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23 January 2015

Mr. Brian Mueller
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U.S. Environmental Protection Agency (EPA) Region 6
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RE: Draft Data Evaluation Summary Report
Falcon Refinery Superfund Site
Remedial Investigation/Feasibility Study
EPA Region 6 Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0088-RICO-06MC

Dear Mr. Mueller:

EA Engineering, Science, and Technology, Inc. (EA) is enclosing one electronic of the Draft Data Evaluation Summary Report. Per our discussion, the remaining distribution of this report will be made once EPA receives input from the various stakeholders on their preferred distribution approach (hard copies v. electronic copies).

If you have any questions regarding this submittal, please call me at (972) 315-3922.

Sincerely yours,

Robert M. Owens
Project Manager

Enclosure

cc: Michael Pheeny, EPA Contracting Officer (letter only)
Rena McClurg, EPA Project Officer (letter only)
Tim Startz, EA Program Manager (letter only)
File

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| TO:<br>**Mr. Brian Mueller**<br>**U.S. Environmental Protection Agency (EPA) Region 6** | | FROM:<br>**Mr. Robert Owens**<br>**EA Engineering, Science, and Technology, Inc.** | |
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# Draft Data Evaluation Summary Report

# Falcon Refinery Superfund Site
# Remedial Investigation/Feasibility Study
# Ingleside, San Patricio County, Texas
# EPA Identification No. TXD086278058

# Remedial Action Contract 2 Full Service
# Contract: EP-W-06-004
# Task Order: 0088-RICO-06MC

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AOC | Area of Concern |
| AST | Aboveground storage tank |
| AVS | Acid volatile sulfides |
| bgs | Below ground surface |
| CCV | Continuing calibration verification |
| CLP | Contract Laboratory Program |
| COPC | Contaminant of potential concern |
| CRDL | Contract-required detection limit |
| CRQL | Contract-required quantitation limit |
| DESR | Data Evaluation Summary Report |
| DQO | Data quality objective |
| EA | EA Engineering, Science, and Technology, Inc., PBC |
| EPA | U.S. Environmental Protection Agency |
| Eurofins | Eurofins Frontier Global Sciences, Inc. |
| FM | Farm-to-Market Road |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| GCAL | GCAL Analytical Laboratories, LLC |
| LCS | Laboratory control sample |
| MD | Matrix duplicate |
| MDL | Method detection limit |
| mg/kg | Milligrams per kilogram |
| MS | Matrix spike |
| MSD | Matrix spike duplicate |
| PARCCS | Precision, accuracy, representativeness, comparability, completeness, and sensitivity |
| PCB | Polychlorinated biphenyl |
| PRP | Potentially responsible party |
| QA | Quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality control |
| RI | Remedial Investigation |
| RPD | Relative percent difference |
| RRF | Relative response factor |
| SDG | Sample delivery group |
| SEM | Simultaneously extracted metals |
| SIM | Selected ion monitoring |
| Site | Falcon Refinery Superfund Site |
| SM | Standard method |
| SOP | Standard operating procedure |
| SOW | Statement of Work |
| SVOC | Semivolatile organic compound |
| TAL | Target Analyte List |
| TDS | Total Dissolved Solids |
| TSS | Total Suspended Solids |

| | |
|---|---|
| μmol/g | Micromoles per gram |
| VOC | Volatile organic compound |

# 1. INTRODUCTION

This document presents the Data Evaluation Summary Report (DESR) prepared by EA Engineering, Science, and Technology, Inc., PBC (EA) for the Falcon Refinery Superfund Site (site) located in Ingleside, San Patricio County, Texas. This DESR documents and summarizes the analytical data collected during the Remedial Investigation/Feasibility Study (RI/FS) field investigation. EA produced this DESR for the U.S. Environmental Protection Agency (EPA) Region 6 as part of Task Order No. 0088-RICO-06MC under Remedial Action Contract No. EP-W-06-004, in accordance with the Statement of Work (SOW) issued by EPA (EPA 2012).

The purpose of the field investigation was to collect sufficient data to support the RI/FS for the site. The media sampled included soil, sediment, surface water, and ground water. The EPA SOW and the EPA-approved Work Plan and Cost Estimate (EA 2012) set forth the framework and requirements for this effort. Results from Phase I and Phase II of the RI are included in this DESR. EA has included all Phase I results provided by the Potentially Responsible Party (PRP) subcontractor laboratory.

The purpose of the DESR is presented in Section 2. A data summary compiling, tabulating, and summarizing the data collected during the RI activities is provided in Section 3. The quality assurance/quality control (QA/QC) findings are presented in Section 4. Data evaluation parameters are presented in Section 5. The data quality objectives (DQOs) evaluation and conclusions are presented in Section 6. References are provided in Section 7. Supporting materials follow the text.

# 2. PURPOSE

The purpose of this DESR is to summarize analytical data quality and usability as related to the project-specific DQOs presented in the Quality Assurance Project Plan (QAPP) (EA 2013a) and QAPP Addendum (EA 2013b). The DQO process is a series of planning steps designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended application. The project-specific DQOs for the RI/FS process were developed and presented in the QAPP. The methods and techniques required to yield analytical data of acceptable quality and quantity to support DQOs are also outlined in the QAPP.

The principal study questions for the site derived from the DQO process are as follows:

1. ***What are possible sources for contamination?***
2. ***What are the nature and extent of soil, sediment, surface water, and ground water contamination?***
3. ***What are the potential migration pathways for transport of these contaminants?***
4. ***Are concentrations of site contaminants of potential concern (COPCs) significantly greater than background?***
5. ***What is the potential risk to human health and ecological receptors from exposure to site-related COPCs?***

Phase I of the RI was conducted in 2007 and 2008 by the PRP consultant. Samples collected during Phase I were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), hexavalent chromium, metals, polychlorinated biphenyls (PCBs), herbicides, and pesticides.

Following an evaluation of the previous Phase I investigation data, EA conducted Phase II of the RI in September 2013 and October 2014 to supplement data collected during Phase I. Samples collected during Phase II were analyzed for VOCs, SVOCs, Target Analyte List (TAL) metals (total and dissolved), simultaneously extracted metals (SEM), tributyltin compounds, total dissolved solids (TDS), and total suspended solids (TSS).

# 3. DATA SUMMARY

This section presents a summary of the data collected during Phase I and Phase II of the RI field investigation. Data grouping summaries are presented in Tables A-1 through A-5 of Appendix A. Complete results for Phase I samples with an "A" designation (i.e. FR-009A, FR-019A, etc.) were not available; therefore, these results were not included in the database.

Data analyses tables are presented in Tables A-6 through A-10 of Appendix A. The minimum and maximum detected results for each analyte were based upon the Phase I and Phase II data.

## 3.1 SITE DESCRIPTION

The site is located 1.7 miles southeast of State Highway 361 on Farm-to-Market Road (FM) 2725 at the north and south corners of the intersection of FM 2725 and Bishop Road near the City of Ingleside in San Patricio County, Texas. The site occupies approximately 104 acres and consists of a refinery that operated intermittently. The refinery has not produced hydrocarbon products in several years. The refinery is currently inactive, except for a crude oil storage operation being conducted by Superior Crude Gathering, Inc. When in operation the refinery had a capacity of 40,000 barrels per day and the primary products consisted of naphtha, jet fuel, kerosene, diesel, and fuel oil. The refinery also historically transferred and stored vinyl acetate, a substance not excluded under the CERCLA petroleum exclusion (EPA 2012).

The site is divided into the North Site, South Site, and current barge dock facility. There are pipelines that connect the North and South Sites with the current and former barge dock facilities. The North Site consisted of nine above ground storage tanks (ASTs), three truck loading racks, associated piping, and a transfer pump. The South Site consisted of the main operations of the refinery. This area had a control room, heaters, crude towers, coalescers, boilers, fire water tank, exchangers, cooling towers, desalters, exchangers, compressors, a lab, 24 ASTs, separator, clarifiers, and aeration pond (TRC 2013). The barge dock facility is located on Redfish Bay and was used to load and unload crude oil and refined hydrocarbons via pipelines that connect the dock to the North and South Sites.

The Site has been divided into areas of concern (AOCs) based upon former use and location (Figure 1). AOC-1 consists of the Former Operational Units and includes the entire North Site and a drum disposal area and metal waste disposal area of the South Site; AOC-1 has been divided into AOC-1N (Figure 2) and AOC-1S (Figure 3). AOC-2 (Figure 4) includes areas of the refinery that were not used for operations or storage and have no record of releases. AOC-3 (Figure 5) encompasses the wetlands immediately adjacent to the Site that are bordered by Bay Avenue, Bishop Road, and a dam on the upstream side; wetlands located between Bishop Road, Sunray Road, Bay Avenue, and residences along Thayer Road; and the wetlands between Sunray Road, residences along FM 2725, Gulf Marine Fabricators, Offshore Specialty Fabricators, and the outlet of the wetlands into Redfish Bay. Within AOC-3, there are one active and several abandoned pipelines that lead from the refinery to the barge dock facilities. During June 2006, the abandoned pipelines were cut, the contents of the pipelines were removed, and plates were welded on the pipelines. AOC-4 includes the barge docking facility (Figure 6). AOC-4 is approximately 0.5 acres and is located on Redfish Bay. The fenced facility, which is connected to the refinery by pipelines, is used to load and unload barges. Currently only crude oil passes through the docking facility. Historically, refined products were also loaded and unloaded. AOC-5 (Figure 7) encompasses the sediments and surface water within the Intracoastal Waterway adjacent to the barge dock facility. AOC-6 (Figure 8) includes the neighborhood along Thayer Road, across from the refinery. AOC-7 (Figure 9) includes the neighborhood along Bishop Road, across from the North Site.

## 3.2 SOIL

During Phase I of the RI, surface and subsurface soil samples were collected from AOCs 1N, 1S, 2, 3, 4, 6, and 7. Additional surface and subsurface soil samples were collected during Phase II from AOCs 1N, 1S, 2, 3, and 4. Phase I and Phase II sample locations are illustrated in Figures 2 through 9. Background soil samples were also collected to evaluate whether site concentrations are significantly greater than background. The background soil locations are illustrated in Figure 10.

Surface soil samples from 0 to 0.5-feet below ground surface (bgs) and subsurface soil samples greater than 0.5-feet bgs were collected during the field investigation. The depth information was not available for the Phase I subsurface soil samples; therefore sample depths were not specified on the summary tables. Subsurface soil samples collected during Phase II ranged from 0.5 to 5 feet bgs. A summary of the analytical methods for Phase I and II soil samples is presented in Appendix A Tables A-1 and A-2. A summary of the data is provided in Appendix A Tables A-6 and A-7.

Geotechnical data was also collected as part of the RI Phase II activities. Geotechnical analyses were performed by Daniel B. Stephens & Associates, Inc. and included the following: moisture content, bulk density, porosity, particle size, plasticity tests, specific gravity, and fraction of organic carbon. These results are included in Appendix E.

## 3.3 GROUND WATER

During Phase I of the RI, ground water samples were collected from AOCs 1N, 1S, and 6.

Ground water samples were collected from AOCs 1N, 1S, 2, 3, and 4 during the Phase II investigation. Phase I and II sample locations are illustrated in Figures 2 through 9.

A summary of the analytical methods for Phase I and II ground water samples is presented in Appendix A Table A-3. The available field and laboratory documentation does not indicate whether the Phase I ground water samples were analyzed for total or dissolved metals. However, the planning documents for the Phase I field activities (Kleinfelder 2007) state the ground water samples were to be analyzed for dissolved metals; therefore dissolved metals analysis was listed in Table A-3. A summary of the ground water data is provided in Appendix A Table A-8.

### 3.4 SEDIMENT AND SURFACE WATER

During Phase I of the RI, sediment samples (i.e., from 0 to 0.5-feet bgs) and corresponding surface water samples were collected from AOCs 1S, 3, and 5. Sediment samples were collected from AOC 5, and surface water samples were collected from AOCs 3 and 5 in 2013 as part of Phase II sampling. The 2013 AOC 5 surface water locations were re-sampled in 2014 in order to achieve lower detection limits using low-level trace metals analysis. The 2014 samples were collected as close as possible to the 2013 sample locations given the sampling conditions (i.e., barge traffic, winds, and ocean current). Phase I and II sample locations are illustrated in Figures 2 through 9. Background samples were also collected to evaluate whether site concentrations are significantly greater than background. The background sediment and surface water sample locations are illustrated in Figure 10.

A summary of the analytical methods for Phase I and II sediment and surface water samples is presented in Appendix A Tables A-4 and A-5. A summary of the sediment and surface water data is provided in Appendix A Tables A-9 and A-10.

## 4. QUALITY ASSURANCE/QUALITY CONTROL

This section describes the QA/QC findings for the analytical data provided by the supporting laboratories. The Phase I samples were submitted to a subcontractor laboratory for analysis by the PRP consultant. Data validation reports for the Phase I samples were not provided by the PRP and therefore are not included in this report.

A complete listing of analyses for the Phase II data is presented in the Field Sampling Plan (FSP) and FSP Addendum (EA 2013c; 2013d). The project field samples were collected and sent to two types of laboratory facilities: (1) EPA-selected contract laboratories and (2) EA subcontractor laboratories. The following sections present the QA/QC results of the project data by laboratory type.

According to the requirements of the QAPP (EA 2013a), the responsibility for the validation and review of the Phase II data from the EPA laboratories was held by EPA. Data from the EPA-selected contract laboratories was validated by the EPA Environmental Services Assistance Team. Electronic deliverables from EPA-selected laboratories contained suitable data validation qualifiers and accompanying case narratives and/or data validation summaries.

EA chemists and/or designees validated Phase II data from the EA subcontractor laboratories in accordance with the EPA guidance Contract Laboratory Program (CLP) National Functional Guidelines (EPA 2008; 2010). In addition to the EPA validation guidance documents, acceptance criteria presented in the QAPP and analytical methods were used for the validation.

In preparing this DESR, the available data validation reports and case narratives were reviewed. The QC findings are summarized in the following sections and only address those issues that resulted in the qualification of data. Other minor findings that were deemed insignificant to data quality are discussed in individual reports included in the appendices to this report.

## 4.1 EPA CONTRACTOR LABORATORY DATA

A modified computer-aided data review and evaluation was performed on the Phase II data generated by the EPA-selected contract laboratories. The contracted laboratories were Mitkem Corporation in North Kingstown, Rhode Island and ALS Laboratory in Salt Lake City, Utah. The following analyses were included in the validated data:

- Trace VOC analysis following CLP SOW SOM01.2
- Low/medium VOC analysis following CLP SOW SOM01.2
- SVOC base/neutral and acid analysis following CLP SOW SOM01.2
- Total TAL metals analysis following CLP SOW ISM01.3
- Dissolved TAL metals analysis following CLP SOW ISM01.3.

The qualifiers and definitions used for the EPA contractor laboratory data are presented in Table 1 (below). The deliverables included appropriate data qualifiers and accompanying data summaries. Appendix B of this DESR contains the data validation reports for the following Sample Delivery Groups (SDGs): MF2B96, MF2C06, F2C99, MF2B95, MF2C37, F2C98, F2C32, F2C66, MF2B33, MF2B63, F2D96, F2A01, F2A21, F2A63, F2B23, MF2A03, MF2A10, MF2A29, MF2A35, MF2A74, MF2A85, MF2B16, F2A00, F2A20, F2A54, F2A68, F2A94, F2D76, MF2B20, MF2B65, F2C33, F2C62, MF2B19, MF2B70, and F2C55.

## TABLE 1. DATA VALIDATION QUALIFIERS

| Qualifier | Definition |
|---|---|
| **Data Qualifier Definitions for Organic Data Review** | |
| U | Not detected at reported quantitation limit |
| L | Reported concentration is below the contract-required quantitation limit (CRQL) |
| J | Estimated value |
| M | The analyte concentration reported should be used as a raised quantitation limit because of interferences and/or laboratory contamination |
| N | The analyte concentration is tentative |
| UJ | Estimated quantitation limit |
| R | Result is unusable |
| ^ | The reported concentration has a high bias. Actual concentration may be lower than the concentration reported |
| V | The reported concentration has a low bias. Actual concentration may be higher than the concentration reported |
| F+ | A false positive exists |
| F- | A false negative exists |
| * | Result is not recommended for use because of associated QA/QC performance inferior to that from other analysis |
| **Data Qualifier Definitions for Inorganic Data Review** | |
| U | The analyte was analyzed for, but was not detected above, the reported sample quantitation limit |
| L | Reported concentration is between the method detection limit and the CRQL |
| J | Result is estimated because of outlying quality control parameters such as matrix spike, serial dilution, etc., or the result is below the CRQL |
| + | The reported concentration has a high bias. Actual concentration may be lower than the concentration reported |
| - | The reported concentration has a low bias. Actual concentration may be higher than the concentration reported |
| R | Result is unusable |
| F | A possibility of a false negative exists |
| UC | Reported concentration should be used a raised quantitation limit because of blank effects and/or laboratory or field contamination |
| W | The result should be used with caution. The result was reported on a dry weight basis although the sample did not conform to the EPA Office of Water definition of a soil sample because of its high water content (>70 percent moisture) |

NOTE:
CRQL Contract-required quantitation limit
QA/QC Quality Assurance/Quality Control

The findings reported in the EPA data validation reports are summarized below:

- **Case 43795 SDG MF2B96 for ground water samples collected in September 2013 (report date 12/04/2013):**

— Because of laboratory blank concentrations, some results above the method detection limits (MDLs) but less than the CRQLs for the following analytes should be considered nondetect and were flagged (U) at the CRQLs: potassium, cobalt, zinc, beryllium, antimony, thallium, cadmium, lead, vanadium, selenium, copper, and chromium.

— Because of laboratory blank concentrations, some results above the CRQLs for the following analytes were flagged (J+): antimony, cobalt, and zinc.

— Barium results were qualified as estimated (J) due to the serial dilution difference above the acceptable limit.

— Selenium results were qualified because the pre-digestion matrix spike exhibited low recovery and the post-digestion spike exceeded 75 percent. Nondetect results were qualified (UJ). Detect results were qualified (J).

- **Case 43795 SDG MF2C06 for ground water samples collected in September 2013 (report date 11/18/2013):**

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes, should be considered nondetect and were flagged (U) at the CRQLs: barium, cobalt, zinc, beryllium, cadmium, lead, vanadium, selenium, arsenic, and copper.

— Because of laboratory blank concentrations, some results above the CRQLs for the following analytes were flagged (J+): arsenic, cobalt, and zinc.

- **Case 43975 SDG F2C99 for ground water samples collected in September 2013 (report date 11/6/2013):**

— For the target compounds with both full scan and selected ion monitoring (SIM) analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— Due to the continuing calibration verification being outside QC criteria, the associated 2-nitrophenol results were qualified (UJ).

- **Case 43795 SDG MF2B95 for ground water samples collected in September 2013 (report date 11/22/2013):**

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes, should be considered nondetect and were flagged (U) at the CRQLs: potassium, magnesium, cobalt, copper, lead, vanadium, arsenic, barium, beryllium, antimony, and silver.

— Because of laboratory blank concentrations, some cobalt and zinc results above the CRQLs were flagged (J+).

— Selenium results were qualified because the pre-digestion matrix spike exhibited low recovery and the post-digestion spike exceeded 75 percent. Nondetect results were qualified (UJ). Detect results were qualified (J).

— Sodium results were qualified as estimated because the serial dilution differences did not meet QC criteria.

- **Case 43795 SDG MF2C37 for ground water samples collected in September 2013 (report date 11/18/2013):**

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes should be considered nondetect and were flagged (U) at the CRQLs: barium, cobalt, zinc, beryllium, cadmium, lead, vanadium, selenium, and arsenic.

— Because of laboratory blank concentrations, some cobalt, arsenic, and zinc results above the CRQLs were flagged (J+).

- **Case 43795 SDG F2C98 for ground water samples collected in September 2013 (report date 11/19/2013):**

— 1,1,2-Trichloroethane, cis-1,3-dichloropropene, and trans-1,3-dichloropropene results were qualified (UJv) in samples F2D04 and F2D22 due to low surrogate recovery.

- **Case 43795 SDG F2C32 for sediment samples collected in September 2013 (report date 11/01/2013):**

— For the target compounds with both full scan and SIM analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes should be considered nondetect

and were flagged (U) at the CRQLs: benzaldehyde, phenol, acetophenone, phenanthrene, naphthalene, and 2-methylnaphthalene.

— Because of laboratory blank concentrations, some results above the CRQLs for the following analytes were qualified (UM): phenanthrene, naphthalene, and 2-methylnaphthalene.

— Due to elevated percent difference in the continuing calibration verification (CCV), some pentachlorophenol results were qualified (UJ).

- **Case 43795 SDG F2C66 for sediment samples collected in September 2013 (report date 11/18/2013):**

— For the target compounds with both full scan and SIM analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— No data were qualified by the reviewer.

- **Case 43795 SDG MF2B33 for sediment samples collected in September 2013 (report date 11/18/2013):**

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes should be considered nondetect and were flagged (U) at the CRQLs: beryllium, thallium, cadmium, silver, arsenic, and antimony.

— Antimony results were qualified because the pre-digestion matrix spike exhibited low recovery and the post-digestion spike exceeded 75 percent. Nondetect results were qualified (UJ). Detect results were qualified (J).

— Chromium and arsenic results were qualified as estimated because the serial dilution differences did not meet QC criteria.

— Sample SDB-IC03-0.0-0.5 had a moisture content greater than 70 percent, which does not conform to the EPA definition of a soil. The results for this sample were qualified (W) on the data summary table and should be used with caution.

- **Case 43795 SDG MF2B63 for sediment samples collected in September 2013 (report date 11/1/2013):**

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes should be considered nondetect and were flagged (U) at the CRQLs: beryllium, antimony, cadmium, silver, and selenium.

— Manganese results were qualified because the pre-digestion matrix spike exhibited low recovery and the post-digestion spike exceeded 75 percent. Detect results were qualified (J).

— Antimony results were qualified as unusable (R) because the matrix spike recovery was below 30 percent.

— Chromium results were qualified as estimated because the serial dilution differences did not meet QC criteria.

- **Case 43795 SDG F2D96 for sediment samples collected in September 2013 (report date 10/22/2013):**

— The initial calibration and opening and closing CCVs for 1,4-dioxane were below the minimum calibration criteria. The 1,4-dioxane results were qualified (UJ).

— Sample F2E07 was re-analyzed for VOCs due to a low internal standard response. The re-analysis also showed poor internal standard response, indicating a matrix effect. The results from the original analysis were designated for use.

- **Case 43795 SDG F2A01 for soil samples collected in September 2013 (report date 11/04/2013):**

— For the target compounds with both full scan and SIM analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— The results for 2-nitrophenol and isophorone were qualified (UJv) in sample MW-06-0.5-2.0 due to low surrogate recovery.

- **Case 43795 SDG F2A21 for soil samples collected in September 2013 (report date 10/30/2013):**

— For the target compounds with both full scan and SIM analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— Due to method blank detections, some results above the MDLs but less than the CRQLs for the following analytes should be considered nondetect and were flagged (U) at the CRQLs: benzaldehyde and acetophenone.

— The results for the following analytes were qualified as unusable (R) in sample MW-16-0.0-0.5 due to low surrogate recovery: 3,3'-dichlorobenzidine, 4-chloroaniline, and hexachlorocyclopentadiene.

- **Case 43795 SDG F2A63 for soil samples collected in September 2013 (report date 10/29/2013):**

— For the target compounds with both full scan and SIM analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— No data were qualified by the reviewer.

- **Case 43795 SDG F2B23 for soil samples collected in September 2013 (report date 11/4/2013):**

— For the target compounds with both full scan and SIM analyses, the SIM results were designated for use only when the corresponding full scan results were non-detect or below the CRQL.

— No data were qualified by the reviewer.

- **Case 43795 SDG MF2A03 for soil samples collected in September 2013 (report date 11/19/2013):**

— Because of laboratory blank concentrations, some results above the MDLs but less than the CRQLs for the following analytes should be considered nondetect and were flagged (U) at the CRQLs: calcium, potassium, arsenic, barium, cobalt, beryllium, thallium, silver, zinc, cadmium, and copper.

— The reviewer qualified the antimony results as estimated (UJ) due to matrix spike recoveries below 30 percent.

— Chromium, nickel, and vanadium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG MF2A10 for soil samples collected in September 2013 (report date 11/1/2013):**

— Antimony, lead, manganese, and zinc results were qualified as estimated (J) because the matrix spike recoveries were outside QC limits.

— Barium, copper, magnesium, nickel, and zinc results were qualified as estimated (J) in some samples due to high relative percent difference (RPD) in the laboratory duplicate.

— Arsenic, chromium, cobalt, copper, nickel, and vanadium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG MF2A29 for soil samples collected in September 2013 (report date 11/1/2013):**

— Because of laboratory blank concentrations, some sodium, calcium, potassium, vanadium, cobalt, barium, beryllium, thallium, cadmium, silver, and copper results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

— Iron results were qualified as estimated (J) due to high RPD in the laboratory duplicate.

— The reviewer qualified the antimony results as estimated (UJ) due to low matrix spike recoveries.

- **Case 43795 SDG MF2A35 for soil samples collected in September 2013 (report date 11/19/2013):**

— Because of laboratory blank concentrations, some beryllium, cadmium, and silver results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

— Mercury, calcium, and manganese were qualified as estimated (J) due to high RPD in the laboratory duplicate samples.

— Antimony results were qualified as estimated (UJ) due to low matrix spike recoveries.

— Arsenic, chromium, and magnesium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

— Arsenic results were qualified as estimated (J) due to high matrix spike recoveries.

- **Case 43795 SDG MF2A74 for soil samples collected in September 2013 (report date 11/1/2013):**

— Because of laboratory blank concentrations, some calcium, vanadium, barium, cobalt, beryllium, cadmium, silver, and zinc results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

— Manganese and iron results were qualified as estimated (J) because the laboratory duplicate RPD was above the QC limit.

— The reviewer qualified the antimony results as estimated (UJ) due to matrix spike recoveries below 30 percent.

— Arsenic results were qualified as estimated (J) due to low matrix spike recoveries.

— Vanadium and chromium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG MF2A85 for soil samples collected in September 2013 (report date 11/5/2013):**

— Because of laboratory blank concentrations, some calcium, potassium, cobalt, barium, beryllium, thallium, cadmium, silver, vanadium, selenium, arsenic, nickel, and copper results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

— Barium, zinc, arsenic, antimony, and copper results were qualified as estimated (J) due to low matrix spike recoveries.

- **Case 43795 SDG MF2B16 for soil samples collected in September 2013 (report date 11/18/2013):**

— Because of laboratory blank concentrations, some calcium, potassium, barium, cobalt, beryllium, thallium, cadmium, silver, vanadium, arsenic, nickel, and copper results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

— Calcium results were qualified as estimated (J) because the laboratory duplicate RPD was above the QC limit.

— Barium and antimony results were qualified as estimated (J) due to low matrix spike recoveries.

- **Case 43795 SDG F2A00 for soil samples collected in September 2013 (report date 11/18/2013):**

— Because of laboratory blank concentrations, some methylene chloride and acetone results less than two times the CRQLs were flagged (U) at the CRQLs.

— Because of laboratory blank concentrations, the methylene chloride result in sample F2B54 was qualified (UM).

— Because of laboratory blank concentrations, some m,p-xylene, toluene, and 1,2,4-trichlorobenzene results below the CRQLs were flagged (U) at the CRQLs.

- **Case 43795 SDG F2A20 for soil samples collected in September 2013 (report date 10/23/2013):**

— 1,4-Dioxane did not meet the technical minimum relative response factor (RRF) criteria for the calibrations associated with project sample results. Results were qualified as estimated nondetect and biased low (UJv) for all samples in the SDG.

- **Case 43795 SDG F2A54 for soil samples collected in September 2013 (report date 10/31/2013):**

— Because of laboratory blank concentrations, some methylene chloride results less than two times the CRQLs were flagged (U) at the CRQLs.

— Because of laboratory method blank concentrations, some tetrachloroethene and toluene results less than the CRQLs were flagged (U) at the CRQLs.

— 1,4-Dioxane did not meet the technical minimum RRF criteria for the CCV associated with project sample results. Results were qualified as estimated nondetect and biased low (UJv) for all samples in the SDG.

— The following results for samples F2A60 and F2A62 were rejected (R) due to low internal standard area counts: 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and bromoform.

- **Case 43795 SDG F2A68 for soil samples collected in September 2013 (report date 11/5/2013):**

— 1,4-Dioxane did not meet the technical minimum RRF criteria for the calibrations associated with project sample results. Results were qualified as estimated nondetect and biased low (UJv) for all soil samples in the SDG.

— The following results in trip blank sample F2D81 were qualified as estimated nondetect and biased low (UJv) due to low surrogate recoveries: dichlorodifluoromethane, chloromethane, vinyl chloride, bromomethane, chloroethane, carbon disulfide, cyclohexane, methylcyclohexane, 1,2-dichloropropane, and bromodichloromethane.

- **Case 43795 SDG F2A94 for soil samples collected in September 2013 (report date 10/15/2013):**

— Because of laboratory blank concentrations, some methylene chloride results less than two times the CRQLs were flagged (U) at the CRQLs.

— Because of laboratory method blank concentrations, some sample results less than the CRQLs were flagged (U) at the CRQLs for the following analytes: 1,2-dichlorobenzene, m,p-xylene, toluene, 1,2,3-trichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, 1,2,4-trichlorobenzene, o-xylene, 1,3-dichlorobenzene, tetrachloroethene, and trichlorofluoromethane.

— 1,4-Dioxane did not meet the technical minimum RRF criteria for the calibrations associated with project sample results. Results were qualified as estimated nondetect and biased low (UJv) for all soil samples in the SDG.

— One closing CCV did not meet the minimum RRF criteria for 1,2,3-trichlrobenzene and 1,2,4-trichlorobenzene. These results were qualified as unusable (R) in samples F2B00 and F2B06.

— The results for the following analytes were qualified as estimated (J or UJ) in samples F2B00 and F2B06 due to CCV percent difference being outside the criteria: trichloroethene, 2-butanone, 2-hexanone, methyl acetate, carbon tetrachloride, 1,2-dibromo-3-chloro-propane, cyclohexane, methyl tert-butyl ether, acetone, 1,1,1-trichloroethane, 1,1,2,2-tetrachloroethane, and methylcyclohexane.

— The following results for samples F2B02 and F2B04 were rejected (R) due to low internal standard area counts: 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and bromoform.

- **Case 43795 SDG F2D76 for soil samples collected in September 2013 (report date 11/18/2013):**

— No data were qualified by the reviewer.

- **Case 43795 SDG MF2B20 for surface water samples collected in September 2013 (report date 12/4/2013):**

— Because of laboratory blank concentrations, some manganese, vanadium, arsenic, chromium, selenium, and copper results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

— Antimony, barium, and mercury results were qualified (UJ) due to low matrix spike recoveries.

— Calcium and potassium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG MF2B65 for surface water samples collected in September 2013 (report date 12/4/2013):**

  — Because of laboratory blank concentrations, some manganese, vanadium, and arsenic results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

  — Barium and mercury results were qualified (UJ) due to low matrix spike recoveries.

  — Calcium and potassium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

  — Detected zinc results were qualified as estimated (J) and nondetect zinc results were qualified (UJ) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG F2C33 for surface water samples collected in September 2013 (report date 11/19/2013):**

  — Because of laboratory blank concentrations, the phenanthrene result in sample F2C33 was qualified (UM).

- **Case 43795 SDG F2C62 for surface water samples collected in September 2013 (report date 10/25/2013):**

  — 2-Chloronaphthalene, hexachlorobenzene, and atrazine results were qualified (UJv) in sample F2D55 due to low surrogate recovery.

- **Case 43795 SDG MF2B19 for surface water samples collected in September 2013 (report date 11/5/2013):**

  — Because of laboratory blank concentrations, some potassium, manganese, vanadium, selenium, cobalt, antimony, thallium, copper, and lead results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

  — Barium, arsenic, and mercury results were qualified (UJ) due to low matrix spike recoveries.

  — Magnesium and potassium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG MF2B70 for surface water samples collected in September 2013 (report date 11/18/2013):**

  — Because of laboratory blank concentrations, some potassium, magnesium, manganese, chromium, vanadium, cobalt, antimony, and lead results below the CRQLs should be considered nondetect and were flagged (U) at the CRQLs on the data summary table.

  — Barium, arsenic, and mercury results were qualified (UJ) due to low matrix spike recoveries.

  — Detect selenium results were qualified (J) due to high matrix spike recoveries.

  — Potassium results were qualified as estimated (J) because the serial dilution differences were above the QC limit.

- **Case 43795 SDG F2C55 for surface water samples collected in September 2013 (report date 11/4/2013):**

  — No data were qualified by the reviewer.

## 4.2 EA SUBCONTRACTED LABORATORY DATA – SEPTEMBER 2013

The validation of September 2013 project data generated by EA subcontractor laboratories was performed by EA project chemists or designees in accordance with the EPA CLP guidelines (EPA 2008, 2010) for completing data validation for applicable test methods. Sediment and surface water samples were analyzed for TSS, acid volatile sulfides (AVS), and SEM by the TestAmerica Pittsburgh laboratory. One soil sample was analyzed for tributyltin by the TestAmerica Burlington laboratory. Appendix D of this DESR contains the data validation report for the following SDGs: 180-25000, 180-25127, 180-25128, and 180-25130.

The following analyses were included in the validated data:

- TSS ─ Standard Methods (SM) 2540D
- AVS ─ EPA Method SW9034
- SEM ─ EPA Method SW6010B (copper, nickel, cadmium, lead, and zinc)
- Tributyltin ─ EPA Method 3550C and TestAmerica laboratory-specific standard operating procedure (SOP) for *Organotins by Gas Chromatography* (TA 2013).

The data validation findings are summarized in the following sections.

### 4.2.1 Holding Times and Preservation

The samples were received by the laboratories intact, in good condition, and the cooler temperatures were within the specified EPA guidelines for the specific analytical methods.

The soil, sediment, and surface water samples were analyzed within the required holding time.

### 4.2.2 Calibration Criteria

Initial and continuing calibrations were performed at the proper concentrations and frequencies. Standard calibration data does not apply to the TSS methodology as this is a gravimetric procedure.

### 4.2.3 Blank Detections

Analytes were not detected in the blanks, unless otherwise noted:

Low-level detections of SEM metals (copper, nickel, and zinc) and acid volatile sulfides below the method reporting limit were detected in associated method blank samples. As a result, low-level analyte detections for nickel and sulfide in project samples were U-qualified at the reporting limit:

- SD5-05-0.0-0.5─SEM nickel qualified 1.5U milligrams per kilogram (mg/kg) and 0.025U micromoles per gram (µmol/g)
- SD5-06-0.0-0.5─AVS qualified 22U mg/kg and 0.69U µmol/g
- SD5-09-0.0-0.5─AVS qualified 21U mg/kg and 0.66U µmol/g.

### 4.2.4 Matrix Spike Samples

Matrix spike (MS) and matrix spike duplicate (MSD) samples were collected and analyzed for AVS and SEM metals analysis. The MS/MSD recoveries met the acceptance criteria with the exception of the AVS method. The MS/MSD for the AVS was slightly below the criteria (75-125%) at 71 and 73 percent recovery. As a result the following sample data was J-qualified:

- SD5-03-0.0-0.5─AVS qualified 360J mg/kg and 11J µmol/g.

### 4.2.5 Laboratory Control Samples

The laboratory control sample recoveries were within acceptable QC limits.

### 4.2.6 Surrogate Spike Recovery

Surrogate spike compounds were included with the tributyltin analysis by gas chromatography only. The recoveries for the surrogate spikes were within the method acceptance criteria for both the primary and secondary columns. No data required qualification.

### 4.2.7 Field and Laboratory Duplicates

One field duplicate sediment sample and two field duplicate surface water samples were collected and analyzed for the site sampling event. The field duplicate samples are identified on Table 1. The RPD for the sediment duplicate exceeds the 20% RPD criteria for all SEM metals and the AVS with the exception of lead. The surface water duplicate sample SW3-01 exceeds the 20% RPD for TSS. Associated data were J-qualified as estimated values:

- SD5-01-0.0-0.5─SEM cadmium qualified 1.5J mg/kg and 0.014J µmol/g
- SD5-01-0.0-0.5─SEM copper qualified 190J mg/kg and 2.9J µmol/g
- SD5-01-0.0-0.5─SEM nickel qualified 230J mg/kg and 4.0J µmol/g
- SD5-01-0.0-0.5─SEM zinc qualified 260J mg/kg and 3.9J µmol/g
- SD5-01-0.0-0.5─AVS qualified 1600J mg/kg and 51J µmol/g
- SD5-01-0.0-0.5─SEM/AVS ratio qualified 0.22J (no units)
- SW3-01─TSS qualified 9.2J mg/L.

Laboratory duplicate samples were also run for the TSS analysis. The RPD for the laboratory duplicate samples was within the method-specific criteria.

### 4.2.8 Interference Check Standard

The interference check standard was run for the SEM metals analysis. The recoveries for all metals were within the method acceptance criteria. No data required qualification.

### 4.2.9 Compound Quantitation and Reporting Limits

The reported quantitation results and reported detection limits were reviewed and found to be accurate and to meet project requirements.

## 4.3 EA SUBCONTRACTED LABORATORY DATA – OCTOBER 2014

The validation of October 2014 project data generated by EA subcontractor laboratories was performed by EA project chemists or designees in accordance with the EPA CLP guidelines (EPA 2008, 2010) for completing data validation for applicable test methods. Ground water samples were analyzed for VOCs, SVOCs, total and dissolved metals (including mercury), and TDS by GCAL Analytical Laboratories, LLC (GCAL). Surface water samples were analyzed for VOCs, SVOCs, and TDS by GCAL and for low-level trace total and dissolved metals by Eurofins Frontier Global Sciences, Inc. (Eurofins). Appendix D of this DESR contains the data validation reports for the following GCAL SDGs: 214100765, 214100844, 214100941, 214101019; and the Eurofins Falcon Refinery Report (12/23/2014).

Validation for the October 2014 project samples was performed for the analytical parameters and methods listed below:

- TDS ─ Standard Methods (SM) 2540C-2011
- VOCs ─ EPA Method SW8260B

- SVOCs — EPA Method SW8270D
- Total and dissolved TAL Metals ─ EPA Method SW6020A
- Total and dissolved Mercury ─ EPA Method SW7470A
- Low-level trace total and dissolved Antimony — EPA Method 1638
- Low-level trace total and dissolved Mercury — EPA Method 1631E
- Low-level trace total and dissolved metals — EPA Method 1640 (silver, arsenic, cadmium, chromium, copper, nickel, lead, selenium, thallium, and zinc)
- Total and dissolved hexavalent chromium — SM3500-Cr.

The data validation findings are summarized in the following sections.

### 4.3.1 Holding Times and Preservation

The samples were received by the laboratories intact, in good condition, and the cooler temperatures were within the specified EPA guidelines for the specific analytical methods.

The ground water and surface water samples were analyzed within the required holding time.

### 4.3.2 Calibration Criteria

Initial and continuing calibrations were performed at the proper concentrations and frequencies. No data required qualification due to calibration issues. Standard calibration data does not apply to the TDS methodology as this is a gravimetric procedure.

### 4.3.3 Blank Detections

No data required qualification due to blank detections (method, trip, rinsate, field) with the following exceptions:

- Acetone was detected in field blank FB-11 at a concentration of 7.31 micrograms per liter (µg/L). Acetone was also detected in sample MW-02 at a similar concentration. The acetone result in MW-02 was qualified (UJ).

- Acetone was detected in field blank FB-04 at a concentration of 8.33 µg/L. Acetone was also detected in samples MW-11 and MW-11 DUP at similar concentrations. The acetone results were qualified (UJ) in samples MW-11 and MW-11 DUP.

- Metals were detected above the reporting limit in the equipment rinsate ER-01: barium (9.9 µg/L), calcium (7,520 µg/L), copper (6.44 µg/L), magnesium (1,390 µg/L), potassium (640 µg/L), and sodium (8,780 µg/L). Barium, calcium, magnesium, potassium, and sodium results were detected in MW-02 at similar concentrations to the amount detected in the rinsate; these results were qualified (UJ). Copper was detected in MW-02 and MW-04 at similar concentrations; these results were qualified (UJ).

- Metals were detected above the reporting limit in the equipment rinsate (ER-02): barium (10.4 µg/L), calcium (7,860 µg/L), copper (6.39 µg/L), magnesium (1,430 µg/L), potassium (668 µg/L), and sodium (8,860 µg/L). Barium and potassium were detected in MW-05 at similar concentrations to the amount detected in the rinsate; these results were qualified. Sodium was detected in MW-03 at a similar concentration; this result was qualified (UJ). Copper was detected in MW-03 and MW-05 at similar concentrations; these results were qualified (UJ).

- Metals were detected above the reporting limit in the equipment rinsate (ER-03): barium (11.4 µg/L), calcium (8,350 µg/L), copper (38.9 µg/L), magnesium (1,540 µg/L), potassium (693 µg/L), and sodium (9,260 µg/L). Barium, magnesium, and sodium were detected in MW-07 at similar concentrations to the amount detected in the rinsate; these results were qualified (UJ). Copper was detected in MW-07 and MW-09 at similar concentrations; these results were qualified (UJ).

- Chromium was detected above the reporting limit in the equipment rinsate (ER-11). Project sample results detected at concentrations less than the five times the levels reported for blank samples were qualified as estimated with a UJ-qualifier. Chromium results were qualified (UJ) in samples SW5-01, SW-5-01 Dissolved, SW5-02, SW-5-02 Dissolved, SW5-03, SW-5-03 Dissolved, SW5-04, SW-5-04 Dissolved, SW5-05, SW-5-05 Dissolved, SW5-06, SW-5-06 Dissolved, SW5-07, SW-5-07 Dissolved, SW5-08, SW-5-08 Dissolved, SW5-09, SW-5-09 Dissolved, SW5-09 DUP, SW-5-09 DUP Dissolved, SW5-10, and SW-5-10 Dissolved.

- Arsenic was detected above the reporting limit in the tubing blank used for sampling for the low-level trace metals. Project sample results detected at concentrations less than five times the levels reported for blank samples were qualified as estimated with a UJ-qualifier. Arsenic results were qualified (UJ) in samples SW5-01, SW-5-01 Dissolved, SW5-02, SW-5-02 Dissolved, SW5-03, SW-5-03 Dissolved, SW5-04, SW-5-04 Dissolved, SW5-05, SW-5-05 Dissolved, SW5-06, SW-5-06 Dissolved, SW5-07, SW-5-07 Dissolved, SW5-08, SW-5-08 Dissolved, SW5-09, SW-5-09 Dissolved, SW5-09 DUP, SW-5-09 DUP Dissolved, SW5-10, and SW-5-10 Dissolved.

### 4.3.4 Matrix Spike Samples

No data required qualification for matrix and matrix spike duplicate recoveries with the following exceptions:

- 3,3'-Dichlorobenzidine was recovered low in the MS/MSD associated with SDG 214100765. The 3,3'-dichlorobenzidine result was qualified as estimated (UJ) in sample MW-04.

- Silver was recovered low in the MS/MSD for the dissolved metals analysis in SDG 214100844. Dissolved silver results were qualified (UJ) in MW-02 and MW-04.

- Aluminum was recovered high in the MS/MSD for the total metals analysis in SDG 214101019. The aluminum results were qualified as estimated (J) in samples MW-01, MW-03, MW-05, MW-07, and MW-09.

- Aluminum was recovered high in the MS/MSD for the total metals analysis in SDG 214100844. The aluminum results for MW-02 and MW-04 were qualified as estimated (J).

### 4.3.5 Laboratory Control Samples

No data required qualification due to laboratory control sample recoveries with the following exceptions:

- Acetophenone results were qualified as estimated (J) in samples ER-03 and FB-03 due to high RPD between the LCS and LCS duplicate (SDG 214100941).

- Acetophenone results were qualified as estimated (J) in samples ER-04 and FB-04 due to high RPD between the LCS and LCS duplicate (SDG 214101019).

### 4.3.6 Surrogate Spike Recovery

Surrogate spike compounds were included with the gas chromatography method analyses only. No data required qualification with the following exceptions:

- The SVOC surrogate 2-fluorobiphenyl was recovered low in sample MW-3. The detected 2-methylnaphthalene result was qualified as estimated (J) by the reviewer. The following non-detect results were qualified (UJ): 1,2,4,5-tetrachlorobenzene, 2,4-dinitrotoluene, 2-chloronaphthalene, 2-chlorophenol, 2-nitroaniline, 3-nitroaniline, 4-bromophenyl phenylether, 4-chloroaniline, 4-chlorophenyl phenyl ether, 4-nitroaniline, acenaphthene, acenaphthylene, acetophenone, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, biphenyl, bis(2-chloroethoxy)methane, bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, carbazole, chrysene, di-n-butylphthalate, di-n-octylphthalate, dibenz(a,h)anthracene, dibenzofuran, diethylphthalate, dimethylphthalate, fluoranthene, fluorene, hexachlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, hexachloroethane, indeno(1,2,3-cd)pyrene, isophorone, naphthalene, nitrobenzene, phenanthrene, pyrene, pyridine, n-nitrosodi-n-propylamine, and n-nitrosodiphenylamine.

### 4.3.7 Serial Dilution

Serial dilution analysis was performed for the metals analyses. No data required qualification with the following exception:

- The %difference in SDG 214100844 was outside QC limits for total aluminum. Total aluminum results were qualified as estimated (J) in samples MW-02 and MW-04.

### 4.3.8 Field and Laboratory Duplicates

The calculated RPDs for the duplicate samples were within acceptable limits with the following exceptions:

- RPD for field duplicate sample MW-17 for dissolved nickel was above the acceptable limit defined by the QAPP. Therefore, the dissolved nickel results were qualified as estimated (J) in MW-17 and MW-17 DUP.

- RPD for field duplicate sample SW5-09 for antimony was above the acceptable limit defined by the QAPP. Therefore, the antimony results were qualified as estimated (J) in SW5-09 and SW5-09 DUP.

- RPD for field duplicate sample SW5-09 for dissolved arsenic was above the acceptable limit defined by the QAPP. These results were already qualified (UJ) due to detections in the rinsate; no further qualification is required.

### 4.3.9 Interference Check Standard

The interference check standard was run for the metals analyses. The recoveries for all metals were within the method acceptance criteria. No data required qualification.

### 4.3.10 Compound Quantitation and Reporting Limits

The reported quantitation results and reported detection limits were reviewed and found to be accurate and to meet project objectives.

## 5. DATA EVALUATION PARAMETERS

The data were evaluated for acceptable quality and quantity based on the critical indicator parameters, represented by precision, accuracy, completeness, comparability, representativeness, and sensitivity (PARCCS). To the extent possible, EA followed EPA's data quality assessment process (EPA 2006a; 2006b). This evaluation helps determine whether limitations should be placed on the data and to verify that the type, quality, and quantity of data that are collected are appropriate for their intended use. The PARCCS parameters were reviewed for the laboratory analytical data results and are discussed in the following sections.

A well-defined QA/QC process is integral to the generation of analytical data of known and documented quality. The QC process includes those activities required during data collection to produce data of sufficient quality to support the decisions that will be made based on the data (e.g., decisions to be made prior to, during, and after site remedial actions). After environmental data are collected, QA activities focus on evaluating the quality of the data in order to determine

the data usability with respect to support for remedial or enforcement decisions. Table 2 presents the acceptance criteria for definitive laboratory data for chemical analyses of investigation samples, which were also presented in the QAPP.

## 5.1 DATA CATEGORIES

To produce data suitable for decision-making, an appropriate analytical technique must be selected. The EPA Superfund program has developed two descriptive categories of analytical techniques: (1) field-based techniques and (2) fixed-laboratory techniques. The type of data generated depends on the qualitative and quantitative DQOs developed for a project. Regardless of how the data were analyzed, the quality should be adequate for the intended purpose and for decision-making process. Data used to support decisions made for this project were collected using fixed laboratories.

Rigorous analytical methods (e.g., EPA CLP or SW-846 methods) are used to generate analyte-specific, definitive data. The definitive quality of the data is assured by: (1) using SOPs and QC processes during data collection; (2) documented control and traceability of reference standards, calibrations, and instrument performance; and (3) acceptable performance of field and laboratory QC procedures within the defined limits established for these procedures.

**TABLE 2 . QUALITY ASSURANCE INDICATOR CRITERIA**

| Indicator Parameter | Analytical Parameter | QC Sample | Acceptance Criteria for Laboratory Analysis |
|---|---|---|---|
| Accuracy (percent recovery) | VOCs, SVOCs, pesticides, herbicides, PCB Aroclors and congeners | MS, MSD<br>Blanks | 50 to 150 percent recovery<br>Less than CRQL |
| | TAL metals and TSS | MS<br>LCS<br>Blanks [a] | 75 to 125 percent recovery<br>80 to 120 percent recovery<br>Less than CRDL |
| Precision (RPD) | VOCs, SVOCs, pesticides, herbicides, PCB Aroclors and congeners | MS, MSD<br>Field duplicates | 30 percent RPD<br>50 percent RPD |
| | TAL Metals and TSS | MS, MSD or MD<br>Field duplicates | 20 percent RPD (aqueous)<br>35 percent RPD (solid)<br>50 percent RPD |
| Sensitivity (quantitation limits) | Analytical tests | MS, MD, MSD<br>Field duplicates | Not applicable |
| Completeness | The objective for data completeness is 90 percent. | | |
| Representativeness | The sampling network and analytical methods for this site are designed to provide data that are representative of site conditions. | | |
| Comparability | The use of standard published sampling and analytical methods, and the use of QC samples, will ensure data of known quality. These data can be compared to other data of known quality. | | |

NOTE:

[a] May include method blanks, reagent blanks, instrument blanks, calibration blanks, and other blanks collected in the field (such as field blanks)

CRDL = Contract-required detection limit
CRQL = Contract-required quantitation limit
LCS = Laboratory control sample
MD = Matrix duplicate
MDL = Method detection limit
MS = Matrix spike
MSD = Matrix spike duplicate
PCB = Polychlorinated biphenyl
QC = Quality control
RPD = Relative percent difference
SVOC = Semi-volatile organic compound
TAL = Target Analyte List
TSS = Total Suspended Solids
VOC = Volatile organic compound

The majority of the fixed-laboratory analyses were conducted by an EPA-designated CLP laboratory. The analyses listed in Section 4.2 were performed by subcontracted, non-CLP laboratories.

## 5.2 PARCCS EVALUATION

Analytical results were evaluated in accordance with PARCCS parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the project

objectives. Of these PARCCS parameters, precision and accuracy were evaluated quantitatively by collecting the QC check samples listed in Table 2.

The sections below describe each of the PARCCS parameters and how they were assessed within this project.

### 5.2.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates, matrix spike duplicates, and/or laboratory replicates and then calculating the variance between the samples, typically as a RPD.

RPD is calculated as follows:

$$\text{RPD} = \frac{|A - B|}{(A + B)/2} \times 100\%$$

where: A = first duplicate concentration
B = second duplicate concentration.

The acceptance criteria for each analytical methodology are presented in the QAPP. Duplicate results were evaluated for compliance with acceptance criteria for precision for each analytical method. RPD evaluations are documented in individual data validation reports for each SDG which was validated for MS/MSD and laboratory replicate pairs. Sample summaries are presented in Appendix A. The field duplicate RPD evaluations for detected analytes are also presented in Appendix F Table F-1.

The criteria in the FSP for the Phase I and Phase II investigations specify that a minimum of 1 in 10 (10%) of sample matrices be submitted as field duplicates to the laboratory (Kleinfelder 2007; EA 2013a). Field duplicate pairs were collected, analyzed, and evaluated for each matrix. The field duplicate frequency by matrix is shown in Table 3. The overall field project frequency is 10.6 percent for all matrices. The individual frequencies of field duplicate pairs submitted to the laboratory for analysis are provided in Table 3.

**TABLE 3. FIELD DUPLICATE FREQUENCY**

| Matrix | Phase I Samples | Phase I Field Duplicates | Phase I Frequency (%) | Phase II Samples | Phase II Field Duplicates | Phase II Frequency (%) |
|---|---|---|---|---|---|---|
| Ground Water | 25 | 3 | 12 | 42 | 5 | 11.9 |
| Surface Water | 16 | 1 | 6.2 | 43 | 5 | 11.6 |
| Soil | 125 | 12 | 9.6 | 94 | 11 | 11.7 |
| Sediment | 57 | 6 | 10.5 | 20 | 2 | 10 |

The criterion for field duplicate precision is 50% RPD. Only 148 of 843 comparisons exhibited an RPD greater than 50% (Table F-1 of Appendix F). The majority of field duplicate precision

samples (140 of 148) that exceeded 50% RPD were soil and sediment samples. The variability indicates heterogeneity and the uneven distribution of contaminants in the matrix rather than a shortfall in reproducibility in the sampling and analysis process.

Laboratory analytical precision is evaluated by analyzing laboratory duplicates (also called matrix duplicates [MDs]) or MS/MSDs. For this project, MS/MSD and MD samples were generated for analytes. The results of the analysis of each MS/MSD or original sample/MD pair were used to calculate the RPD as a measure of lab precision. The RPD acceptance criteria are listed in Table 2.

### 5.2.2 Accuracy

A program of sample spiking was conducted to evaluate laboratory accuracy. This program includes analysis of the MS and MSD samples, laboratory control samples (LCSs) or blank spikes, surrogate standards, and method blanks. MS and MSD samples were prepared and analyzed at a frequency of 5 percent for soil samples. LCSs or blank spikes are also analyzed at a frequency of 5 percent. Surrogate standards, where available, are added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy. Through the process of data validation and review, MS, LCS, and surrogate recoveries were evaluated for compliance with acceptance criteria for accuracy. The evaluations of percent recovery are documented in Appendix B through D.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where: S = measured spike sample concentration
C = sample concentration
T = true or actual concentration of the spike.

The objective for accuracy of field measurements is to achieve and maintain factory specifications for the field equipment. To this end, appropriate SOPs for instrument calibration were followed and calibration results were properly documented.

### 5.2.3 Representativeness

Representativeness is a qualitative parameter and is defined by the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or a process or environmental condition. Sample results were evaluated for representativeness by examining items related to sample collection, including chain-of-custody documentation, sample labeling, collection dates, and condition of the samples upon receipt at the laboratory. Laboratory procedures were also examined, including anomalies reported by the laboratory, either upon receipt of the samples at the laboratory or during analytical processes; adherence to recommended holding times of samples prior to analysis; calibration of laboratory instruments; adherence to analytical methods; and completeness of data package documentation. Any item that may have adversely affected the representativeness of the sample result is

documented in the data validation narratives. Because of the limited data available for the Phase I investigation, the representativeness evaluation includes the Phase II samples only.

The Phase II samples were analyzed within the holding times specified by the methods, unless otherwise noted in Section 4. Blank results were evaluated during the data validation or review process to determine whether equipment decontamination procedures (equipment rinsate) or laboratory conditions (preparation or calibration blanks) affected sample results. Quality control issues associated with blank contamination were indicated in the CLP Laboratory case narratives. Quality control issues associated with blank contamination in the analyses performed by EA contracted laboratories were addressed in the data validation reports.

The Phase II field investigation program, which was outlined in the FSP and QAPP, was designed to answer the principal study questions from the DQO process identified in Section 2. It is important that the data collected during the field investigation is suitable and sufficient to evaluate the following RI components: source identification, nature and extent determination, migration pathway evaluation, and risk characterization.

A combination of random and judgmental sampling was used during the Phase I sampling activities (Kleinfelder 2007). Phase II sample locations for AOC-3 were selected based upon Visual Sample Plan analysis, and judgmental sample locations were used for the remaining AOCs. The biased/judgmental sample locations were selected based on historical site evidence (e.g., source locations, Phase I sampling results, etc.) or visual cues during the site reconnaissance.

An evaluation of spatial distribution and sample density is an inexact science that is often subject to opinion and conjecture. Datasets inherently have some level of uncertainty with regards to the representativeness of the characterization. Although the level of uncertainty varies from area to area, the acceptable level of uncertainty is often individualistic and subject to interpretation. Essentially, there is a delicate balance between expending additional effort to characterize an area and the necessity for additional data to reduce uncertainty in the data set.

To evaluate the robustness of the data set, two criteria were utilized in a semi-quantitative weight-of-evidence evaluation:

- *Is sampling sufficient to: (1) determine the nature and extent of contamination and (2) calculate an exposure point concentration for risk assessment?* The QAPP (EA 2013a) states that statistical approaches will be consistent with EPA guidance, including ProUCL 4.0 User Guide (Singh, Singh, and Maichle 2007). This guidance recommends that a minimum of 8 to 10 samples is necessary for a data set. The datasets were sufficient to meet this criterion.

- *Is the spatial distribution and sample density adequate to evaluate the nature and extent of contamination and complete the migration pathway analyses?* This evaluation will be the focus of the RI Report and was not the subject of this DESR. The Phase I and Phase II sample locations are presented in Figures 1 through 10 of this report.

### 5.2.4 Completeness

Completeness is defined as the percentage of measurements judged to be valid. The validity of sample results is determined through the data validation process. The rejected (R) sample results are considered to be invalid data. The data that are qualified as estimated detect (J) or estimated nondetect (UJ) are considered to be valid and usable to achieve project objectives. The completeness is calculated and reported for each method and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. Because of the limited data available for the Phase I investigation, the completeness evaluation includes the Phase II samples only.

Of the 25,574 Phase II sample results, 42 were rejected. This resulted in a data completeness of 99.8 percent, which met the data completeness objective of greater than 90 percent. A summary of rejected data is included in Table F-2 of Appendix F.

During sample analysis, some samples required reanalysis with a second or alternative dilution; the sample with higher reporting limits (i.e., more dilution) was eliminated from further consideration so that two results for a single sample were not presented.

### 5.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data was achieved by consistently following standard field and laboratory SOPs and by using standard measurement units in reporting analytical data. Standard EPA analytical methods and QC were used to support the comparability of analytical results with those obtained in other testing. Calibrations were performed in accordance with EPA or manufacturer's specifications and were checked with the frequency specified in the EPA CLP SOW(s) or other EPA methods. No method substitutions were observed that reduced the quality of the data for comparison purposes.

### 5.2.6 Sensitivity

Sensitivity is the measure of the signal from an instrument that represents an actual deflection or response above instrument noise. The analytical sensitivity is measured by the method detection limit or instrument detection limit and reported with the necessary dilution factors, preparation factors, and dry-weight factors of an individual sample as the sample quantitation limit.

Ideally the lowest of the detection limits outlined by the laboratories would be below human health screening levels, analytically achievable quantitation limits are not always low enough to meet this goal. Specific known exceptions to the desired detection limits were discussed during the DQO development, as noted in the QAPP. The suitability of the detection limits achieved will be assessed further in the human health risk assessment.

The analytical parameters and their quantitation limits for use on this project are determined under the EPA CLP SOW(s). The contract-required detection limit (CRDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a

specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix. CRQLs are contractually specified maximum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects.

For this project, analytical methods have been selected so that the CRQL for each target analyte is below the applicable regulatory screening criteria, wherever practical. For this project, samples results were reported as estimated values if concentrations are less than CRQLs but greater than CRDLs. The CRDL for each analyte was listed as the detection limit in the laboratory's electronic data deliverable.

# 6. DATA QUALITY OBJECTIVES AND CONCLUSIONS

With the exception of a few analyses listed in Table F-2, 99.8 percent of the data collected were determined to be usable (unqualified or qualified as estimated). Because data validation results were not available for the Phase I results, only the Phase II results were included in the completeness assessment.

One of the goals of the RI field investigation and data collection efforts was to obtain results of known quality that can support the RI/FS. Based upon an overall review of the results presented within this DESR, the issues identified in the sections below are of importance in this evaluation.

## 6.1 CHEMICALS OF POTENTIAL CONCERN TARGETED

Industry-specific wastes, existing site data, and operational history were considered in development of the Site FSP and QAPP for the Phase II activities (EA 2013a; 2013c). Because the QAPP set forth the DQOs based on knowledge of historic operations and the findings of the previous investigations, the target chemicals were appropriately analyzed and targeted in the RI Phase II field investigation.

## 6.2 MEDIA VARIABILITY

Field QC samples including field duplicates, MS/MSD samples, trip blanks, field blanks and equipment rinsates were collected to ensure that measurement error was reduced and to increase general confidence in the analytical results.

## 6.3 LABORATORY PERFORMANCE

Laboratory performance for the Phase II RI sample analysis achieved the project DQOs. There were no laboratory issues associated with the Phase II field investigation samples analyzed by the EA subcontractor laboratories. Laboratory performance for the EPA contracted laboratories was not provided in the data validation report.

## 6.4 CONCLUSIONS

The analytical results for this sampling event met the overall project objectives for the quantity and quality of data required to support the decision-making process of this investigation. Because of the limited data available for the Phase I investigation, the completeness evaluation includes the Phase II samples only. Of the 25,574 Phase II sample results, 42 were rejected due to poor data quality. This resulted in an overall data completeness of 99.8 percent, which achieved the data completeness objective of 90 percent.

Data with no qualification and detect and nondetect data qualified as estimated are still usable to achieve the project objectives. Data validation reports for the Phase I samples were not available and therefore not included in this report. The validated Phase II data were found to be representative and comparable for the samples. Precision and accuracy were acceptable with the exception of the rejected results presented in Table F-2 of Appendix F.

# 7. REFERENCES

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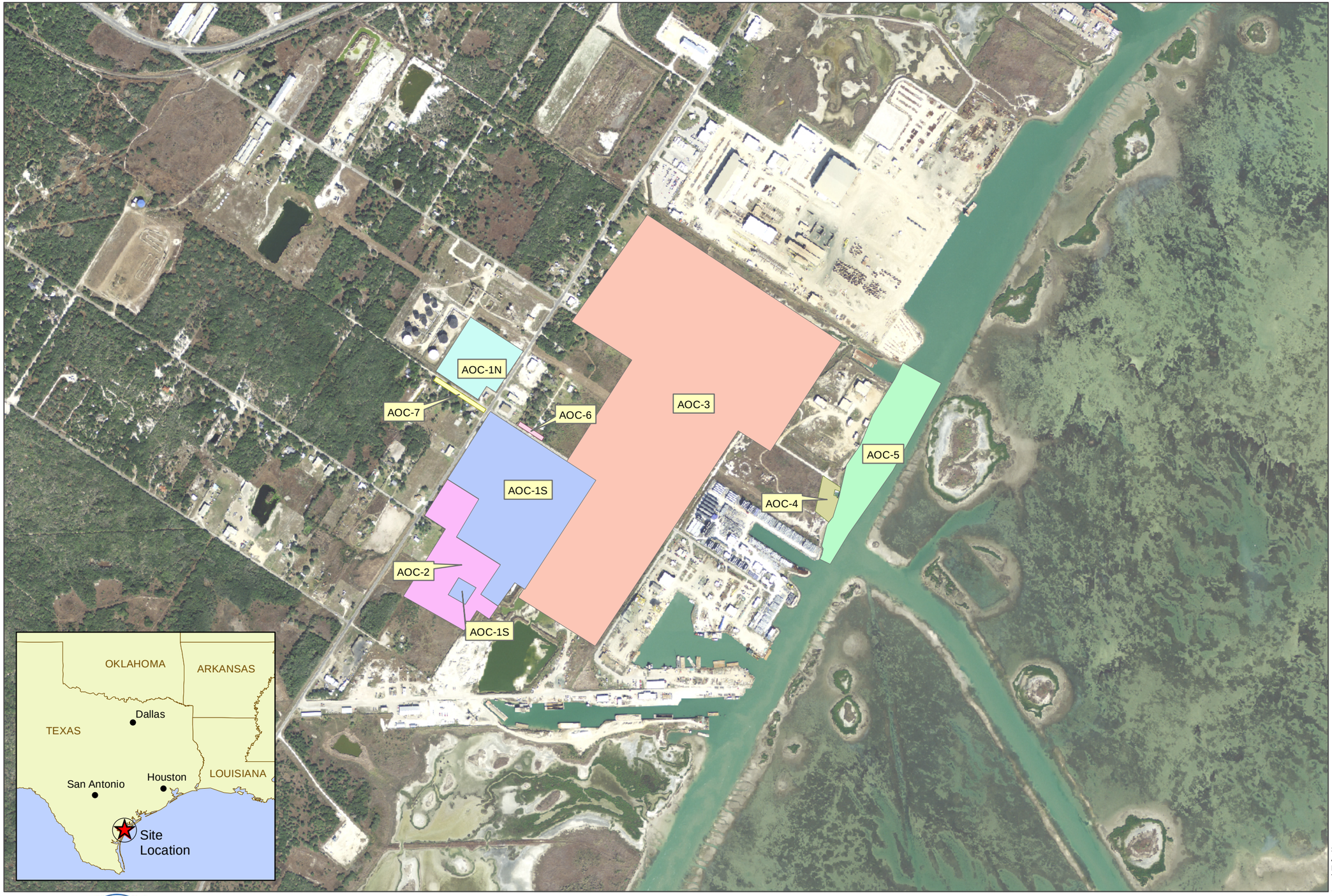
# Figures




N

0 750 1,500

Feet

1 inch = 1,000 feet

Sources:
Areas of Concern: TRC, dated, March 10, 2011.
Image: 2009 Texas Orthoimagery Program,
Texas Strategic Mapping Program, TNRIS, 2009.

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 1
Site Map
Data Evaluation Summary Report

2015 -01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 1 Location.mxd EA-Dallas rmullen

N

0 100 200

Feet

1 inch = 200 feet

**Legend:**

- Soil Sample (2007/2008)
- Soil Sample (2013)
- Ground Water Sample (2007/2008)
- Ground Water Sample (2013/2014)
- Area of Concern 1 Boundary

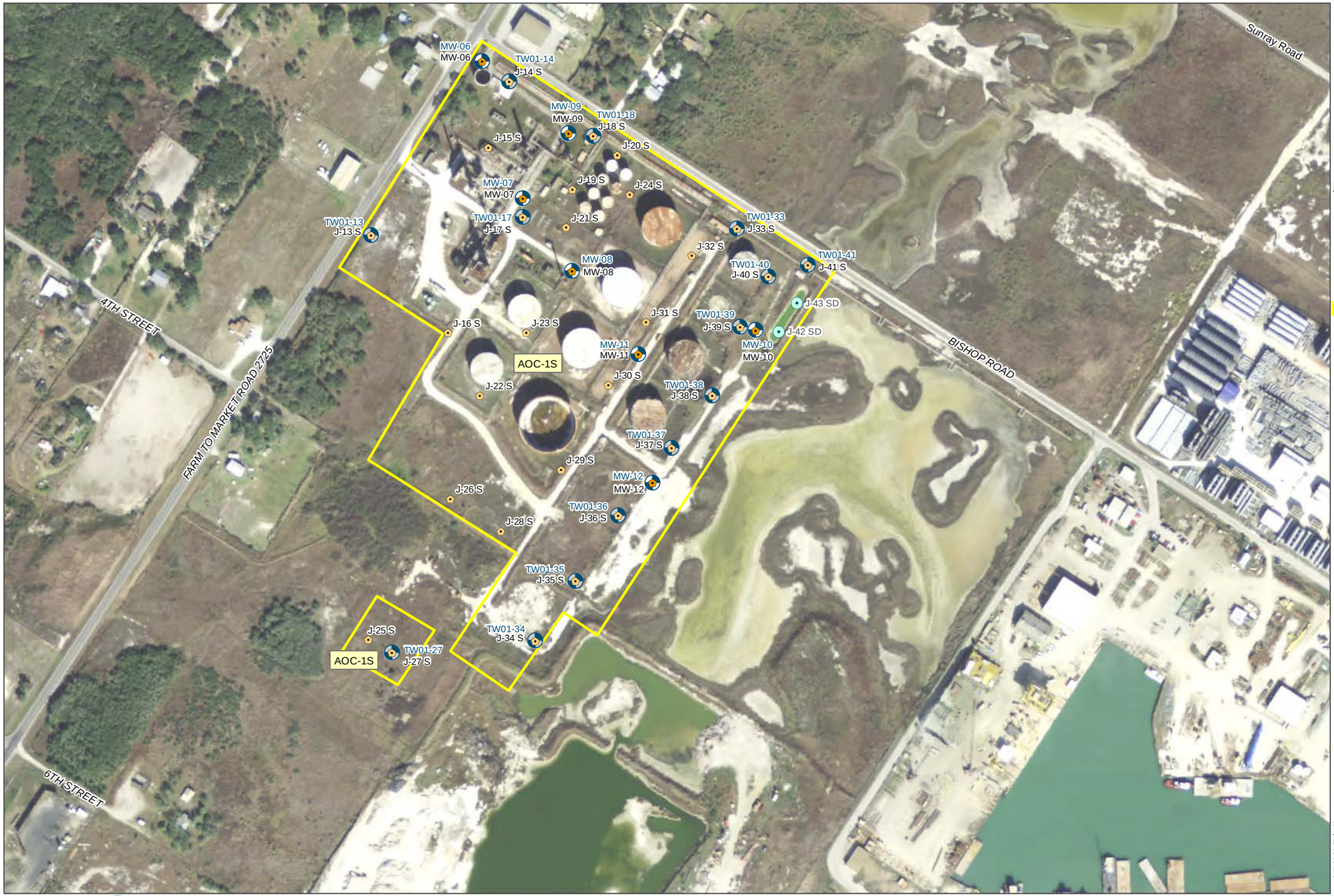
Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern: TRC, dated, March 10, 2011
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 2
Sample Location Map for Area of Concern 1N
Data Evaluation Summary Report

2015-01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 2 AOC1_N.mxd EA-Dallas rmullen




N

0 100 200

Feet

1 inch = 300 feet

**Legend:**

- Soil Sample (2007/2008)
- Soil Sample (2013)
- Surface Water and Sediment Samples (2007/2008)
- Ground Water Sample (2007/2008)
- Ground Water Sample (2013/2014)
- Area of Concern 1 Boundary

Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern Boundary: TRC, dated March 10, 2011.
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009.

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 3
Sample Location Map for Area of Concern 1S
Data Evaluation Summary Report

2015 -01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 3 AOC1_S_2.mxd EA-Dallas rmullen

N

0 100 200

Feet

1 inch = 200 feet

**Legend:**

- Composite Soil Sample 1 (2007/2008)
- Composite Soil Sample 2 (2007/2008)
- Composite Soil Sample 3 (2007/2008)
- Composite Soil Sample 4 (2007/2008)
- Soil Sample (2013)
- Ground Water Sample (2013/2014)
- Area of Concern 2 Boundary

Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern: TRC, dated, March 10, 2011
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 4
Sample Location Map for Area of Concern 2
Data Evaluation Summary Report

2015 -01 -07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 4 AOC2.mxd EA-Dallas rmullen

N

0 250 500

Feet
1 inch = 510 feet

**Legend:**

- Soil Sample (2007/2008)
- Soil Sample (2013)
- Ground Water Sample (2013/2014)
- Sediment Sample (2007/2008)
- Sediment/Surface Water Sample (2007/2008)
- Surface Water Sample (2013)
- Area of Concern 3 Boundary

Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern Boundary:TRC, dated March 10, 2011.
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009.

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 5
Sample Location Map for Area of Concern 3
Data Evaluation Summary Report

2015-01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 5 AOC3.mxd EA-Dallas rmullen

N

0 50 100

Feet
1 inch = 100 feet

**Legend:**

- Composite Soil Sample (2007/2008)
- Soil Sample (2013)
- Ground Water Sample (2013/2014)
- Area of Concern Boundary

Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern Boundary: TRC, dated March 10, 2011.
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 6
Sample Location Map for Area of Concern 4
Data Evaluation Summary Report

2015-01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 6 AOC4.mxd EA-Dallas rmullen

N

0 150 300

Feet

1 inch = 300 feet

**Legend:**

- Surface Water and Sediment Sample (2007/2008)
- Surface Water and Sediment Sample (2013)
- Surface Water Sample (2014)
- Area of Concern Boundary

Sources:
Area of Concern Boundary: TRC, dated March 10, 2011.
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 7
Sample Location Map for Area of Concern 5
Data Evaluation Summary Report

2015-01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 7 AOC5.mxd EA-Dallas rmullen

N

0 50 100

Feet

**Legend:**

- Soil Sample (2007/2008)
- Ground Water Sample (2007/2008)
- Area of Concern 6 Boundary

Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern Boundary: TRC, dated, March 10, 2011.
2007/2008 Samples: Kleinfelder 2009.
Image: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009.

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 8
Sample Location Map for Area of Concern 6
Data Evaluation Summary Report

2015 -01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 8 AOC6.mxd EA-Dallas rmullen

N

0 50 100

Feet

**Legend:**

- Soil Sample (2007/2008)
- Area of Concern 7 Boundary

Source: AOC and Pipeline Source:
TRC, dated, March 10, 2011
2007/2008 Samples: Kleinfelder 2009.
Image: 2009 Texas Orthoimagery Program,
Texas Strategic Mapping Program, TNRIS, 2009

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 9
Sample Location Map for Area of Concern 7
Data Evaluation Summary Report

2015-01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 9 AOC7.mxd EA-Dallas rmullen

N

0 750 1,500

Feet

1 inch = 1,500 feet

**Legend:**

- Soil Sample (2007/2008)
- Soil Sample (2013)
- Surface Water and Sediment Sample (2007/2008)
- Surface Water and Sediment Sample (2013)
- Ground Water Sample (2007/2008)
- Ground Water Sample (2013)
- Areas of Concern Boundary

Note:
Groundwater sample locations with a "MW" or "TW" prefix indicate that the sample was collected from a permanant or temporary well, respectively.

Sources:
Area of Concern Boundaries: TRC, dated March 10, 2011.
2007/2008 Samples: Kleinfelder 2009.
2013 Samples: EA 2014.
Image: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009.

Falcon Refinery Superfund Site
Ingleside, San Patricio County,Texas

Figure 10
Sample Location Map for Background Samples
Data Evaluation Summary Report

2015 -01-07 P:\gis\Projects\Falcon\MXDs\DESR\Figure 10 Background.mxd EA-Dallas rmullen