements contained in the August 5, 2021, Unilateral Administrative Order (UAO; EPA, 2021). The purpose of this ERP is to plan for potential emergencies prior to the commencement of hazardous waste operations associated with the Pre-Construction Field Sampling Event (PCFSE). It will be updated prior to initiation of Southern Impoundment remedial action (RA) excavation activities.

The Site is located in Harris County, Texas, east of the City of Houston, between two unincorporated areas known as Channelview and Highlands. The Southern Impoundment is approximately 20 acres in size and is located on a small peninsula that extends south of Interstate Highway 10. References in this ERP to the "work site" are to the Southern Impoundment.

Major incidents that may require emergency response during the PCFSE could include severe weather, fire, explosion, chemical reaction, truck rollovers, off-site accidents involving transport vehicles, spills or other incidents that may pose a hazard to on-site personnel and nearby residents and/or the environment.

2. Pre-Emergency Planning

2.1 Coordination with Outside Parties

During any emergency events on-site, personnel may coordinate and communicate with the following authorities (as necessary):

- USEPA Region 6.
- Harris County Sheriff.
- Channelview Fire Department.
- National Response Center.
- Harris County Hazardous Materials Response Team (HCHMRT).
  Texas Commission on Environmental Quality (TCEQ).
- Texas Railroad Commission (TRRC).
- Texas Department of Transportation (TxDOT).
- United States Coast Guard (USCG).
- Port of Houston Authority (POHA).

A meeting with these authorities may be requested and conducted prior to the commencement of each phase of Southern Impoundment RA activities at the work site, in order to facilitate a coordinated, integrated, and timely response for any emergencies that may occur during intrusive field activities which represent a potential for release of hazardous substances. Topics that may be discussed/reviewed at the meeting may include the following:

ED_014247_00001508-00365

- Site history/historical response actions.
- Nature and extent of contamination.
- Nature and duration of anticipated field activities.
- Health and Safety Plan (HASP) contents.
- ERP contents.
- Transportation Routes.
- Emergency response support that can be provided by local emergency response authorities.

A copy of the sign-in sheet for those authorities who attend the meeting, will be maintained on file at the work site.

2.2 Initial Notification Procedures

To minimize hazards to human health and safety and/or the environment, in the event of a fire, explosion, spill, or release involving a hazardous substance including oil, raw materials and by products, or hazardous waste, it is the responsibility of on-site personnel to immediately report any such releases to the Site Supervisor (SS). The SS will be responsible for implementing emergency procedures, if necessary, and for notification of appropriate project specific contacts and local emergency response authorities listed in Table 1.

2.3 Emergency Contacts

The emergency telephone numbers for the local emergency response authorities and other local, state, and federal authorities are presented in Table 1. The closest hospital to the work site is located approximately 9 miles east of the work site, in Baytown, Texas. The emergency telephone numbers and the emergency route to the hospital will be posted at the work site prior to commencement of the PCFSE activities at the work site and will be included in the Southern Impoundment Health and Safety Plan.

Table 1 Emergency Contact Information

Emergency Information		
Contact	**Phone Number**	**Site Location**
Local Police: Harris County Constable Baytown Police Department	911 (713) 637-0014 (281) 422-8371	Southern Impoundment: Adjacent to 18003 Market Street Channelview, Texas 77530 (29.791692, -95.066069)
Local Fire Department: Channelview Fire Department	911 (281) 452-5782	
Ambulance	911	
Stakeholders		
EPA Region 6	(800) 887-6063 or (214) 665-2760	
National Response Center	(800) 424-8802	
Harris County Hazardous Materials Response Team 24-Hour Emergency Line	(800) 590-0005	
Texas Commission on Environmental Quality (TCEQ)	(713) 767-3500	
Texas State Emergency Response Commission	(800) 832-8224	
Texas Railroad Commission (TRRC)	(844) 773-0305 or (512) 463-6788	

ED_014247_00001508-00366

Emergency Information		
Contact	**Phone Number**	**Site Location**
Texas Department of Transportation (TxDOT)	(800) 558-9368	
United States Coast Guard (USCG)	(504) 589-6225	
Port of Houston Emergency Dispatch Non-Emergency Dispatch	 (713) 670-3611 (713) 670-3620	

3. Emergency Recognition and Prevention

This section describes the methods and procedures that may be used to recognize and prevent or minimize the adverse effects of any releases of hazardous substances that may occur at the work site during implementation of the Southern Impoundment RD.

3.1 Emergency Recognition

Procedures will be put in place so that on-site personnel will be prepared to recognize and report to the SS any incident (e.g., fire, explosion) or releases of hazardous substances which may endanger human health and safety or the environment. Specifically, when personnel discover such an incident or release of a hazardous substance, the procedures that on-site personnel would be instructed to follow would include the following:

- Report the incident/release to the SS.
- The SS will determine if the incident/release represents an emergency and, if so, will immediately notify the IPC's Remedial Project Manager.

The procedures would also address plans so that personnel in the affected area(s) will immediately evacuate the area of release or the work site in accordance with the "Evacuation Procedures," presented in Section 6.

3.2 Release Prevention Measures

The following procedures/measures may be implemented at the work site to prevent potential releases of or minimize the impact of releases of hazardous substances during the PCFSE:

- All potential hazardous substances (i.e., diesel fuel, etc.) will be stored in vessels with adequate secondary containment should a spill occur.
- All potential contaminated substances generated during activities (i.e., impacted soils, dewatering fluids, decontamination fluid, used Personal Protective Equipment [PPE], etc.) will be placed onto the appropriate staging pads or placed in compatible containers.
- The SS will be accountable for hazardous substances spill/release prevention and is responsible for properly instructing on-site personnel in the operation and maintenance of equipment to prevent the discharges of hazardous substances.
- A supply of spill/release response materials and emergency safety equipment should be stored at the work site during activities to immediately respond to releases/emergencies.
- On-site personnel will be trained, consistent with the level of their responsibilities and in accordance with 29 CFR 1910.120(q)(6), so that they are capable of providing immediate response in order to contain and/or mitigate spills and releases.

ED_014247_00001508-00367

– If necessary, a meeting is to be conducted with local emergency response authorities in order to facilitate a coordinated, integrated, and timely response for any emergencies that on-site personnel are unable to contain and/or control.

4. Personnel Roles

This section of the ERP describes, for purposes of the PCFSE, the various personnel roles, responsibilities, and the lines of authority that individuals may be assigned and communication procedures that may be followed by on-site personnel involved in responses to incidents or emergencies.

4.1 Site Supervisor

The SS (or equivalent) will be assigned responsibility for implementing on-site emergency response procedures and directing the on-site and emergency personnel. All on-site personnel and their communications would be coordinated through the SS. Specific duties of the SS in the case of an incident may include the following:

– Initially identify the source and character of the incident and the type and quantity of any release (if applicable). Assess possible hazards to human health or the environment in consultation with the Health and Safety Officer (as defined in Section 4.2) that may result directly from the incident.
– If the incident may threaten human health or safety of on-site personnel, immediately determine whether evacuation of the work site is necessary in consultation with the Project Coordinator and EPA Remedial Project Manager (RPM).
– If the incident does not threaten human health or safety of on-site personnel or nearby residents or the environment, determine if on-site personnel can contain or control the incident or release. If not, notify local emergency response authorities identified above in Table 1.
– Direct on-site personnel to control the incident or release until, if necessary, outside emergency response help arrives. Specifically ensure that the location where the incident/release occurred and the surrounding area are evacuated and all operations in the vicinity of the incident are discontinued to ensure that fire, explosions, or spills do not spread. Direct work site personnel not involved in emergency response actions to avoid the area of the incident and leave emergency control procedures unobstructed and ensure protected personnel are on standby for emergency rescue, if necessary.
– Determine, in consultation with the Health and Safety Officer, when the emergency has passed and initiate an "all clear" signal to notify on-site personnel of such.
– Ensure that all emergency equipment used is decontaminated, recharged, and/or fit for its intended use before work site operations are resumed.
– Record time, date, and details of the incident, and determine what additional reporting with respect to the incident is required.
    - Per regulations developed under the CERCLA of 1980 (Superfund), a spill/release of one pound or more of any hazardous substance for which a reportable quantity has not been established or which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or Toxic Substances Control Act (TSCA), may require reporting.

4.2 Health and Safety Officer

This individual will be responsible for identifying and evaluating actual and potential hazards and provide oversight of emergency response actions with respect to the safety of operations being conducted. The Health and Safety Officer will report directly to the SS. Specific duties of the Health and Safety Officer are as follows:

ED_014247_00001508-00368

- Conduct an initial assessment of the emergency situation to identify chemical(s) and potential physical hazard(s) of the emergency response actions.
- Perform necessary air monitoring to determine levels of exposure and necessary protective equipment for emergency personnel and evaluate the potential for off-site migration of airborne contaminants.
- Present a safety briefing to on-site personnel to inform them of the actual and potential hazards of the emergency response and required levels of personnel protective equipment.
- Identify use of any engineering controls, (e.g., ventilation, remote handling devices, etc.), to control overexposure of personnel to hazardous substances.
- Identify work zones to be established by on-site personnel.
- Investigate any injuries or illnesses as a result of accidents occurring during the emergency response.
- Observe the safety of clean-up activities and ensure appropriate PPE requirements are being adhered to.
- Determine when it is safe for personnel to return to the affected area after emergency response action are completed.
- Maintain a log of safety briefings, air monitoring, safety observations, and other important issues relevant to safety.

4.3 On-Site Personnel

The SS will be responsible for directing the on-site personnel in emergency response operations. Specific steps that the SS may take in directing on-site personnel are described below.

The on-site personnel will be instructed to respond initially to all emergency incidents. Priorities of on-site personnel will be to protect human health and safety of on-site personnel and nearby residents, and then the environment. Concentration will be placed on preventing the spill/release from spreading to nearby areas. Specific duties of the on-site personnel may be as follows:

- Clear the area of all personnel not actually involved in responding to the emergency and remove any injured persons from the area such that medical treatment can be administered by qualified first aid trained personnel.
    - Prior to allowing treatment of injured persons by first aid trained personnel, decontamination of the injured persons will be performed. On-site personnel will be responsible for ensuring that the level of decontamination reflects the extent of injury and level of contamination.
- Establish appropriate work zones for emergency response as directed by the Health and Safety Officer.
- Control the incident or release at the direction of the SS, until, if necessary, outside emergency response help arrives.

The SS may appoint or designate, as necessary, on-site personnel to assist in the following efforts:

- Notification of local emergency response authorities.
- Site evacuation and accounting of personnel and visitors.
- Assuring that personnel not involved in the emergency response and/or clean-up activities are kept a safe distance from the area and do not interfere with operations.
- Maintaining on-site traffic lanes for emergency response vehicles.
- Sampling efforts to determine the extent of contamination and clean-up efforts, if appropriate.
- Proper containerization, labeling and staging of any recovered hazardous substances, if appropriate.
- Assisting in decontaminating, recharging, or replacing all emergency equipment used during the emergency response.
- Assisting in returning personnel to their work areas after the "all clear" signal is given.

ED_014247_00001508-00369

5. Severe Weather

5.1 Preparation

The SS will adopt procedures to monitor weather and river levels, along with any Hazardous Weather Outlooks for the surrounding areas. The SS will also adopt procedures to be followed in the event that a severe weather or tornado watch or warning is issued by the National Weather Service, which may include directing on-site personnel to shelter areas, which will be determined prior to the PCFSE. Routes to shelters will be included in the Southern Impoundment HASP.

It is anticipated that the PCFSE activities will be conducted in the months of the year with a lower likelihood for hurricanes and tropical storms, but there could be exceptions in which activities take place during the remaining months of the year. There would be defined preparation phases to address situations involving severe weather, a tropical depression, tropical storm, or a hurricane that is anticipated to make landfall in the general vicinity of the work site based on the National Hurricane Center advisories. Four phases and associated procedures that may be adopted to protect the work site and personnel in the event of severe weather are described below.

To verify preparedness in the event of inclement weather, the SS will conduct routine drills and review the respective phases with the project team members. During the preparedness drills, the project team will discuss the equipment and materials presently on-site and how they would handle securing the work site and personnel in the event of severe weather. If opportunities for improvement are identified during the drills, the findings will be incorporated into the ERP.

Phase I Preparation

Phase I preparations would be for expected severe weather events, including heavy rains with potential localized flooding, in the southeast Texas vicinity and will affect the Channelview Area within 96 hours. In the event of a Phase I scenario, the SS would execute the following steps:

- Monitor the weather forecast for updated hurricane predictions.
- Consider suspending all non-essential work site activities and deliveries.
- List all work necessary to control loose materials/equipment from potential damage (water or wind).
- Verify that all supplies needed to secure the work site are available.

Phase II Preparation

Phase II preparations would be for an expected tropical depression, tropical storm, or hurricane landfall in the southeast Texas vicinity which is predicted to have up to 50 miles per hour (mph) winds and will affect the Channelview Area within 96 hours. In the event of a Phase II scenario, the SS would execute the procedures outlined in Phase I and, in addition, execute the following:

- Suspend all non-essential work.
- Consider timing of a complete suspension of work and for covering of any open excavations.
- Secure or remove equipment that could be damaged by the storm (i.e., small totes, drums, vehicles, monitoring instruments, etc.).

Phase III Preparation

Phase III preparations would be for an expected tropical depression, tropical storm, or hurricane landfall in the southeast Texas vicinity which is predicted to have up to 50 mph winds and will affect the Channelview Area within 84 hours. In the event of a Phase III scenario, the SS would follow the procedures outlined in Phases I and II and, in addition, execute the following:

ED_014247_00001508-00370

- Cancel all deliveries.
- Suspend all work and shutdown and move equipment off-site, as necessary.
- Take all records off-site.
- Backfill any open excavations using available on-site material or clean backfill.

Phase IV Preparation

Phase IV preparations would be for an expected tropical depression, tropical storm, or hurricane landfall in the vicinity of southeast Texas which is predicted to affect the Channelview Area within 72 hours. In the event of a Phase IV scenario, the SS would follow the procedures outlined in Phases I, II, and III and, in addition, execute the following:

- Evacuate all personnel from the work site.
- Suspend all work activities and move equipment off-site, to the extent that has not already been done under Phase III, until the SS, in coordination with the Project Coordinator and EPA RPM, determines the work site is safe for re-entry.

5.2 Re-Entry Procedure

The Health and Safety Officer, in coordination with the Project Coordinator and IPC's Remedial Project Manager, will be responsible for determining the appropriate time for personnel to return to the work site. Work site personnel will not be permitted to access the work site until the SS approves entry.

Federal, state, and local government agencies and law enforcement officials have agreed to recognize specific identification from critical infrastructure owners and operators, and their contractors, subcontractors, and assignees that seek access into a closed emergency area. Once identity has been verified, access is granted at the discretion of agency or official representatives (e.g., law enforcement, National Guard). A valid State Driver's License and/or employer issued photo ID and/or Transportation Worker Identification Credential (TWIC) Card may be required to gain access at checkpoints.

Once the local authorities have granted access, the SS, in coordination with 'IPC's Remedial Project Manager, can then determine the appropriate time for personnel to return to the work site.

5.3 Site Inspection

Once it is determined that the work site is safe to access, it is anticipated that specific personnel selected by the SS will mobilize to the work site to complete a post severe weather site inspection. The SS will be responsible for determining how such personnel should document work site conditions, including with photographs and field notes. In addition, the SS may have such personnel note any damage or impact to materials or equipment, determine approximate high water levels, and/or obtain relevant information from any local residents that may have stayed in the area during the storm. The SS will also be responsible to, if necessary, direct personnel to prepare a site inspection report for submittal to the EPA.

6. Evacuation Route and Procedures

Emergencies require prompt and deliberate action. In the event of a hazardous substance spill/release, it will be necessary for personnel and other persons present at the work site to follow an established set of procedures consistent with OSHA requirements in 29 CFR 1910.120(b)(4)(ii)(J) and (j)(1)(viii). The procedures that are established should be followed, as closely as possible, with the understanding that, in specific emergency situations, the SS may deviate from the procedures to provide a more effective plan for bringing the situation under control. The SS will be responsible for determining which situations require evacuation of the work site.

ED_014247_00001508-00371

This section describes procedures which may be employed to address potential exposures of on-site personnel and persons in the vicinity of the work site to hazardous conditions arising out of spills/releases of hazardous substances at the work site. It is anticipated that no single defined route can be identified for evacuation or safe distances due to the nature of the work, and that safe distances will only be determined at the time of an emergency, based on a combination of work site and incident conditions. However, the following measures are provided to serve as general guidelines. Table 2, below, addresses the criteria for releases.

Table 2 Criteria for Hazardous Material Spill/Release Incidents

Release Classification	Criteria
Minor Release	Low toxicity compound spill > 1 barrels (bbl) outside secondary containment, or ≥ 5 bbl inside secondary containment, unless it impacts or potentially impacts state or marine waters. Single handheld detector with a Lower Explosive Limit (LEL) reading ≥ 50 percent. Smoke Investigation.
Major Release	High toxicity compound spill impacting or potentially impacting state or marine waters. Fire or Explosion. Hazardous materials release with off-site potential.

6.1 Minor Releases Requiring Limited Evacuation

As part of the procedures applicable in the event of minor releases (small spills of low toxicity) of hazardous substances, personnel may be directed to evacuate the immediate area and report to the Contaminant Reduction Zone (CRZ). The CRZ will be determined by the SS prior to the PCFSE. Low toxicity may be defined for this purpose as a compound having an Animal LD50 greater than 50 milligrams/ kilograms (mg/kg). A signal to evacuate a limited area in the case of a minor release will be established, such as one short blast using an air horn or verbal communication. Small spills or leaks from a container will require initial evacuation of an area, potentially at least 35 feet in all directions, to allow for clean-up and to prevent exposure.

After initial assessment of the extent of the release and potential hazards, the SS, in consultation with the Health and Safety Officer, will determine the specific boundaries for evacuation. Appropriate steps, such as caution tape, rope, traffic cones, or barricades would be used to secure the boundaries.

6.2 Major Release Requiring Evacuation of the Site

As part of the procedures applicable in the event of a major hazardous substance release (large spills of high toxicity), personnel may be directed to evacuate the work site. High toxicity may be defined for this purpose as a compound having an Animal LD50 less than 50 mg/kg. A signal to notify on-site personnel to evacuate the work site in case of major releases requiring evacuation of the work site will be established prior to the PCFSE. Site evacuation would be initiated by the SS, in consultation to the extent practical, with the Project Coordinator, IPC's Remedial Project Manager, and the EPA RPM. However, if necessary, the SS would initiate work site evacuation, as necessary, to protect the health and safety of on-site personnel.

6.3 Site Evacuation Route

As part of the procedures governing evacuation of the work site, muster points and evacuation routes for the work site will be identified. The routes should be addressed during safety meetings, including any changes to such routes due to changing work site conditions, work activities, and weather factors. A secondary evacuation route would also be identified during the safety meeting.

6.4 Evacuation Route

As part of the procedures to be followed in the event work site evacuation is necessary, it is recommended that the following actions (or similar) be undertaken:

ED_014247_00001508-00372

- The signal for work site evacuation should be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the work site should cease to allow safe exit of personnel and movement of emergency equipment.
- ALL personnel, visitors, and contractors should immediately leave through the identified primary or secondary evacuation route.
- No persons will remain or re-enter the work site unless to carry out their emergency duty procedures. Those within the work site area will normally only include emergency response personnel or other emergency teams (e.g., fire department).
- Immediately upon exit, ALL personnel, visitors, and contractors should be accounted for by the SS or designee.
- The names of emergency response team members and/or other emergency team members involved in emergency response should be reported to the SS.
- Re-entry into emergency areas, to find persons not accounted for should not be attempted.
- Re-entry into the work site will be made only after an "all clear" signal is given by the SS. At his/her direction, a signal or other notification will be given for re-entry into the work site.

7. Emergency Site Security and Control

The SS will put in place security measures to be followed in the event of an emergency. Implementation of security procedures should begin with the notification that an emergency has occurred. If it is necessary to evacuate personnel from the work site or an area within the work site, security measures would be implemented to safely remove personnel and to secure the area from re-entry, to prevent or minimize the exposure of unprotected personnel to work site hazards and avoiding interference with emergency response actions. As part of those measures, on-site personnel should be instructed to immediately take steps to secure the spill/release area and establish safe boundaries (i.e., work zones). This may include, if necessary, establishing the following three work zones at the direction of the Health and Safety Officer:

- ***Support Zone (SZ)*** - The uncontaminated area where emergency response personnel should not be exposed to hazardous conditions.
- ***Contaminant-Reduction Zone (CRZ)*** - The area where decontamination takes place.
- ***Exclusion Zone (EZ)*** - The contaminated area/emergency response area.

7.1 Delineation of Work Zones

The location of these three zones would be pre-determined, based on, to the extent applicable, sampling and monitoring results, expected work activities, and potential routes and extent of contamination dispersion in the event of a release. Procedures should be adopted to minimize movement of personnel and equipment among these zones, to restrict to access control points to prevent cross contamination from contaminated areas to clean areas, and to clearly mark work zones, including by lines, placards, hazard tape, construction cones and/or signs, or enclosed by physical barriers such as fences or ropes.

7.2 Communication Systems

A system of communication should be established at the hazardous substance spill/release scene. The communication system would address both internal communication among on-site personnel and external communication between on-site and off-site personnel.

The SS will be responsible for determining the proper methods of communication at the work site. The SS will also be responsible for instructing all on-site personnel on the use of the selected communication methods.

ED_014247_00001508-00373

7.2.1 Internal Communication

Internal communication will be used to:

- Alert emergency response personnel members to emergencies.
- Pass along safety information, such as the next rest period, air change, heat-stress check, etc.
- Communicate changes in the work to be accomplished.
- Maintain site control.

The SS will be responsible for determining the proper methods of communication at the work site. The SS will also be responsible for instructing all on-site personnel on the use of the selected communication methods.

7.2.2 External Communication

An external communication system between on-site and off-site personnel will be implemented to:

- Coordinate emergency response.
- Report to management.
- Maintain contact with essential off-site personnel.
- The primary means of external communication will be by telephone.

8. Emergency First Aid and Medical Treatment

During the PCFSE, it is anticipated that any personnel requiring emergency medical attention would be evacuated immediately from EZs and CRZs and that personnel will be instructed not enter such areas to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation in such a situation will be based on the type and severity of the illness or injury and the nature of the contaminant. Personnel would be instructed that if decontamination does not interfere with essential treatment, it should be performed.

8.1 Emergency Medical Actions

If actual or suspected serious injury occurs, it is recommended that these steps be followed:

- Remove the exposed or injured person(s) from immediate danger.
- First aid to be rendered at on-site personnel discretion. Decontaminate affected personnel after critical first aid is given.
- Notify SS and Health and Safety Officer of the incident.
- Obtain emergency medical services or ambulance transport to the hospital. Routes to the nearest hospital and urgent care facility will be included in the HASP and posted at the work site.
- Other personnel in the work area will be evacuated to a safe distance until the Health and Safety Officer determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.

8.2 First Aid

Qualified personnel may give first aid at their discretion and stabilize an individual needing assistance. Professional medical assistance will be obtained at the earliest possible opportunity.

ED_014247_00001508-00374

8.3 Emergency Numbers

In the event of an emergency medical incident the telephone numbers provided in Table 1 shall be available to summon for assistance.

9. Emergency Alerting and Response Procedures for On-Site Incidents

In the event of an emergency involving an on-site hazardous substance spill or release, the general procedures that may be used for rapid and safe response and control of the situation may include those identified below.

9.1 Emergency Alerting Procedures

If on-site personnel discover a chemical spill or a vapor or substance release, they should immediately notify the SS. When contacted, the SS should obtain information pertaining to the following, to the extent applicable:

- The substance spilled or released.
- Location of the release or spillage of hazardous substance.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill/release or vapor or smoke release is heading.
- Any injuries involved.
- Fire explosion or chemical reaction or possibility of these events.
- The area and substances involved and the intensity of the fire or explosion.

This information will then be used by the SS to assess the magnitude and potential severity of the spill or release.

9.2 Emergency Response Procedures

The initial response to any emergency should be to protect human health and safety, and then the environment. Other steps, such as identification, containment, treatment, and disposal assessment, should be considered as part of the secondary response.

Emergency response procedures may include the measures described below:

- If a spill/release occurred that was not contained within a dike or sump area (e.g., drum staging area or decontamination pad), an area of isolation should be established around the spill/release. The size of the area should be established depending on the size of the spill/release and the substances involved.
- If the spill/release results in the formation of a toxic vapor cloud (by outbreak of fire or other), further evacuation may be required, based on isolation directions that have been established prior to the initiation of work activities for Southern Impoundment PC FSE. A decision may be made to modify the scope of the evacuation based on air monitoring performed by the Health and Safety Officer.
- If the control and clean-up of a spill or release is determined to be within the capabilities of the on-site personnel and to not threaten human health or safety of on-site personnel or nearby residents, local emergency response authorities may not be notified. A decision on notifications to local emergency authorities would be made by the SS, and in consultation with the IPC's Remedial Project Manager and EPA RPM, if practicable.
- Any release occurring from drums or other containers containing solid wastes should be placed into approved containers and should be labeled as to its contents and transferred to the on-site staging area pending treatment and/or off-site disposal.

ED_014247_00001508-00375

– In the event of spilled liquid, the spilled liquids should be confined to the immediate area of the spill and the liquids may be pumped, with the use of a portable hand pump, into an overpack drum or tank (or similar container) or absorbed with an inert absorbent. The spilled liquids should be confined by implementing steps such as diking around the spill with native material or with an inert absorbent. Containers containing such materials should be appropriately labeled as to contents and transferred to an on-site drum staging area pending treatment and/or off-site disposal. In some situations, such as if the spilled liquid consisted of non-aqueous phase liquids (NAPL) or decontamination water, additional steps may be required to address the spilled substance and visibly affected soils.

The SS is designated responsibility for determining whether spill or release is not within the capabilities of the on-site personnel or for other reasons should be immediately reported to the 911 dispatcher. In that situation, the SS will have responsibility for initiating evacuation of potentially affected work site areas.

10. Personal Protection and Emergency Equipment

10.1 Personal Protective Equipment

Emergency response personnel entering an EZ for emergency spill/release response should, depending on the task and exposure potential, be required to wear an appropriate protection level as determined by the SS and as directed by the Health and Safety Officer.

10.2 Emergency Equipment

Emergency equipment will need to be available for deployment during emergencies/releases of hazardous substances if needed. That emergency equipment may include the equipment discussed below.

10.2.1 Air Monitoring Equipment

The SS will determine which direct reading instrumentation will be used in emergency situations to assess the degree of environmental hazard prior to the PCFSE.

The following equipment list includes direct reading instrumentation that could be used in emergency situations to assess the degree of environmental hazard. This equipment will only be used by the Safety and Health Office, SS, or other specially trained designees. This equipment will be stored, charged and ready, for immediate use in evaluating hazardous chemical concentrations.

Equipment Name	Application
Photoionization detector (PID) with an 11.7 eV lamp.	Measures total undifferentiated organic chemical concentrations.
Real-Time Digital Particulate Monitor, such as a MIE DataRAM.	Measures particulate levels.

10.2.2 Emergency Response Clean-Up Equipment

A sufficient supply of emergency response clean-up equipment should be maintained at the work site to be used for spill/release control. The SS will determine which emergency response clean-up equipment should be used in for spill/release control prior to the commencement of activities at the work site as part of the PCFSE.

ED_014247_00001508-00376

10.2.3 Emergency Safety Equipment

It is recommended that the following equipment, at a minimum, be staged at the work site, during active Southern Impoundment activities, to provide for safety and first aid:

- Additional PPE equipment.
- Potable water.
- OSHA approved first aid kit sized for a minimum of ten people.
- Portable emergency eyewash.
- 20-pound ABC type dry chemical fire extinguishers (one per each piece of heavy equipment).

11. Response Follow-Up

Following all emergency response actions and activation of this ERP, it is recommended that the SS adopt response follow-up procedures that include conducting a debriefing session for all key individuals involved to evaluate the response and revisions to ERP, if necessary. The follow-up procedures may address the need for and responsibility for preparation of an incident report.

12. References

- EPA, 2021. Unilateral Administrative Order for the Remedial Action of the Southern Impoundment. U.S. EPA Region 6, CERCLA Docket No. 06-05-21. In the matter of: San Jacinto River Waste Pits Superfund Site, Harris County, Texas, Respondent. August 2021.

ED_014247_00001508-00377

GHD.com

The Power of Commitment

Appendix D

Microsoft Project Projected RA Construction Schedule

Microsoft Project Projected Dates Related to RA Construction

APPENDIX D - PROJECTED SOUTHERN IMPOUNDMENT RA CONSTRUCTION SCHEDULE
SAN JACINTO RIVER WASTE PITS SUPERFUND SITE
INTERNATIONAL PAPER COMPANY

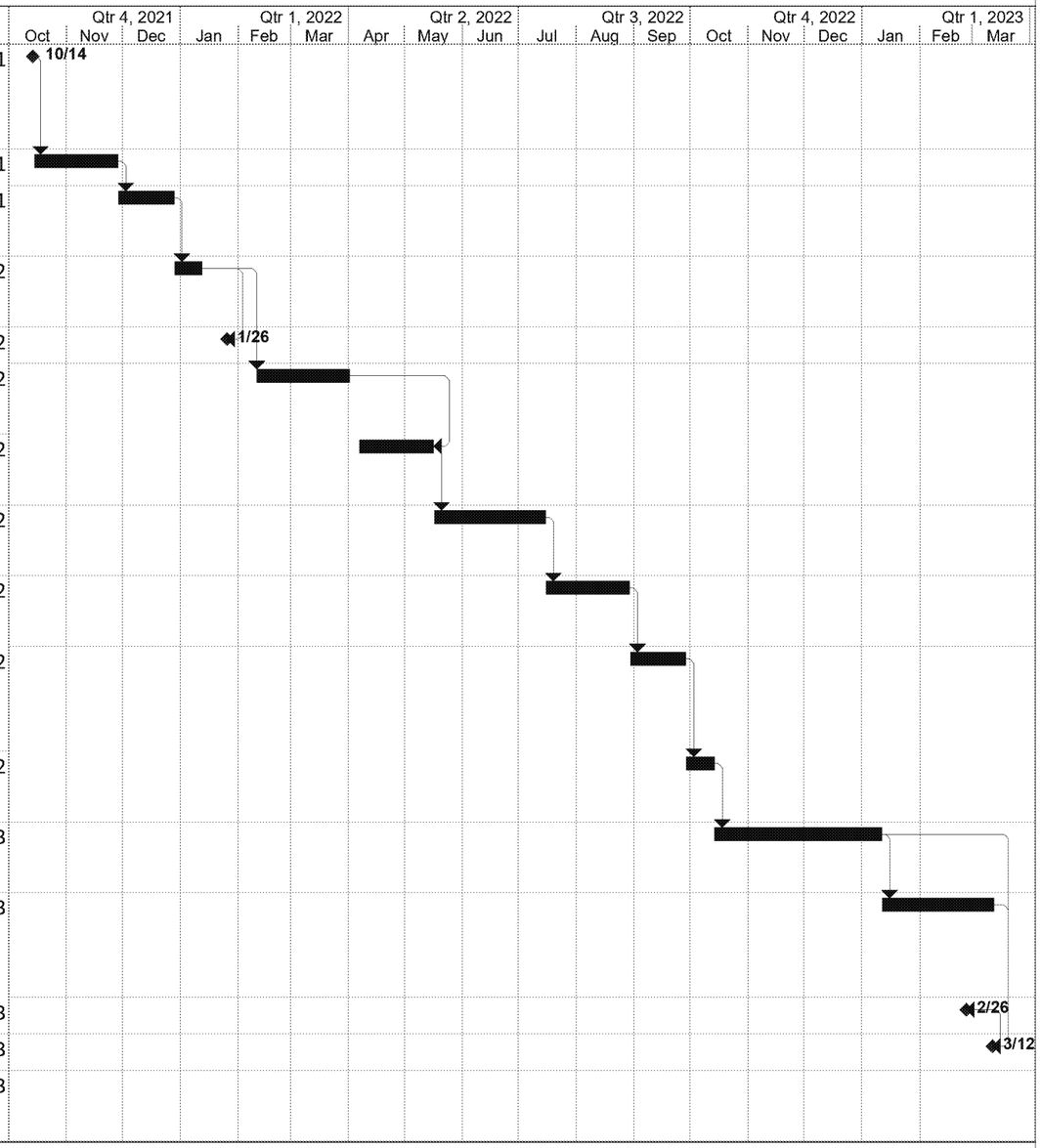
ID	Task Name	Notes
1	**Pre-Construction Field Sampling**	
2	Submit RAWP including PCFSP to EPA	30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order
3	Pre-Construction Sampling Conference	14 days after final EPA approval of PCFSP
4	Start of Pre-Construction Sampling	30 days after final EPA approval of PCFSP
5	Submit updated Design Drawings and Specifications to EPA	60 days after receipt of all validated data from PCFSE
6	**RA Preparations**	
7	RA project bidding and selection of RC, Notice to EPA of Procurement of RC	90 days after final EPA approval of updated Design Drawings and Specifications
8	RA Pre-Construction Conference	14 days prior to Start of RA Construction
9	**RA Construction**	
10	Start of RA Construction	60 days after notice to EPA of selected RC
11	RA Construction	RA Construction schedule to be provided by RC within 30 days following RC selection notice to EPA
12	Pre-Final Inspection	14 days after completion of RA Construction
13	Pre-Final Inspection Report	30 days after completion of pre-final Inspection or as requested by EPA
14	Final Inspection	14 days after submission of Pre-Final Inspection Report
15	**Post RA Construction**	
16	RA Report	90 days after Final Inspection
17	Periodic Review Support Plan	5 years after Start of RA Construction

Date: 10/14/2021 The dates in this document are conditioned and based on a number of assumptions which are detailed in Section 6.0 of the RAWP. Project: 11215131

APPENDIX D PROJECTED DATES - SOUTHERN IMPOUNDMENT RA CONSTRUCTION

All of the dates in this document, other than the date for submission of the RAWP, are conditional and may change for the reasons discussed in Section 6.2 of the RAWP.

WBS	Task Description	Notes	Duration	Start	Finish
1	Submit RAWP including PCFSP to EPA	30 days after EPA Notice of Authorization to Proceed regarding Supervising Contractor under 61.c of Order	1 day	Thu 10/14/21	Thu 10/14/21
2	EPA initial review of RAWP (Estimated)	Estimated at 45 days	45 days	Fri 10/15/21	Sun 11/28/21
3	Respondent response to EPA initial RAWP review comments (Estimated)	Estimated at 30 days	30 days	Mon 11/29/21	Tue 12/28/21
4	EPA final review and approval of RAWP (Estimated)	Estimated at 15 days	15 days	Wed 12/29/21	Wed 1/12/22
5	Pre Construction Sampling Conference	14 days after final EPA approval of PCFSP	1 day	Wed 1/26/22	Wed 1/26/22
6	Pre Construction Field Sampling Event (PCFSE) (Estimated)	Initiated 30 days after final EPA approval of PCFSP	50 days	Fri 2/11/22	Fri 4/1/22
7	Receipt of all validated data from the PCFSE (Estimated)	Estimated at 40 days following receipt of all PCFSE final analytical reports	40 days	Thu 4/7/22	Mon 5/16/22
8	Submit updated Design Drawings and Specifications to EPA	60 days after receipt of all validated data from PCFSE	60 days	Tue 5/17/22	Fri 7/15/22
9	EPA initial review of updated Design Drawings and Specifications (Estimated)	Estimated at 45 days	45 days	Sat 7/16/22	Mon 8/29/22
10	Respondent response to EPA initial design drawings and specifications review comments (Estimated)	Estimated at 30 days	30 days	Tue 8/30/22	Wed 9/28/22
11	EPA final review and approval of updated Design Drawings and Specifications (Estimated)	Estimated at 15 days	15 days	Thu 9/29/22	Thu 10/13/22
12	RA Project Bidding and selection of RC, Notice to EPA of selected RC	90 days after final EPA approval of updated Design Drawings and Specifications	90 days	Fri 10/14/22	Wed 1/11/23
13	RC procurement of materials, equipment, personnel, permits, and revision of Supporting Deliverables (if needed)	Estimated at 60 days	60 days	Thu 1/12/23	Sun 3/12/23
14	RA Pre Construction Conference	14 days prior to Start of RA Construction	1 day	Sun 2/26/23	Sun 2/26/23
15	Start of RA Construction	60 days after notice to EPA of selected RC	1 day	Sun 3/12/23	Sun 3/12/23
16	RA Construction	RA Construction Schedule to be provided by RC within 30 days of RC selection notice to EPA	0 days	Sun 3/12/23	Sun 3/12/23



Project:11215131-4
Date: Thu 10/14/21
*Grey highlighted tasks are from the Projected RA Schedule in Table 6.1.

Task | Provisional Task | Summary | Milestone

Changes in any date or time period in this document will affect subsequent dates, including the date projected for the start of RA Construction.
This document contains estimated time periods for EPA review and approval of deliverables.

The actual time periods for that process may be shorter or longer, which will directly impact and change subsequent dates, including the projected start of RA Construction.

GHD.com

→ The Power of Commitment

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/8/2022 7:18:01 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Appelt, Robert [Appelt.Robert@epa.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I just wanted to send out a gentle reminder that agency comments on the Updated Supplemental Deliverables materials have been requested by EPA by COB today. Please let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Wednesday, October 26, 2022 12:22 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I'm glad you were able to access all the documents, and thank you, Robert for helping trouble shoot all of that. As we discussed at the Pre-Construction Conference yesterday, EPA is requesting any feedback be provided by November 8, 2022. Please let me know if you have any questions or need anything else at this time.

Additionally, we received the waste profile information from GHD in a separate email this morning. EPA will be working to complete our waste characterization analysis now that we have the profile info and sampling requirements from the disposal facilities. I'll reach out separately to coordinate a timeline on that so we can incorporate any feedback from the state as well.

Thanks,

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 9:39 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi all, Robert sent me a new folder link and I got the files downloaded. Thanks!

From: Katie Delbecq
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

Access Denied

katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com does not have permissions to access this resource.

Here are a few ideas:

- Please ask the site admin to give you access.
- If you have a different account, try signing in with that account.
  This will sign you out of all other Office 365 services that you're signed into at this time.

If this problem persists, contact your support team and include these technical details:

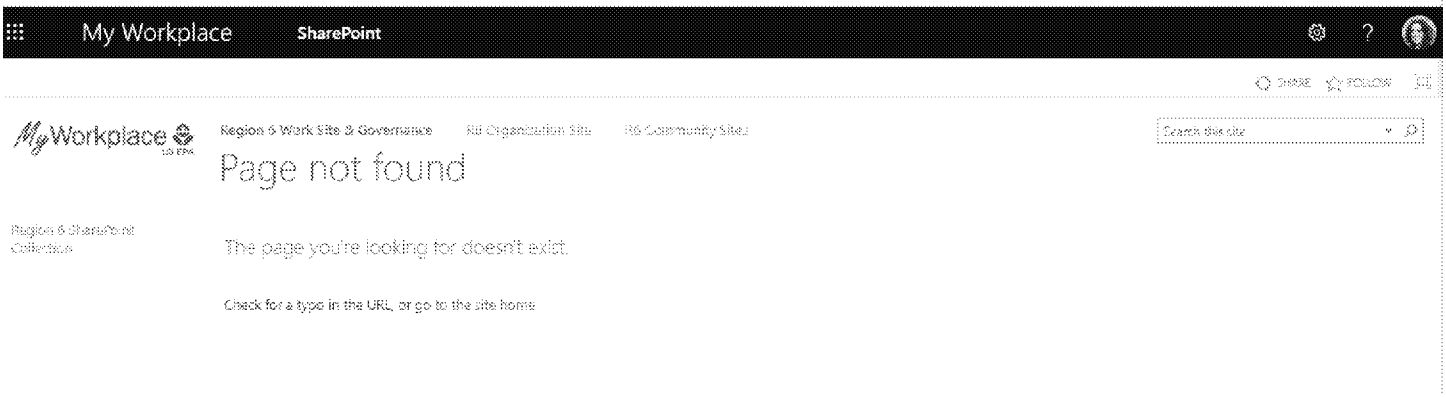
Correlation ID: c26b72a0-30f9-d000-97d1-aa3301224f8
Date and Time: 10/26/2022 8:50:49 AM
User: katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com
Issue Type: User does not have permissions.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

The Power of Commitment
Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Appointment

From: Poulos, Lauren [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=52c920ddc3c6420097620f9504375b94-Poulos, Lau]
Sent: 5/12/2022 10:11:30 PM
To: Cobb, Derrick [Derrick.Cobb@WestonSolutions.com]; Meagan Willis [Meagan.Willis@ghd.com]; Charles Munce [charles.munce@ghd.com]; Appelt, Robert [Appelt.Robert@epa.gov]

Subject: SJRWP SI waste characterization mapping
Location: Microsoft Teams Meeting

Start: 5/18/2022 3:00:00 PM
End: 5/18/2022 4:00:00 PM
Show Time As: Tentative

Required Attendees: Cobb, Derrick; Meagan Willis; Charles Munce; Appelt, Robert

---

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device
sip:teams@video.epa.gov
Video Conference ID: 117 037 959 3
Alternate VTC instructions

Or call in (audio only)
+1 210-469-3886,,838105040# United States, San Antonio
Phone Conference ID: 838 105 040#
Find a local number | Reset PIN

For all EPA meetings, there is no expectation of privacy regarding any communications. Participation in a recorded meeting will be deemed as consent to be recorded. Information on EPA systems is the property of the Agency and may become official records.

Learn More | Meeting options

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/23/2022 6:29:47 PM
To: Wells Richard [Wells.Richard@ghd.com]
CC: Charles Munce [charles.munce@ghd.com]; Willie Beal [Willie.Beal@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Cobb, Derrick [derrick.cobb@westonsolutions.com]; Bingham, Cody [Cody.Bingham@WestonSolutions.com]
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Hi Wells,

Thanks for bringing the team together to discuss this issue over Teams this morning. I wanted to follow up with an email.

As discussed, the analytical method referenced in the FSP has specific requirements for sample collection, volume requirements, field preservation, and laboratory preservation prior to analysis. If existing data or knowledge can be used to document that no hydrocarbons are present between nC6 and nC12 ranges, then the samples can be collected using the bulk sampling technique (i.e., the sample is transferred from the medium into a 4-ounce jar with a TeflonTM-lined lid filling the sample container as full as possible to minimize the head space). The data GHD has provided for justification shows that hydrocarbons are present in that range (albeit at low concentrations), but as the current sample effort is being collected for waste characterization and not site assessment, EPA is comfortable sampling as proposed, as long as a 4-ounce jar with a TeflonTM-lined lid is used and little to no headspace is allowed in each container, as described above. The result should be a representative sample of the waste for disposal at the facility.

Please document and integrate this change into the existing approved FSP so that it may be referenced moving forward and confirm that 4-ounce jars with TeflonTM-lined lids will be used.

As always, your coordination is appreciated.

Happy Thanksgiving,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, November 22, 2022 1:34 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Good afternoon Lauren,

Please see the following clarification following our 11/21/2022 call regarding TPH sample collection for the upcoming waste confirmation sampling at the site beginning 11/28/2022:

GHD Services, Inc. (GHD) proposes to collect samples from 26 grid areas across the removal limits as descried in the Field Sampling Plan (FSP). Three borings will be completed within each grid area. A sample from each boring will be collected from the entire vertical profile of material that will be removed for disposal. The three samples will then be homogenized into a single composite sample for each one of the 26 grid areas.

EPA requested in the November 17, 2022, email that any samples for VOCs be collected as discrete samples rather than composites. GHD does not plan to collect samples for VOCs. However, the samples will be analysed for TPH by Method 1005, which does include the volatile hydrocarbon fractions in the nC6 to nC12 range. TX Method 1005 also specifies using Method SW846-5035 sampling procedures when collecting solid samples for volatile analysis (nC6 to nC12 range).
After review of TX Method 1005 and the proposed sampling procedures, GHD concludes that the composite bulk sampling that is currently proposed in the FSP is appropriate for characterizing the material to be excavated and generated. Three samples were previously collected for waste characterization and analysed for TPH and the results are summarized below:

		TPH (C6-C12)	*TPH (C12-C28)*	*TPH (C25-C36)*
		mg/kg	*mg/kg*	*mg/kg*
Sample Identification:	**Sample Date:**			
SL0064	11/05/2018	8.3	340 J	510 J
SL0065	11/05/2018	14	430 J	600 J
SL0084	11/05/2018	1.7 J	33 J	130 J

These results show that the TPH at the site is primarily in the heavier carbon ranges (nC12-nC28 and nC25-nC36) which is not considered volatile, with only minor amounts (<1.4 %) in the nC6 to nC12 range.

GHD also recommends the bulk composite sampling method because the purpose of the data collection is waste characterization confirmation. Collecting a composite sample of the entire vertical profile would provide more representative data of the waste material to be excavated and generated for disposal as compared to discrete sampling.

Sampling procedure Method SW846-5035 is not warranted for the proposed TPH sampling. This sampling collection and preservation method is specified to retain low concentrations of volatiles that could be lost due to the disturbance caused by sampling techniques. The TPH Class1/Class 2 waste criterion that the results will be compared to is 1,500 mg/kg, which is well above the concentration range where losses due to the sampling techniques would affect the data evaluation and interpretation.

Please reach out to me if you have any clarifying questions/comments.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 10/26/2022 5:22:08 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Appelt, Robert [Appelt.Robert@epa.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I'm glad you were able to access all the documents, and thank you, Robert for helping trouble shoot all of that. As we discussed at the Pre-Construction Conference yesterday, EPA is requesting any feedback be provided by November 8, 2022. Please let me know if you have any questions or need anything else at this time.

Additionally, we received the waste profile information from GHD in a separate email this morning. EPA will be working to complete our waste characterization analysis now that we have the profile info and sampling requirements from the disposal facilities. I'll reach out separately to coordinate a timeline on that so we can incorporate any feedback from the state as well.

Thanks,

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 9:39 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi all, Robert sent me a new folder link and I got the files downloaded. Thanks!

From: Katie Delbecq
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

Access Denied

katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com does not have permissions to access this resource.

Here are a few ideas:

- Please ask the site admin to give you access.
- If you have a different account, try signing in with that account.
  This will sign you out of all other Office 365 services that you're signed into at this time.

If this problem persists, contact your support team and include these technical details:

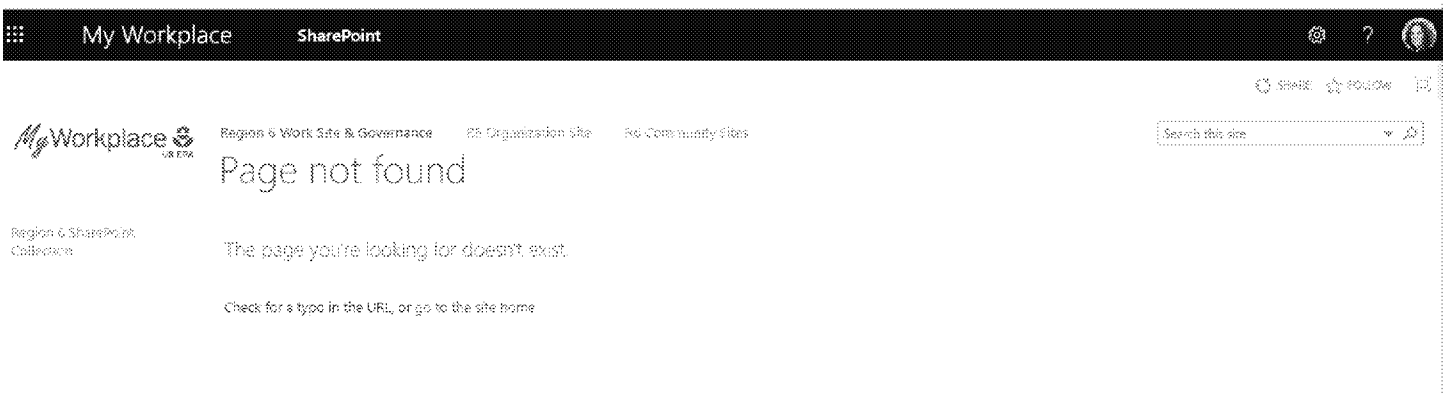
Correlation ID: c26b72a0-30f9-d000-97d1-aa3301224f8
Date and Time: 10/26/2022 8:50:49 AM
User: katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com
Issue Type: User does not have permissions.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/8/2022 10:16:46 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Copy that, Katie – sounds good, and thanks for the heads up!

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Tuesday, November 08, 2022 1:27 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

FYI, I left you a voicemail earlier today; don't need a call back right away though, we can roll that into the next time we talk.

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Tuesday, November 8, 2022 1:24 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Wonderful – thanks so much, Katie! I'll reach out to you tomorrow so we can set something up, and I look forward to TCEQ's feedback.

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Tuesday, November 08, 2022 1:21 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren,
Our letter is with management for final approval; targeted to have to you by COB today. I'm happy to have a call tomorrow or Thursday if you'd like to discuss comments in an expedited fashion.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Tuesday, November 8, 2022 1:18 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I just wanted to send out a gentle reminder that agency comments on the Updated Supplemental Deliverables materials have been requested by EPA by COB today. Please let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Wednesday, October 26, 2022 12:22 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I'm glad you were able to access all the documents, and thank you, Robert for helping trouble shoot all of that. As we discussed at the Pre-Construction Conference yesterday, EPA is requesting any feedback be provided by November 8, 2022. Please let me know if you have any questions or need anything else at this time.

Additionally, we received the waste profile information from GHD in a separate email this morning. EPA will be working to complete our waste characterization analysis now that we have the profile info and sampling requirements from the disposal facilities. I'll reach out separately to coordinate a timeline on that so we can incorporate any feedback from the state as well.

Thanks,

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 9:39 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi all, Robert sent me a new folder link and I got the files downloaded. Thanks!

From: Katie Delbecq
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

Access Denied

katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com does not have permissions to access this resource.

Here are a few ideas:

- Please ask the site admin to give you access.
- If you have a different account, try signing in with that account.
  This will sign you out of all other Office 365 services that you're signed into at this time.

If this problem persists, contact your support team and include these technical details:

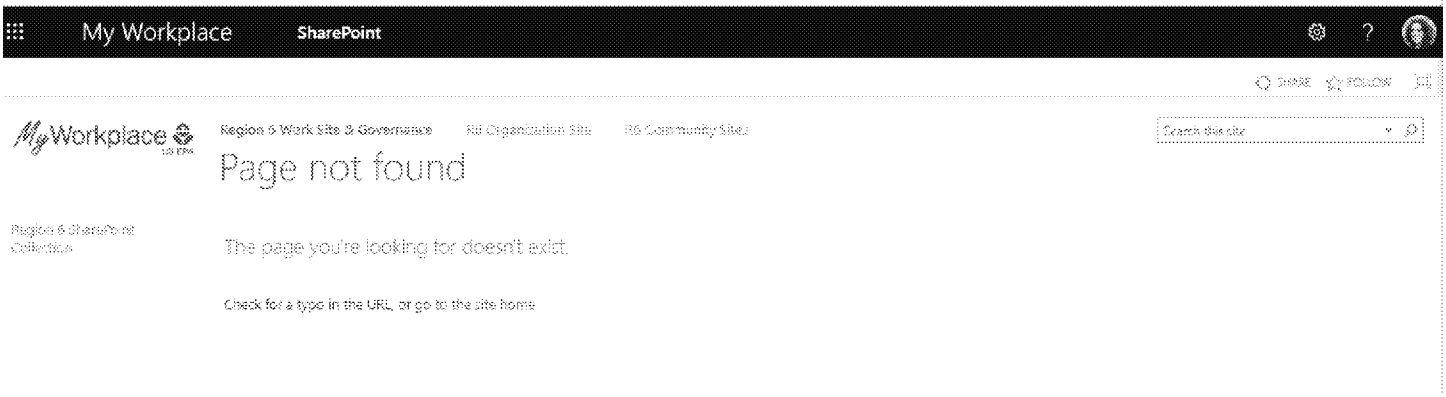
Correlation ID: c26b72a0-3069-d000-97d1-aa3301224f8
Date and Time: 10/26/2022 8:50:49 AM
User: katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com
Issue Type: User does not have permissions.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA

D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ **The Power of Commitment**

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 10/26/2022 5:03:23 PM
To: Wells Richard [Wells.Richard@ghd.com]; Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Appelt, Robert [Appelt.Robert@epa.gov]
CC: Charles Munce [charles.munce@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Willie Beal [Willie.Beal@ghd.com]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Thanks, Wells!

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Wednesday, October 26, 2022 10:58 AM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Willie Beal <Willie.Beal@ghd.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good morning,

As requested, please see the attached approved profiles from both Disposal Facilities.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

The Power of Commitment

Connect

Please consider the environment before printing this email

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

Access Denied

katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com does not have permissions to access this resource.

Here are a few ideas:

- Please ask the site admin to give you access.
- If you have a different account, try signing in with that account.
  This will sign you out of all other Office 365 services that you're signed into at this time.

If this problem persists, contact your support team and include these technical details:

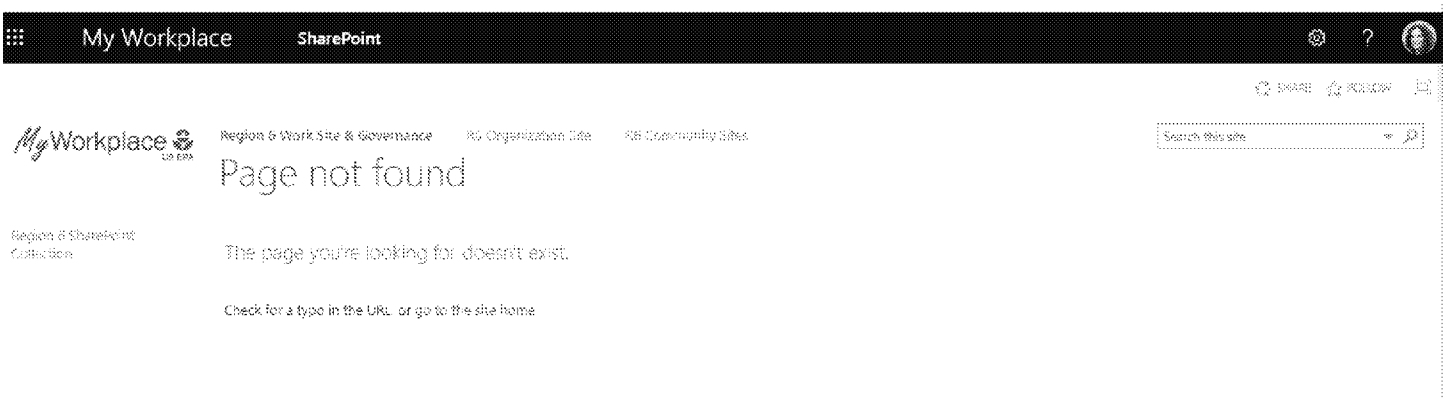
Correlation ID: c26b72a0-30f9-d000-97d1-aa8301224ff8
Date and Time: 10/26/2022 6:50:49 AM
User: katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com
Issue Type: User does not have permissions.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/8/2022 7:24:13 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Appelt, Robert [Appelt.Robert@epa.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Wonderful – thanks so much, Katie! I'll reach out to you tomorrow so we can set something up, and I look forward to TCEQ's feedback.

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Tuesday, November 08, 2022 1:21 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren,
Our letter is with management for final approval; targeted to have to you by COB today. I'm happy to have a call tomorrow or Thursday if you'd like to discuss comments in an expedited fashion.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Tuesday, November 8, 2022 1:18 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I just wanted to send out a gentle reminder that agency comments on the Updated Supplemental Deliverables materials have been requested by EPA by COB today. Please let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Wednesday, October 26, 2022 12:22 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I'm glad you were able to access all the documents, and thank you, Robert for helping trouble shoot all of that. As we discussed at the Pre-Construction Conference yesterday, EPA is requesting any feedback be provided by November 8, 2022. Please let me know if you have any questions or need anything else at this time.

Additionally, we received the waste profile information from GHD in a separate email this morning. EPA will be working to complete our waste characterization analysis now that we have the profile info and sampling requirements from the disposal facilities. I'll reach out separately to coordinate a timeline on that so we can incorporate any feedback from the state as well.

Thanks,

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 9:39 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi all, Robert sent me a new folder link and I got the files downloaded. Thanks!

From: Katie Delbecq
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

Access Denied

katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com does not have permissions to access this resource.

Here are a few ideas:

- Please ask the site admin to give you access.
- If you have a different account, try signing in with that account.
  This will sign you out of all other Office 365 services that you're signed into at this time.

If this problem persists, contact your support team and include these technical details:

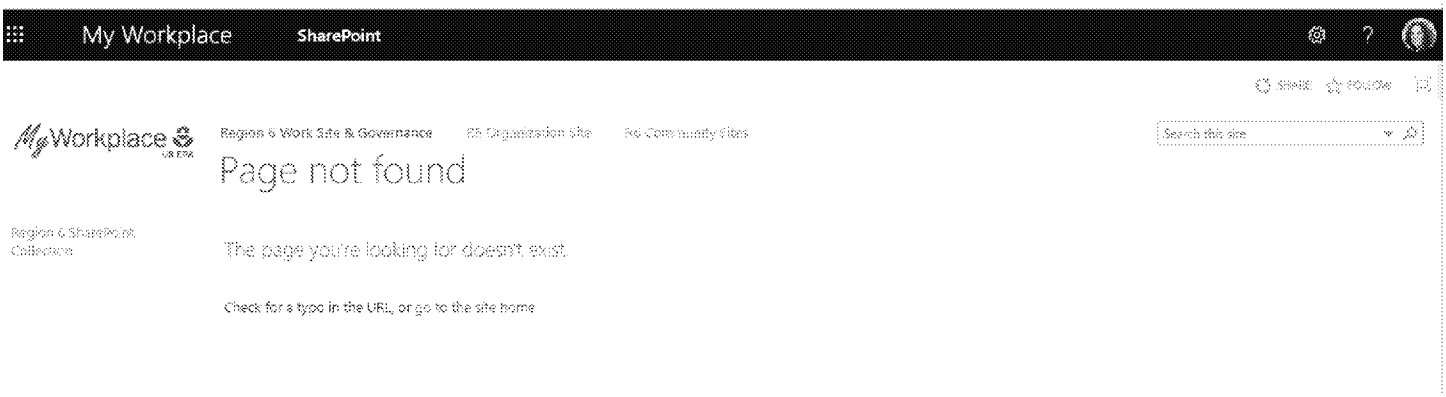
Correlation ID: c26b72a0-30f9-d000-97d1-aa3301224f8
Date and Time: 10/26/2022 6:50:49 AM
User: katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com
Issue Type: User does not have permissions.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 1/21/2022 8:08:08 PM
To: Meagan Willis [Meagan.Willis@ghd.com]
Subject: FW: San Jacinto Southern Impoundment Update to the CAC

FYI – thanks again for working with me this morning to get the dates and status updates together.

Have a great weekend,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Friday, January 21, 2022 2:07 PM
To: Jackie Medcalf <jyoung@txhea.org>
Cc: Rachel Jordan <ad@txhea.org>; Howard, Ashley <Howard.Ashley@epa.gov>
Subject: RE: San Jacinto Southern Impoundment Update to the CAC

Hi Jackie,

Thanks again for emailing. I was able to confirm dates and current progress in the field with GHD this week, and to answer your questions: the first rounds of sampling as per the approved 100% RD and associated RAWP were completed December 2021. After receiving data back from the sidewall samples, additional rounds of sampling (step-outs) were required for all excavation polygons, and these have been completed. After receiving that data back from the lab, another round of step-out sampling was needed for the SC polygon (completed 1/12/11), the SW (completed 1/19/22), and the NC (anticipated to be completed tomorrow 1/22/22). No further step-outs were required for the NE polygon. We are still waiting on data from these areas (SC, SW, and NC) to determine whether another round of step-outs will be required.

Generally, the purpose of the step-out sampling is to define the vertical and horizontal extents of impacted material, refine delineation of the volume of overburden available for reuse, and provide additional waste characterization data as part of the Pre-Construction Confirmation Sampling effort approved in the 100% RD. Sidewall samples will be collected to confirm that the lateral extent of material requiring excavation has been defined to ensure such material will be excavated. Sampling completed earlier in the process was focused more on site characterization.

As for the sampling approaches to expect on the northern impoundment, the Remedial Design is still under development, and questions should be directed to Ashley Howard for more details. I've cced her here in case she can provide more information.

I hope this is helpful, and let me know if you have any follow up questions.

Thanks, and have a great weekend!

Lauren Poulos
214-665-8371

From: Jackie Medcalf <jyoung@txhea.org>
Sent: Tuesday, January 18, 2022 3:44 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Rachel Jordan <ad@txhea.org>
Subject: Re: San Jacinto Southern Impoundment Update to the CAC

Hi Lauren,

Thank you for this update. Were the second round of sidewall step-out samples completed last week?
Could you explain to me what the difference is with doing sidewall step-out samples versus sampling completed earlier in the process? Is this to make sure the boundaries are clearly understood? I just want to make sure I am understanding correctly. Is this something we can anticipate to see at the northern pit when it reaches this stage?

Sincerely,
Jackie

On Fri, Jan 7, 2022 at 8:50 AM Poulos, Lauren <poulos.lauren@epa.gov> wrote:

> Hello,
>
> I hope this email finds the members of the San Jacinto CAC doing well and having had a nice holiday season. **I wanted to provide some brief updates on progress specific to the Site's southern impoundment:**
>
> - The Remedial Action Work Plan (RAWP) was approved with modifications on November 5, 2021. Note, this version focused on the upcoming Pre-Construction Field Sampling Event (PCFSE) work and related plans and documentation. As data is received and incorporated into the Remedial Design, an updated RAWP will be submitted for review and approval prior to excavation and off-site disposal of the waste.
> - The PCFSE began November 29, 2021 as per the Final 100% Remedial Design and approved RAWP. Field sampling and work has been running smoothly since then. EPA has had agency staff and contractor representation present on site to oversee sampling.
> - The initial rounds of sidewall, bottom of excavation, and overburden sampling have been completed for all 4 excavation polygons. Sidewall results were placed on priority rush with the lab in the event additional sidewall step-out sampling is needed.
> - Second rounds of sidewall sampling have been necessary for all excavation polygons on site, and sampling approaches have been reviewed and approved by EPA. The second round of sidewall step-out sampling should be completed for all polygons by early next week.
> - Third rounds of sidewall step-outs will be dependent on results from the lab, which like many things, has been impacted by the recent COVID surge. Generally, field sampling efforts are on schedule at this time.
>
> Please let me know if you have any follow up questions related to the southern impoundment, and note that **for any questions on the Site's northern impoundment, please contact Ashley Howard** (cced here). My goal is to get updates to the CAC via email such as this one on a more regular basis to keep everyone abreast of progress, so until next time, I hope you all stay safe and healthy!
>
> Thanks,
>
> **Lauren Poulos**
>
> Remedial Project Manager
>
> Arkansas/Texas Section (SEDRA)

Superfund Division

U.S. EPA Region 6

214-665-8371

--

Jackie Medcalf
Founder | CEO | Executive Director
Texas Health and Environment Alliance, Inc
www.linkedin.com/in/jackiemedcalf
3262 Westheimer Rd #142
Houston, TX 77098
281-315-5242
TXHEA.org

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/23/2022 5:13:04 PM
To: Wells Richard [Wells.Richard@ghd.com]
CC: Charles Munce [charles.munce@ghd.com]; Willie Beal [Willie.Beal@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Cobb, Derrick [derrick.cobb@westonsolutions.com]; Bingham, Cody [Cody.Bingham@WestonSolutions.com]
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

I can make that

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Wednesday, November 23, 2022 11:02 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Cobb, Derrick <derrick.cobb@westonsolutions.com>; Bingham, Cody <Cody.Bingham@WestonSolutions.com>
Subject: Re: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Lauren,

Does 1130 work for y'all today?

Wells Richard
225-454-4363

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, November 23, 2022 9:55:42 AM
To: Wells Richard <Wells.Richard@ghd.com>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>; Cobb, Derrick <derrick.cobb@westonsolutions.com>; Bingham, Cody <Cody.Bingham@WestonSolutions.com>
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Hi Wells,

I just left you a couple voicemails on your desk and mobile lines and wanted to follow up via email as well. Can we have a Teams discussion about this topic today, preferably this morning? EPA has a few questions and concerns with the approach as outlined below, and it would be great to go over everything and hopefully reach a resolution today as the sampling is scheduled to start on Mon 11/28.

Also, on that topic, is the sampling still on schedule with the recent and expected rain on-site? Can you please provide an update on that?

Thanks,

Lauren Poulos

214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, November 22, 2022 1:34 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Good afternoon Lauren,

Please see the following clarification following our 11/21/2022 call regarding TPH sample collection for the upcoming waste confirmation sampling at the site beginning 11/28/2022:

GHD Services, Inc. (GHD) proposes to collect samples from 26 grid areas across the removal limits as descried in the Field Sampling Plan (FSP). Three borings will be completed within each grid area. A sample from each boring will be collected from the entire vertical profile of material that will be removed for disposal. The three samples will then be homogenized into a single composite sample for each one of the 26 grid areas.

EPA requested in the November 17, 2022, email that any samples for VOCs be collected as discrete samples rather than composites. GHD does not plan to collect samples for VOCs. However, the samples will be analysed for TPH by Method 1005, which does include the volatile hydrocarbon fractions in the nC6 to nC12 range. TX Method 1005 also specifies using Method SW846-5035 sampling procedures when collecting solid samples for volatile analysis (nC6 to nC12 range).
After review of TX Method 1005 and the proposed sampling procedures, GHD concludes that the composite bulk sampling that is currently proposed in the FSP is appropriate for characterizing the material to be excavated and generated. Three samples were previously collected for waste characterization and analysed for TPH and the results are summarized below:

		TPH (C6-C12)	*TPH (C12-C28)*	*TPH (C25-C36)*
		mg/kg	*mg/kg*	*mg/kg*
Sample Identification:	**Sample Date:**			
SL0064	11/05/2018	8.3	340 J	510 J
SL0065	11/05/2018	14	430 J	600 J
SL0084	11/05/2018	1.7 J	33 J	130 J

These results show that the TPH at the site is primarily in the heavier carbon ranges (nC12-nC28 and nC25-nC36) which is not considered volatile, with only minor amounts (<1.4 %) in the nC6 to nC12 range.

GHD also recommends the bulk composite sampling method because the purpose of the data collection is waste characterization confirmation. Collecting a composite sample of the entire vertical profile would provide more representative data of the waste material to be excavated and generated for disposal as compared to discrete sampling.

Sampling procedure Method SW846-5035 is not warranted for the proposed TPH sampling. This sampling collection and preservation method is specified to retain low concentrations of volatiles that could be lost due to the disturbance caused by sampling techniques. The TPH Class1/Class 2 waste criterion that the results will be compared to is 1,500 mg/kg, which is well above the concentration range where losses due to the sampling techniques would affect the data evaluation and interpretation.

Please reach out to me if you have any clarifying questions/comments.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment
Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/23/2022 3:55:42 PM
To: Wells Richard [Wells.Richard@ghd.com]
CC: Charles Munce [charles.munce@ghd.com]; Willie Beal [Willie.Beal@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Cobb, Derrick [derrick.cobb@westonsolutions.com]; Bingham, Cody [Cody.Bingham@WestonSolutions.com]
Subject: RE: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Hi Wells,

I just left you a couple voicemails on your desk and mobile lines and wanted to follow up via email as well. Can we have a Teams discussion about this topic today, preferably this morning? EPA has a few questions and concerns with the approach as outlined below, and it would be great to go over everything and hopefully reach a resolution today as the sampling is scheduled to start on Mon 11/28.

Also, on that topic, is the sampling still on schedule with the recent and expected rain on-site? Can you please provide an update on that?

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, November 22, 2022 1:34 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Willie Beal <Willie.Beal@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: TPH Sample Collection Clarification - SJRWP - Southern Impoundment

Good afternoon Lauren,

Please see the following clarification following our 11/21/2022 call regarding TPH sample collection for the upcoming waste confirmation sampling at the site beginning 11/28/2022:

GHD Services, Inc. (GHD) proposes to collect samples from 26 grid areas across the removal limits as descried in the Field Sampling Plan (FSP). Three borings will be completed within each grid area. A sample from each boring will be collected from the entire vertical profile of material that will be removed for disposal. The three samples will then be homogenized into a single composite sample for each one of the 26 grid areas.

EPA requested in the November 17, 2022, email that any samples for VOCs be collected as discrete samples rather than composites. GHD does not plan to collect samples for VOCs. However, the samples will be analysed for TPH by Method 1005, which does include the volatile hydrocarbon fractions in the nC6 to nC12 range. TX Method 1005 also specifies using Method SW846-5035 sampling procedures when collecting solid samples for volatile analysis (nC6 to nC12 range).
After review of TX Method 1005 and the proposed sampling procedures, GHD concludes that the composite bulk sampling that is currently proposed in the FSP is appropriate for characterizing the material to be excavated and generated. Three samples were previously collected for waste characterization and analysed for TPH and the results are summarized below:

Sample Identification:	Sample Date:	TPH (C6-C12) mg/kg	TPH (C12-C28) mg/kg	TPH (C25-C36) mg/kg
SL0064	11/05/2018	8.3	340 J	510 J
SL0065	11/05/2018	14	430 J	600 J
SL0084	11/05/2018	1.7 J	33 J	130 J

These results show that the TPH at the site is primarily in the heavier carbon ranges (nC12-nC28 and nC25-nC36) which is not considered volatile, with only minor amounts (<1.4 %) in the nC6 to nC12 range.

GHD also recommends the bulk composite sampling method because the purpose of the data collection is waste characterization confirmation. Collecting a composite sample of the entire vertical profile would provide more representative data of the waste material to be excavated and generated for disposal as compared to discrete sampling.

Sampling procedure Method SW846-5035 is not warranted for the proposed TPH sampling. This sampling collection and preservation method is specified to retain low concentrations of volatiles that could be lost due to the disturbance caused by sampling techniques. The TPH Class1/Class 2 waste criterion that the results will be compared to is 1,500 mg/kg, which is well above the concentration range where losses due to the sampling techniques would affect the data evaluation and interpretation.

Please reach out to me if you have any clarifying questions/comments.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/8/2022 10:16:03 PM
To: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]
CC: Appelt, Robert [Appelt.Robert@epa.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Thanks, Katie – we'll take a look, and I'll reach out to you tomorrow to set up a time to discuss.

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Tuesday, November 08, 2022 3:23 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Robert,
Please see the attached comments letter from TCEQ on the Updated Southern Impoundment Supporting Deliverables.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Tuesday, November 8, 2022 1:18 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I just wanted to send out a gentle reminder that agency comments on the Updated Supplemental Deliverables materials have been requested by EPA by COB today. Please let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Wednesday, October 26, 2022 12:22 PM
To: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Cc: Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Katie,

I'm glad you were able to access all the documents, and thank you, Robert for helping trouble shoot all of that. As we discussed at the Pre-Construction Conference yesterday, EPA is requesting any feedback be provided by November 8, 2022. Please let me know if you have any questions or need anything else at this time.

Additionally, we received the waste profile information from GHD in a separate email this morning. EPA will be working to complete our waste characterization analysis now that we have the profile info and sampling requirements from the disposal facilities. I'll reach out separately to coordinate a timeline on that so we can incorporate any feedback from the state as well.

Thanks,

Lauren Poulos
214-665-8371

From: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Sent: Wednesday, October 26, 2022 9:39 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi all, Robert sent me a new folder link and I got the files downloaded. Thanks!

From: Katie Delbecq
Sent: Wednesday, October 26, 2022 8:56 AM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Lauren and Wells,

I have received all the files attached to the email, so like Lauren, still need to get the HASP and waste profiles. I'm having a different error with the EPA SharePoint site link but will work on resolving it on my end. I believe in the past I've been able to use my TCEQ Microsoft login credentials to access files shared by EPA RPMs this way, but today am getting the following message:

Access Denied

katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com does not have permissions to access this resource.

Here are a few ideas:

- Please ask the site admin to give you access.
- If you have a different account, try signing in with that account.
  This will sign you out of all other Office 365 services that you're signed into at this time.

If this problem persists, contact your support team and include these technical details:

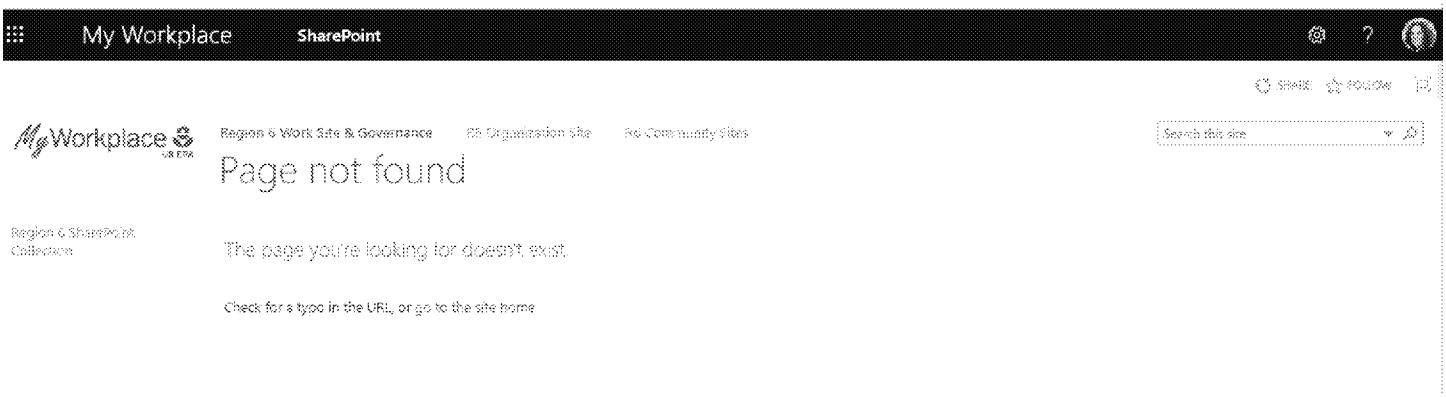
Correlation ID: c26b72a0-30f9-d000-97d1-aa3301224f8
Date and Time: 10/26/2022 8:50:49 AM
User: katie.delbecq_tceq.texas.gov#ext#@usepa.onmicrosoft.com
Issue Type: User does not have permissions.

Katie Delbecq, P.G.
Project Manager, Superfund Section
Remediation Division
Texas Commission on Environmental Quality
MC-136, P.O. Box 13087
Austin, TX 78711-3087
Phone: 512-239-2505

From: Poulos, Lauren <poulos.lauren@epa.gov>
Sent: Wednesday, October 26, 2022 8:43 AM
To: Wells Richard <Wells.Richard@ghd.com>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

The attachments have been received. I'm having some issues accessing the documents via the link provided, though. Here's a screenshot of the page that pulls up for me:



Is anyone else having this issue?

Also, can you please point me to where the waste profile information has been provided? Yesterday, I believe Charles said it would be submitted as a separate document from the Supplemental Deliverables but coming in with them.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard
Engineer

GHD
Proudly employee-owned | ghd.com
5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA
D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/17/2022 5:56:08 PM
To: Wells Richard [Wells.Richard@ghd.com]
CC: Katie Delbecq [Katie.Delbecq@tceq.texas.gov]; Charles Munce [charles.munce@ghd.com]; Brent Sasser [Brent.Sasser@ipaper.com]; Appelt, Robert [Appelt.Robert@epa.gov]
Subject: RE: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Hi Wells,

I spoke with Charles this week and understand that GHD has scheduled sampling to take place starting Mon 11/28 as per the disposal facility requirements and to prepare for upcoming waste management from the site as work progresses. While comments on the updated Supplemental Deliverables are still under development and will be provided soon, I wanted to resolve a few more time sensitive issues prior to 11/28. Charles and I spoke this morning, and I wanted to follow up with an email about the following:

- Any VOC soil samples taken will be discrete (i.e., not composite).
- Waste codes do not match between the two disposal facilities for the project. Can you please clarify why this might be?
- Should any result from a sampling grid area exceed the limits listed in Table 3.2 of the FSP, please coordinate with EPA regarding further characterization.

As I mentioned, there are going to be additional comments forthcoming, but for the sake of not holding up the field work, I wanted to get to these items first. Let me know if you have any questions or need anything else at this time.

Thanks,

Lauren Poulos
214-665-8371

From: Wells Richard <Wells.Richard@ghd.com>
Sent: Tuesday, October 25, 2022 6:55 PM
To: Poulos, Lauren <poulos.lauren@epa.gov>; Appelt, Robert <Appelt.Robert@epa.gov>
Cc: Katie Delbecq <Katie.Delbecq@tceq.texas.gov>; Charles Munce <charles.munce@ghd.com>; Brent Sasser <Brent.Sasser@ipaper.com>
Subject: San Jacinto River Waste Pits Site - Updated Southern Impoundment Supporting Deliverables 10.25.2022

Good afternoon,

GHD, on behalf of International Paper Company, submits to the EPA the following Updated Southern Impoundment Supporting Deliverables following Remedial Contractor (RC) Selection: (Field Sampling Plan [FSP], Quality Assurance Project Plan [QAPP], Emergency Response Plan [ERP], Transportation and Off-Site Disposal Plan [TODP], Site-Wide Monitoring Plan [SWMP]), and Health and Safety Plan [HASP] – too large to email). All files have been uploaded to the EPA SharePoint site under the folder linked below.

Supporting Deliverables following RC Selection 10-25-2022

If you could please reply to this email to confirm receipt of these documents it would be appreciated.

Thank you,

Wells Richard

Engineer

GHD

Proudly employee-owned | ghd.com

5551 Corporate Blvd Suite 200 Baton Rouge LA 70808 USA

D +1 225 296 6508 **M** +1 225 454 4363 **E** wells.richard@ghd.com

→ The Power of Commitment

Connect

Please consider the environment before printing this email

CONFIDENTIALITY NOTICE: This email, including any attachments, is confidential and may be privileged. If you are not the intended recipient please notify the sender immediately, and please delete it; you should not copy it or use it for any purpose or disclose its contents to any other person. GHD and its affiliates reserve the right to monitor and modify all email communications through their networks.

Message

From: Poulos, Lauren [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=52C920DDC3C6420097620F9504375B94-POULOS, LAU]
Sent: 11/8/2021 10:35:22 PM
To: Trae Camble [tcamble@porthouston.com]
Subject: FW: EPA Approval with Modifications to San Jacinto Southern Impoundment RA Work Plan
Attachments: 2021 11 05 EPA SJRWP SI RAWP Signed Approval with Modifications.pdf

Hi Trae,

FYI – let me know if you have any questions or would like to discuss.

Thanks,

Lauren Poulos
214-665-8371

From: Poulos, Lauren
Sent: Friday, November 05, 2021 4:17 PM
To: Charles Munce <charles.munce@ghd.com>
Cc: Meagan Willis <Meagan.Willis@ghd.com>; Philip J Slowiak <Philip.Slowiak@ipaper.com>; Katie Delbecq <Katie.Delbecq@tceq.texas.gov>
Subject: EPA Approval with Modifications to San Jacinto Southern Impoundment RA Work Plan

Hi Charles,

Attached is EPA's signed approval with modifications to the San Jacinto River Waste Pits Southern Impoundment Remedial Action Work Plan. Let me know if you have any questions, and thanks for coordinating.

Have a great weekend,

Lauren Poulos
Remedial Project Manager
Arkansas/Texas Section (SEDRA)
Superfund Division
U.S. EPA Region 6
214-665-8371

Appointment

From: Poulos, Lauren [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=52c920ddc3c6420097620f9504375b94-Poulos, Lau]
Sent: 5/12/2022 10:11:27 PM
To: Poulos, Lauren [poulos.lauren@epa.gov]; Cobb, Derrick [Derrick.Cobb@WestonSolutions.com]; Meagan Willis [Meagan.Willis@ghd.com]; Charles Munce [charles.munce@ghd.com]; Appelt, Robert [Appelt.Robert@epa.gov]

Subject: SJRWP SI waste characterization mapping
Location: Microsoft Teams Meeting

Start: 5/18/2022 3:00:00 PM
End: 5/18/2022 4:00:00 PM
Show Time As: Busy

Required Attendees: Cobb, Derrick; Meagan Willis; Charles Munce; Appelt, Robert

---

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device
sip:teams@video.epa.gov
Video Conference ID: 117 037 959 3
Alternate VTC instructions

Or call in (audio only)
+1 210-469-3886,,838105040# United States, San Antonio
Phone Conference ID: 838 105 040#
Find a local number | Reset PIN

For all EPA meetings, there is no expectation of privacy regarding any communications. Participation in a recorded meeting will be deemed as consent to be recorded. Information on EPA systems is the property of the Agency and may become official records.

Learn More | Meeting options

Appointment

From: Howard, Ashley [Howard.Ashley@epa.gov]
Sent: 4/23/2021 2:26:28 PM
To: Howard, Ashley [Howard.Ashley@epa.gov]; latrice.babin@pcs.hctx.net [Latrice.Babin@pcs.hctx.net]; Janie Smith [Janie.Smith@ghd.com]; Charles Munce [charles.munce@ghd.com]
CC: Poulos, Lauren [poulos.lauren@epa.gov]; Randy Palachek [Randy.M.Palachek@parsons.com]; Dimetra.hamilton [Dimetra.Hamilton@pcs.hctx.net]; Brady, Andrew (PCS) [Andrew.Brady@pcs.hctx.net]; Dean, Kirk [Kirk.Dean@parsons.com]; Lopez, Robert (PCS) [Robert.Lopez@pcs.hctx.net]

Subject: Harris County SJRWP Update Meeting
Attachments: EPA Review and Comments on Supplemental Design Investigation Sampling Plan 3-29-21.pdf
Location: Microsoft Teams Meeting

Start: 4/28/2021 3:00:00 PM
End: 4/28/2021 4:00:00 PM
Show Time As: Busy

Required Attendees: Howard, Ashley; Babin, Latrice (PCS); Janie Smith; Charles Munce
Optional Attendees: Poulos, Lauren; Palachek, Randy M; Hamilton, Dimetra (PCS); Brady, Andrew (PCS); Dean, Kirk; Lopez, Robert (PCS)

Please forward this invite as needed.

Discussing Supplemental Design Investigation Sampling Plan Updates.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Or call in (audio only)
+1 202-991-0477,,495746030# United States, Washington DC

Phone Conference ID: 495 746 030#
Find a local number | Reset PIN

By participating in EPA hosted virtual meetings and events, you are consenting to abide by the agency's terms of use. In addition, you acknowledge that content you post may be collected and used in support of FOIA and eDiscovery activities.

Learn More | Meeting options