Michael Renzulli - LSRP

71 Potts Road, Robbinsville, NJ 08691
Office/Fax: 609-249-2699
Mobile: 609-744-7445
E-mail: mike@renzullilsrp.com

February 15, 2021

Mr. Charles Zielinski
Bureau of Case Management
P.O. Box 420. Mail Code 401-05F
401 East State Street
Trenton, NJ 08625

RE: Bayway Refinery Complex Site Remediation
Investigative Area of Concern A18 (Pitch)
- **Revised Feasibility Study Report Addendum**
- **Technical Impracticability Report**
- **Pilot Program Completion Report**

Bayway Refinery
1400 Park Avenue
Linden, Union County, New Jersey
SRP PI# 008282

Dear Mr. Zielinski:

Enclosed please find one electronic copy of each of the following reports for Investigative Area of Concern (IAOC) A18 (Pitch) for the Bayway Refinery Complex (BRC) in Linden, New Jersey prepared on behalf of ExxonMobil Environmental and Property Solutions Company by Kleinfelder, Inc.:

- Revised Feasibility Study Report Addendum
- Technical Impracticability Report
- Pilot Program Completion Report

As LSRP for the BRC, I have reviewed the attached three documents and I find the presentation of the data to be acceptable and compliant with requirements contained with N.J.A.C 7:26E. I find the studies and recommendations to be protective of human health and safety and the environment and to be consistent with the approved version of the Remediation Strategy Road Map document for the site. I therefore approve the submittal of the IAOC A18 Revised Feasibility Study Report Addendum, the Technical Impracticability Report, and the Pilot Program Completion Report to the New Jersey Department of Environmental Protection.

Please contact me at (609) 249-2699 should you have any questions.

Best regards,

Michael Renzulli - LSRP

Michael Renzulli

Michael J. Renzulli, P.G., LSRP

Enclosure

Cc: M. Forlenza – ExxonMobil Environmental and Property Solutions Company
P. Lucuski - Kleinfelder

ExxonMobil Environmental and Property Solutions
Park & Brunswick Avenue
Building 7 – Site Remediation
Linden, New Jersey 07036
703.963.7132 Telephone

Maureen P. Forlenza
Bayway Team Lead Project Manager

E&PS

Date: 2/15/2021

Mr. Mike Renzulli, PG, LSRP
Michael Renzulli - LSRP
71 Potts Road
Robbinsville, New Jersey 08691

Re: Bayway Refinery Complex Site Remediation:
Revised Feasibility Study Report Addendum
Technical Impracticability Report
Pilot Program Completion Report
Investigative Area of Concern A18 (Pitch)
Bayway Refinery
1400 Park Avenue
Linden, Union County, New Jersey
SRP PI# 008282

Dear Mr. Renzulli:

Enclosed please find one electronic copy of each of the following reports for Investigative Area of Concern (IAOC) A18 (Pitch) prepared on behalf of ExxonMobil Environmental and Property Solutions Company by Kleinfelder, Inc.:

- Revised Feasibility Study Report Addendum
- Technical Impracticability Report
- Pilot Program Completion Report

Please sign the attached New Jersey Department of Environmental Protection (NJDEP) Traditional Oversight Form for submittal to the NJDEP Case Manager, Charles Zielinski.

The reports will be initially submitted to the NJDEP electronically, followed by the original hard copies (with an additional electronic version) within the next 30 days.

Please contact me at (703) 963-7132 if you have any questions.

Sincerely,

Maureen Forlenza
Bayway Team Lead Project Manager

cc: S. Ferreira – USEPA (electronically)
D. LaMond – Phillips 66 (electronically)
C. McCardell – Stantec (electronically)

New Jersey Department of Environmental Protection
Site Remediation and Waste Management Program

TRADITIONAL/DIRECT OVERSIGHT REPORT CERTIFICATION FORM

Date Stamp
(For Department use only)

SECTION A. SITE NAME AND LOCATION

Site Name: ExxonMobil Bayway Refinery Complex

List All AKAs:

Street Address: 1400 Park Avenue, Building 7

Municipality: Linden (Township Borough or City)

County: Union Zip Code: 07036

Program Interest (PI) Number(s): 008282 Case Tracking Number(s): RCP000002

SECTION B. REPORT INFORMATION

Report Name: Technical Impracticability Report; Revised Feasibility Study Report Addendum; Pilot Program Completion Report

Report Date: 12/09/2020

Case Type:

- ☒ **RCRA GPRA 2020**
- ☐ **CERCLA/NPL**
- ☐ **USDOD**
- ☐ **USDOE**
- ☐ **Direct Oversight**
- ☐ **Other** (explain):

SECTION C. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: EM Environmental & Property Solutions Co

Representative First Name: Maureen Representative Last Name Forlenza

Title: Bayway Team Lead Project Manager

Phone Number: (703) 963-7132 Ext: Fax:

Mailing Address: Park and Brunswick Avenue - Building 7 - Site Remediation

City/Town: Linden State: New Jersey Zip Code: 07036

Email Address: maureen.p.forlenza@exxonmobil.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: Maureen Forlenza Date: 2/16/21

Name/Title: Maureen Forlenza/PM EMEPSC, Agent/Attorney in fact EMC

SECTION D. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: 584467

First Name: Michael Last Name: Renzulli

Phone Numbers: (609) 249-2699 Ext.: Fax:

Mailing Address: 71 Potts Road

Municipality: Robbinsville State: New Jersey Zip Code: 08691

Email Address: mike@renzullilsrp.com

This statement shall be signed by the LSRP who is submitting this notification in accordance with N.J.S.A. 58:10C-14, and N.J.S.A. 58:10B-1.3b(1) and (2).

(1) I certify, as a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C-1 et seq. to conduct business in New Jersey, that for the remediation described in this submission, and all attachments included in this submission, I personally: Managed, supervised, or performed the remediation conducted at this site that is described in this submission, and all attachments included in this submission; and/or periodically reviewed and evaluated the work performed by other persons that forms the basis for the information in this submission; and/or completed the work of another site remediation professional, licensed or not, after having: (1) reviewed all available documentation on which I relied; (2) conducted a site visit and observed the then-current conditions and verified the status of as much of the work as was reasonably observable; and (3)concluded, in the exercise of my independent professional judgment, that there was sufficient information upon which to complete any additional phase of remediation and prepare workplans and reports related thereto.

(2) I certify:

- *That I have read this submission and all attachments to this submission;*
- *That in performing the professional services as the licensed site remediation professional for the entire site or each area of concern, I adhered to the professional conduct standards and requirements governing licensed site remediation professionals provided in N.J.S.A. 58:10C-16;*
- *That the remediation conducted at the entire site or each area of concern, that is described in this submission and all attachments to this submission, was conducted pursuant to and in compliance with the remediation requirements in N.J.S.A. 58:10C-14.c;*
- *That the remediation described in this submission, and all attachments to this submission, was conducted pursuant to and in compliance with the regulations of the Site Remediation Professional Licensing Board at N.J.A.C. 7:26I; and*
- *That the information contained in this submission and all attachments to this submission is true, accurate, and complete.*

(3) I certify, when this submission includes a response action outcome, that the entire site or each area of concern has been remediated in compliance with all applicable statutes, rules, and regulations and is protective of public health and safety and the environment.

(4) I certify that no other person is authorized or able to use any password, encryption method, or electronic signature that the Board or the Department have provided to me.

(5) I certify that I understand and acknowledge that:

- *If I knowingly make a false statement, representation, or certification in any document or information I submit to the Department I may be subject to civil and administrative enforcement pursuant to N.J.S.A. 58:10C-17.a.1(a)through (f) by the Board, including but not limited to license suspension, revocation, or denial of renewal; and*
- *If I purposely, knowingly, or recklessly make a false statement, representation, or certification in any application, form, record, document or other information submitted to the Department or required to be maintained pursuant to the Site Remediation Reform Act, I shall be guilty, upon conviction, of a crime of the third degree and shall, notwithstanding the provisions of subsection b. of N.J.S.2C:43-3, be subject to a fine of not less than $5,000 nor more than $75,000 per day of violation, or by imprisonment, or both.*

(6) I certify that I have read this certification prior to signing, certifying, and making this submission.

LSRP Signature: Michael Renzulli Date: 2/15/2021

LSRP Name: Michael J. Renzulli, PG/LSRP

Company Name: Michael Renzulli - LSRP

Completed forms should be sent to:

Assigned Case Manager
Bureau of Case Management
Site Remediation Program
NJ Department of Environmental Protection
401-05F
PO Box 420
Trenton, NJ 08625-0420

Certifications

Submissions: **Revised Feasibility Study Report Addendum**
Technical Impracticability Report
Pilot Program Completion Report
Investigative Area of Concern A18 (Pitch)
Bayway Refinery Complex
Linden, New Jersey

Date:

General Objection

ExxonMobil objects to the certification requirement and reserves all rights to the extent that the requirement of a certification and its terms herein are inconsistent with contractual provisions and conduct under the Administrative Consent Order (ACO) executed between ExxonMobil and the Department. Further, due to the limitations imposed by the necessary manner in which data and other information is collected and summarized, there is no one person who has direct knowledge of all the information used to prepare this submission and who also has overall responsibility for all of the information contained in the submission.

N.J.A.C. 7:26E-1.5(a)

This submission is certified pursuant to N.J.A.C. 7:26B-1.6 and the certification is made subject to the statutory provisions of N.J.S.A. 2C:28-3(a). Because of the limitations imposed by the manner in which information is collected and summarized, there is no one person who has direct knowledge of all the information used to prepare the submission and who also has overall responsibility for all of the information contained in the submission; however, based on the above and the General Objection and my review of the information transmitted in this submission:

> "I certify under penalty of law that I have personally examined and am familiar with the information submitted herein including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize that violation of any statute, I am personally liable for the penalties."

Notarized: Date:

Thaddeus J. Briones

THADDEUS J BRIONES
Notary Public, State of New Jersey
My Commission Expires
October 14, 2021

2/16/2021

Maureen Forlenza

Maureen Forlenza
Bayway Team Lead Project Manager,
ExxonMobil Environmental and Property
Solutions Company – Agent and
Attorney in Fact for ExxonMobil

December 9, 2020

Ms. Maureen Forlenza
Bayway Team Lead Project Manager
1900 East Linden Avenue
Building 28A
Linden, New Jersey 07036

Re: Revised Feasibility Study Report Addendum
Responses to NJDEP's comments letter dated April 30, 2019
Bayway Refinery Complex
Park Avenue and Brunswick Avenue
Block 520, Lot 6
City of Linden, Union County, New Jersey
NJDEP SRP Program Interest (PI) No.: 008282
NJDEP DLUR File No.: 2009-04-0001.1 FWW 150001 FWW 140001

Dear Ms. Forlenza:

A *Revised Feasibility Study Report* (RFSR) which proposed remedial actions for Investigative Area of Concern (IAOC) A18 was submitted to the New Jersey Department of Environmental Protection (NJDEP) in August 2018. The NJDEP provided comments on the RFSR in a letter dated April 30, 2019 (**Appendix A**). On June 18, 2019, a meeting between representatives of ExxonMobil Environmental and Property Solutions Company (ExxonMobil), Phillips 66 (property owner), the Licensed Site Remediation Professional (LSRP), Arcadis U.S. Inc. (Arcadis), Kleinfelder Inc. (Kleinfelder) and the NJDEP Site Remediation Program (SRP) and Bureau of Environmental Evaluation and Risk Assessment (BEERA) was held to review the NJDEP's comments on the RFSR. A written summary of the topics discussed during the meeting and in follow-up telephone conversations between the NJDEP SRP Case Manager and the LSRP was submitted to the NJDEP on July 25, 2019 (**Appendix A**). The NJDEP Case Manager responded to the July 25, 2019 submittal via electronic mail on August 14, 2019 stating that the data presented to the NJDEP in the RFSR and the June 18, 2019 meeting demonstrated the technical challenges. However, a *Technical Impracticability Report* and *Pilot Study Summary Report* are supporting documents to the RFSR which are necessary to demonstrate the technical challenges of IAOC A18. The NJDEP could not concur that the technical challenges are sufficient to support the remedy proposed in the RFSR without the *Technical Impracticability* and *Pilot Study Summary Reports* (**Appendix A**). A written response to the NJDEP's April 30, 2019 comments on the RFSR was submitted to the NJDEP on August 15, 2019 (**Appendix A**). The August 15, 2019 response document stated that Comments # 3, 4, 7 and 9 from the NJDEP's April 30, 2019 letter would be addressed in a future submittal.

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This *RFSR Addendum* was prepared to address NJDEP's Comments # 3, 4, 7 and 9 from the April 30, 2019 letter which were not addressed in the August 15, 2019 response to comments. A *Technical Impracticability Report* will be prepared to document the technical impracticability considerations associated with implementing removal or treatment remedial actions in IAOC A18. A *Pilot Study Summary* will be prepared to document the activities conducted during the Pilot Program conducted in IAOC A18 in 2018 and 2019. The *Technical Impracticability Report* and *Pilot Study Summary Report* submitted to the NJDEP under separate cover.

RESPONSES TO NJDEP'S COMMENTS THAT WERE NOT ADDRESSED IN THE AUGUST 15, 2019 LETTER

Comments # 1, 2, 5, 6, 8 and 10 were addressed in the letter submitted to the NJDEP on August 15, 2019 (**Appendix A**). Below are responses to the four comments that were not addressed in the August 15, 2019 letter.

- **NJDEP Comment # 3** – *Please submit all the previous data for the site. The figures submitted only displayed 2015 through 2016 data. Please revise the figures to display all sampling data collected on this IAOC*.
  - **Response** – Historical site data is included in **Tables 1A** through **1F** (soil) and **2A** through **2F** (ground water), and on **Figures 1A** through **1E** (soil) and **Figures 2A** through **2C** (ground water).
- **NJDEP Comment # 4** – *No cost analysis has been submitted for any of the alternatives. Please include a cost analysis for each alternative.*
  - **Response** – As presented in the July 2014 *Feasibility Study Report for the Pitch Area: Investigative Area of Concern A18* prepared by TRC Environmental Corporation, four remedial alternatives were retained for evaluation for the former Pitch Disposal Area; seven remedial alternatives were retained for evaluation for the Mudflat Area; and five remedial alternatives were retained for evaluation for ground water in IAOC A18.

    As presented in the August 2018 RFSR (Kleinfelder, 2018), eleven remedial technology and process options were evaluated based on:
    - The ability of the technology process option to satisfy specific performance criteria; and
    - The anticipated performance of the technology process option relative to the other potential technology process options.

    It was determined that none of the eleven technology process options can be implemented as stand-alone remedial action alternatives. However, certain technology process options can be combined to form comprehensive remedial action alternatives to address soil and ground water impacts at IAOC A18. The retained technology process options were

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assembled into two comprehensive remedial action alternatives to address soil and ground water impacts associated with IAOC A18:

- Alternative 1 – Limited surface excavation of pitch material and mudflat area soils, perimeter sheet pile wall installation, and reactive cap installation; and
- Alternative 2 - Perimeter sheet pile wall installation and impermeable cap installation.

Subsequent to submittal of the RFSR, the potential wetland restoration/enhancement was added to the scope of Alternative 2.

Kleinfelder has prepared feasibility level (-30% / +50%, or lower range / higher range) costs for the two remedial alternatives that were retained for consideration in the RFSR as listed below:

Remedial Area/Option	Alternative 1	Alternative 2
Description	Limited surface excavation of Pitch Material and Mudflat Area soils, perimeter sheet pile wall and reactive cap installation	Perimeter sheet pile wall installation, impermeable cap installation and wetlands restoration
Construction and Management Cost Range		
Lower Range	$59,300,000	$35,600,000
Higher Range	$75,500,000	$53,200,000
30% Contingency		
Lower Range	$14,900,000	$8,900,000
Higher Range	$19,000,000	$13,400,000
Total		
Lower Range	$74,200,000	$44,500,000
Higher Range	$94,500,000	$66,500,000

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- **NJDEP Comment # 7** – *ExxonMobil should develop a comprehensive map of historical total petroleum hydrocarbon (TPH) and extractable petroleum hydrocarbon (EPH) soil and sediment data for IAOC A18 including the vertical extents of TPH greater than 10,000 milligrams per kilogram (mg/kg) and EPH greater than 17,000 mg/kg. ExxonMobil should include information from the geotechnical soil boring logs (Appendix F) because the logs identify the presence of pitch, and from the descriptions in the boring logs of Appendix B (e.g., "residual oil" at a depth of 11 to 12 feet in ASB-861, "PITCH MATERIAL" in GMW-686, etc.). The locations of Historical LNAPL locations (Figure 7) should also be included and identified on the comprehensive TPH/EPH map. The infrastructure appurtenances and sized are not identical on all figures (e.g. Figure 5D versus Figure 12). ExxonMobil should include all infrastructure appurtenances and standardize the horizontal dimensions to be consistent between maps, especially maps where remediation evaluations are included.*
    - **Response** - A comprehensive TPH/EPH map is included as **Figure 1E** and TPH and EPH analytical results are included in **Table 1E**. The NJDEP's *Evaluation of Extractable Petroleum Hydrocarbons in Soil Technical Guidance* (NJDEP, 2019) categorizes EPH products as follows:
        - Category 1 EPH – No. 2 heating oil and diesel fuel; and
        - Category 2 EPH – No 4. heating oil, No. 6 heating oil, hydraulic oil, cutting oil, lubricating oil, crude oil, waste oil, unknown petroleum hydrocarbons, waste vehicular crankcase oil, mineral oil, dielectric fluid, dielectric mineral oil, transformer oil, or EPH-type discharges associated with manufactured gas plant (MGP) sites.

      EPH in IAOC A18 is classified as Category 2 EPH because Pitch Material is a residue generated from the batch distillation of crude oil and unknown petroleum hydrocarbons are present in IAOC A18. The guidance document states that an EPH Default Product Limit (DPL) for Category 2 EPH products including crude oil is 8,000 milligrams per kilogram (mg/kg). The NJDEP's guidance document also states that EPH product determined to be immobile can have an alternative product limit greater than the EPH DPL concentration but may not exceed the 30,000 mg/kg product "ceiling limit". Exceedances of the NJDEP EPH Category 2 DPL have been detected at depths ranging from the ground surface to approximately 12 feet below grade (fbg). Although the NJDEP's Comment # 7 requested a figure showing locations where EPH concentrations exceeded 17,000 mg/kg, **Figure 1E** shows the locations where EPH concentrations have exceeded the currently-applicable EPH DPL of 8,000 mg/kg. Additionally, this figure shows locations where EPH concentrations have exceeded the EPH product ceiling limit of 30,000 mg/kg, and where TPH concentrations have exceeded the TPH criterion of 10,000 mg/kg.

      It should be noted that the TPH criterion of 10,000 mg/kg is no longer an applicable standard based on the NJDEP's *Phase-in for the Implementation of the "Protocol for Addressing Extractable Petroleum Hydrocarbons' and the Associated Analytical Method Analysis of*

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Extractable Petroleum Hydrocarbon Compounds (EPH) in Aqueous and Soil/Sediment/Sludge Matrices" – Version 3.0 (EPH Phase-in), dated August 9, 2010.

The extent of Pitch Material determined during historical remedial investigation activities, including completion of these geotechnical soil borings, was presented on figures included in the RFSR and is also shown on **Figure 1E**. Based on the number of borings completed in IAOC A18, it is impractical to include data boxes with depths, EPH/TPH concentrations, Pitch Material thickness, etc. on this figure because data boxes would obscure the boring locations and site features. Soil analytical data is included in **Tables 1A** through **1E** and available boring logs are included in **Appendix B**. During recent investigation activities, Pitch Material has been detected at thicknesses of up to 8 feet. The greatest thicknesses of Pitch Material have generally been detected in the western portion of the former Pitch Disposal Area. Pitch Material thickness generally decreases to one foot or less toward the eastern side of the former Pitch Disposal Area. Pitch Material is present beneath active refinery infrastructure (the Salt Water Line and Intra-Refinery Pipelines). Pitch Material has not been observed in the area of IAOC A18 located to the east of the Poly Ditch.

Locations where LNAPL has been detected during historical remedial investigation activities are also shown on **Figure 1E**. It should be noted that free product has not been observed in soil borings with the possible exception of the "residual oil" described in the boring log for ASB-861, as stated in the NJDEP's Comment # 7. As shown on **Figure 1E**, exceedances of the NJDEP EPH Category 2 DPL of 8,000 mg/kg have not necessarily correlated to observations of LNAPL in soil borings or monitoring wells, particularly in the Mudflat Area of IAOC A18.

The scale of the figures and the sizes of the site features are consistent on the attached figures. The scale of figures and sizes of site features will be consistent in future deliverables.

The proposed remedial approach for IAOC A18 involves containment of these conditions via a perimeter barrier wall and an impermeable cap. A hydraulic control system is also an element of the proposed remedial action and is intended to prevent ground water mounding upgradient of the barrier wall, maintain hydraulic control at gaps in the barrier wall (i.e. the location of utility crossings) and prevent migration of impacted ground water and LNAPL to the adjacent water bodies. Limited removal of Pitch Material and soil may be conducted as necessary to facilitate installation of the perimeter barrier wall and impermeable cap. Full-scale removal of Pitch Material and impacted soil is technically impracticable, as detailed in the *Technical Impracticability Report*.

- **NJDEP Comment # 9** - *Please provide a full vertical and horizontal delineation of the pitch material where EPH elevations are greater than 30,000 mg/kg.*
  - **Response** - The horizontal extent of Pitch Material in IAOC A18 was refined during the pre-design investigation (PDI) and supplemental PDI activities conducted in 2015 and

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2016. The approximate horizontal extent of Pitch Material in IAOC A18 based on historical borings and PDI/supplemental PDI activities is shown on **Figure 1E**. Pitch Material has been detected at thicknesses up to approximately 8 feet in the western portion of the former Pitch Disposal Area, and decreases to less than 1 foot toward the eastern side. Pitch Material has been observed as sporadic, non-contiguous deposits, usually at the surface, within the Mudflat Area. Pitch Material has not been observed in soil borings advanced to the east of the Poly Ditch.

Pitch Material is present to the northern boundary of IAOC A18, including beneath the inter-refinery pipelines (IRPL). PDI activities are currently being conducted in IAOC A17 to the north of IAOC A18 to support the selection and design of a remedial action for that area. PDI activities in IAOC A17 include an evaluation of the presence and extent of Pitch Material in IAOC A17. Pitch Material that may extend to the north of the IRPL will be addressed as part of the remedial action for IAOC A17.

A comprehensive TPH/EPH map is included as **Figure 1E**. EPH concentrations that exceed the Product Ceiling Limit (30,000 mg/kg) are present throughout the Former Pitch Disposal Area, Mudflat Area and the area east of the Poly Ditch at depths ranging from the ground surface (multiple locations) through 11.5 feet below grade (SB-16). These exceedances extend approximately to the perimeter of IAOC A18 adjacent to the water bodies (Morses Creek and Poly Ditch).

Based on the results of geotechnical borings completed during the Pilot Program in 2018 and 2019 and historical soil investigation activities, glacial till is present at depths ranging from approximately 16 to 26 feet below grade along the edge of the Mudflat Area and at depths ranging from approximately 10 to 18 feet below grade in the Former Pitch Disposal Area and Mudflat Area north of the Salt Water Line. Pitch Material and EPH concentrations that exceed the Product Ceiling Limit in IAOC A18 are present above the glacial till.

The selected remedial action for IAOC A18 includes a perimeter barrier wall to prevent migration of contaminants from the subsurface in IAOC A18 to the surrounding water bodies. The perimeter barrier wall is expected to be constructed to the top of, or into, the glacial till beneath IAOC A18. The glacial till beneath IAOC A18 is a hydraulically confining layer based on aquifer testing conducted throughout the Bayway Refinery Complex, which will prevent the vertical migration of contaminants within IAOC A18. Additionally, a capping system is expected to be constructed over the Former Pitch Disposal Area and Mudflat Area to prevent direct contact with Pitch Material and contaminants in the subsurface by site workers and ecological receptors. Horizontal and vertical delineation of each individual exceedance has not historically been completed for IAOC A18 for the following reasons:

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- Vertical delineation is completed by the hydraulically confining glacial till layer.
- Contaminants can only migrate downward as far as the depth of the glacial till.
- The selected remedial action (perimeter barrier wall) will contain the horizontal extent of Pitch Material and contaminants in soil.
- The selected remedial action (capping system) will prevent direct contact by site workers and ecological receptors, regardless of the depth of the exceedance.

Additional information including cross sections of IAOC A18 will be included in the forthcoming *Remedial Action Workplan*.

CLOSING

This *RFSR Addendum* was prepared to address NJDEP's Comments # 3, 4, 7 and 9 from the April 30, 2019 letter which were not addressed in the August 15, 2019 response to comments. A *Technical Impracticability Report* and a *Pilot Study Summary* will be submitted to the NJDEP under separate cover. Following approval of the RFSR, the *RFSR Addendum*, the *Technical Impracticability Report* and the *Pilot Study Summary Report* by the NJDEP, a *Remedial Action Workplan* which will include a conceptual design will be prepared and submitted to the NJDEP.

If you have any additional questions, please contact Michael Meyerhoefer of Kleinfelder at mmeyerhoefer@kleinfelder.com or 631.671.7597.

Sincerely,
Kleinfelder, Inc.

David C. Hutnick
Environmental Scientist

Michael Meyerhoefer
Senior Project Manager

Electronic Copy: Michael Renzulli, LSRP
Deborah LaMond, P66
Justin Moses, Kleinfelder
Project File

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Tables

TABLE 1A
SOIL ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment	NJ ECO Saline Estuary Sediment	NJDEP NRDCSRS	NJDEP RDCSRS	AGRO-1	AGRO-10	AGRO-11	AGRO-12	AGRO-2	AGRO-3	AGRO-4	AGRO-5	AGRO-6	AGRO-7	AGRO-8	AGRO-9	ASB-1012				
Date								2016-11-02	2016-11-07	2016-11-09	2016-11-09	2016-11-02	2016-11-02	2016-11-03	2016-11-02	2016-11-03	2016-11-03	2016-11-07	2016-11-07	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21
Start Depth								0	0	0	0	0	0	0	0	0	0	0	0	1.5	3.5	7.5	8	10
End Depth								1	1	1	1	1	1	1	1	1	1	1	1	2	4	8	8.5	10.5
Grid Cell (Figures 1A through 1E)								B3	D3	C3	C3	C2	C2	C2	C1	C2	C2	D3	D3			B3		
Chemical	Units																							
1,1,1-Trichloroethane	mg/kg	29.8	~	~	~	~	160000	<0.022	<0.26	<0.00049	<0.026	<0.021	<0.024	<0.026	<0.026	<0.00030	<0.19	<0.00040	<0.44	<0.004	<0.007	<0.01	<0.003	<0.0008
1,1,2,2-Tetrachloroethane	mg/kg	0.127	~	~	~	3	1	<0.031	<0.37	<0.00071	<0.037	<0.030	<0.034	<0.037	<0.037	<0.00042	<0.27	<0.00058	<0.63	<0.003	<0.005	<0.007	<0.002	<0.0005
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	~	~	~	~	~	~	<0.063	<0.76	<0.0014	<0.074	<0.060	<0.070	<0.074	<0.076	<0.00086	<0.54	<0.0012	<1.3	<0.004	<0.007	<0.01	<0.003	<0.0008
1,1,2-Trichloroethane	mg/kg	28.6	~	~	~	6	2	<0.042	<0.50	<0.00096	<0.050	<0.040	<0.047	<0.050	<0.051	<0.00057	<0.36	<0.00078	<0.85	<0.004	<0.006	<0.008	<0.003	<0.0007
1,1-Dichloroethane	mg/kg	~	~	~	~	24	8	<0.024	<0.29	<0.00055	<0.029	<0.023	<0.027	<0.029	<0.029	<0.00033	<0.21	<0.00045	<0.49	<0.004	<0.006	<0.008	<0.003	<0.0007
1,1-Dichloroethene	mg/kg	8.28	~	~	~	150	11	<0.020	<0.24	<0.00045	<0.024	<0.019	<0.022	<0.023	<0.024	<0.00027	<0.17	<0.00037	<0.40	<0.004	<0.006	<0.008	<0.003	<0.0007
1,2,3-trichlorobenzene	mg/kg	20	~	~	~	~	~	<0.029	<0.35	<0.00067	<0.035	<0.028	<0.033	<0.035	<0.035	<0.00040	<0.25	<0.00054	<0.59	<0.035	<0.062	<0.082	<0.029	<0.007
1,2,4-trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.024	<0.28	<0.00054	0.110 J	<0.023	<0.026	<0.028	<0.029	<0.00032	<0.20	<0.00044	<0.48	<0.035	<0.062	<0.082	<0.029	<0.007
1,2-dibromo-3-chloropropane	mg/kg	~	~	~	0.0048	0.2	0.08	<0.063	<0.76	<0.0014	<0.074	<0.060	<0.070	<0.074	<0.076	<0.00086	<0.54	<0.0012	<1.3	<0.003	<0.005	<0.007	<0.002	<0.0005
1,2-dibromoethane	mg/kg	~	~	~	~	0.04	0.008	<0.031	<0.38	<0.00072	<0.037	<0.030	<0.035	<0.037	<0.038	<0.00043	<0.27	<0.00058	<0.63	<0.003	<0.005	<0.007	<0.002	<0.0005
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.022	<0.27	<0.00051	0.0324 J	<0.021	<0.025	<0.026	<0.027	<0.00030	<0.19	<0.00041	<0.45	<0.004	<0.006	<0.008	<0.003	<0.0007
1,2-Dichloroethane	mg/kg	21.2	~	~	~	3	0.9	<0.022	<0.27	<0.00051	<0.026	<0.021	<0.025	<0.026	<0.027	<0.00030	<0.19	<0.00041	<0.45	<0.004	<0.007	<0.01	<0.003	<0.0008
1,2-dichloroethylene, total	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	mg/kg	32.7	~	~	~	5	2	<0.040	<0.48	<0.00092	<0.047	<0.038	<0.044	<0.047	<0.048	<0.00055	<0.34	<0.00074	<0.81	<0.004	<0.006	<0.008	<0.003	<0.0007
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.018	<0.21	<0.00041	<0.021	<0.017	<0.020	<0.021	<0.021	<0.00024	<0.15	<0.00033	<0.36	<0.004	<0.006	<0.008	<0.003	<0.0007
1,4-Dichlorobenzene	mg/kg	0.546	~	~	0.11	13	5	<0.020	<0.24	<0.00045	0.0327 J	<0.019	<0.022	<0.023	<0.024	<0.00027	<0.17	<0.00037	<0.40	<0.003	<0.005	<0.007	<0.002	<0.0005
1-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	mg/kg	~	~	~	~	44000	3100	0.646 J	<2.7	0.0148 J	<0.27	<0.22	<0.25	<0.27	<0.28	0.010 J	<2.0	<0.0042	<4.6	0.056 J	0.040 J	0.075 J	0.026 J	0.002 J
2-Hexanone	mg/kg	~	~	~	~	~	~	<0.18	<2.2	<0.0041	<0.21	<0.17	<0.20	<0.21	<0.22	<0.0025	<1.5	<0.0033	<3.6	<0.007	<0.012	<0.016	<0.006	<0.001
4-methyl-2-pentanone	mg/kg	~	~	~	~	~	~	<0.11	<1.3	<0.0025	<0.13	<0.11	<0.12	<0.13	<0.13	<0.0015	<0.94	<0.0020	<2.2	<0.007	<0.012	<0.016	<0.006	<0.001
Acetone	mg/kg	~	~	~	~	~	70000	1.26 J	<7.8	0.0660	<0.77	<0.62	1.44	0.931 J	1.70	0.0499	<5.6	<0.012	<13	0.56	0.48	0.62	0.26	0.054
Benzene	mg/kg	0.255	~	0.34	~	5	2	*2.30*	*2.01*	<0.00036	0.0393 J	0.934	*3.53*	0.0394 J	0.213	0.00047 J	0.426 J	<0.00029	0.620 J	<0.004	<0.006	<0.008	<0.003	<0.0007
bromochloromethane	mg/kg	~	~	~	~	~	~	<0.041	<0.50	<0.00095	<0.049	<0.040	<0.046	<0.049	<0.050	<0.00056	<0.35	<0.00077	<0.84	<0.004	<0.007	<0.01	<0.003	<0.0008
Bromodichloromethane	mg/kg	0.54	~	~	~	3	1	<0.020	<0.24	<0.00045	<0.023	<0.019	<0.022	<0.023	<0.024	<0.00027	<0.17	<0.00037	<0.40	<0.003	<0.005	<0.007	<0.002	<0.0005
Bromoform	mg/kg	15.9	~	~	~	280	81	<0.034	<0.42	<0.00079	<0.041	<0.033	<0.038	<0.041	<0.042	<0.00047	<0.30	<0.00064	<0.70	<0.035	<0.062	<0.082	<0.029	<0.007
Bromomethane	mg/kg	0.235	~	~	~	59	25	<0.063	<0.76	<0.0014	<0.075	<0.060	<0.070	<0.074	<0.076	<0.00086	<0.54	<0.0012	<1.3	<0.005	<0.009	<0.011	<0.004	<0.0009
Carbon disulfide	mg/kg	~	~	~	~	110000	7800	0.166 J	<0.27	0.0092	0.107 J	0.100 J	0.138 J	0.120 J	0.120 J	0.0023 J	0.249 J	<0.00041	<0.45	0.027 J	0.040 J	0.12	0.027 J	0.007
Carbon tetrachloride	mg/kg	2.98	~	~	~	4	2	<0.021	<0.26	<0.00049	<0.026	<0.021	<0.024	<0.025	<0.026	<0.00029	<0.18	<0.00040	<0.44	<0.004	<0.006	<0.008	<0.003	<0.0007
Chlorobenzene	mg/kg	13.1	~	~	~	7400	510	<0.021	<0.25	<0.00048	<0.025	<0.020	<0.023	<0.025	0.213 J	<0.00029	0.437 J	<0.00039	<0.42	0.005 J	<0.006	<0.008	<0.003	<0.0007
Chloroethane	mg/kg	~	~	~	~	1100	220	<0.055	<0.67	<0.0013	<0.066	<0.053	<0.062	<0.066	<0.067	<0.00076	<0.48	<0.0010	<1.1	<0.007	<0.012	<0.016	<0.006	<0.001
Chloroform	mg/kg	1.19	~	~	~	2	0.6	<0.031	<0.37	<0.00071	<0.037	<0.030	<0.034	<0.036	<0.037	<0.00042	<0.26	<0.00057	<0.62	<0.004	<0.007	<0.01	<0.003	<0.0008
Chloromethane	mg/kg	~	~	~	~	12	4	<0.027	<0.33	<0.00063	<0.032	<0.026	<0.030	<0.032	<0.033	<0.00037	<0.23	<0.00051	<0.55	0.006 J	0.013 J	0.018 J	0.042	0.002 J
cis-1,2-Dichloroethene	mg/kg	~	~	~	~	560	230	<0.057	<0.68	<0.0013	<0.067	<0.054	<0.063	<0.067	<0.069	<0.00077	<0.49	<0.0011	<1.1	<0.004	<0.006	<0.008	<0.003	<0.0007
cis-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.025	<0.31	<0.00058	<0.030	<0.024	<0.028	<0.030	<0.031	<0.00035	<0.22	<0.00047	<0.51	<0.003	<0.005	<0.007	<0.002	<0.0005
cyclohexane	mg/kg	~	~	~	~	~	~	18.2	26.7	<0.0016	<0.084	4.94	22.7	0.437	1.13	<0.00097	1.30 J	0.0043 J	7.85	<0.004	<0.006	<0.008	<0.003	<0.0007
Dibromochloromethane	mg/kg	2.05	~	~	~	8	3	<0.019	<0.23	<0.00044	<0.023	<0.019	<0.022	<0.023	<0.023	<0.00027	<0.17	<0.00036	<0.39	<0.003	<0.005	<0.007	<0.002	<0.0005
Dichlorodifluoromethane	mg/kg	~	~	~	~	230000	490	<0.070	<0.85	<0.0016	<0.084	<0.068	<0.078	<0.084	<0.085	<0.00096	<0.61	<0.0013	<1.4	<0.004	<0.007	<0.01	<0.003	<0.0008
Ethylbenzene	mg/kg	5.16	~	1.4	~	110000	7800	21.0	15.9	<0.00044	0.0787 J	4.84	20.0	0.170	1.59	0.00065 J	1.24	0.0017 J	5.70	<0.003	<0.005	<0.007	<0.002	<0.0005
Hexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	mg/kg	~	~	~	~	~	~	6.54	8.00	<0.00046	0.145 J	3.26	6.19	0.463	0.649	0.0013 J	0.475 J	0.00078 J	3.13 J	<0.003	<0.005	<0.007	<0.002	<0.0005
methyl acetate	mg/kg	~	~	~	~	~	78000	2.72	<3.2	<0.0060	1.05	1.11	1.50	1.59	2.70	<0.0036	7.71	<0.0049	<5.3	<0.007	<0.012	<0.016	<0.006	<0.001
methyl cyclohexane	mg/kg	~	~	~	~	~	~	49.5	89.4	<0.0015	0.246 J	12.5	48.7	1.47	3.66	0.0027 J	3.97	0.0054	29.0	0.007 J	<0.007	<0.01	<0.003	<0.0008
Methyl Tertiary Butyl Ether	mg/kg	~	~	~	~	320	110	<0.034	<0.41	<0.00079	<0.041	<0.033	<0.038	<0.041	<0.042	<0.00047	<0.29	<0.00064	<0.69	<0.004	<0.006	<0.008	<0.003	<0.0007
Methylene chloride	mg/kg	4.05	~	~	~	230	46	1.05	<1.6	<0.0030	<0.15	0.554 J	0.771	<0.15	0.610 J	<0.0018	<1.1	0.0025 J	<2.6	<0.014	<0.025	<0.033	<0.012	<0.003
n-Propylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	mg/kg	4.69	300	~	~	260	90	<0.019	<0.23	<0.00043	<0.022	<0.018	<0.021	<0.022	<0.023	<0.00026	<0.16	<0.00035	<0.38	<0.002	<0.004	<0.005	<0.002	<0.0004
tert-Butyl alcohol	mg/kg	~	~	~	~	11000	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	mg/kg	9.92	~	0.45	~	1500	43	0.0643 J	<0.44	<0.00083	<0.043	0.0516 J	0.0600 J	<0.043	0.0668 J	<0.00050	<0.31	<0.00068	<0.74	<0.004	<0.006	<0.008	<0.003	<0.0007
Toluene	mg/kg	200	~	2.5	~	91000	6300	8.29	16.4	<0.00037	0.0505 J	2.52	21.5	0.0869 J	0.837	0.00058 J	1.58	0.0017 J	2.92	0.005 J	<0.007	<0.01	<0.003	<0.0008
trans-1,2-Dichloroethene	mg/kg	0.784	~	~	~	720	300	<0.020	<0.25	<0.00047	<0.024	<0.020	<0.023	<0.024	<0.025	<0.00028	<0.18	<0.00038	<0.41	<0.004	<0.006	<0.008	<0.003	<0.0007
trans-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.029	<0.35	<0.00065	<0.034	<0.027	<0.032	<0.034	<0.035	<0.00039	<0.25	<0.00053	<0.58	<0.002	<0.004	<0.005	<0.002	<0.0004
Trichloroethene	mg/kg	12.4	~	1.6	~	10	3	<0.025	<0.30	<0.00056	<0.029	<0.024	<0.027	<0.029	<0.030	<0.00034	<0.21	<0.00046	<0.50	<0.004	<0.006	<0.008	<0.003	<0.0007
Trichlorofluoromethane	mg/kg	~	~	~	~	340000	23000	<0.081	<0.98	<0.0019	<0.097	<0.078	<0.091	<0.096	<0.099	<0.0011	<0.70	<0.0015	<1.6	<0.005	<0.009	<0.011	<0.004	<0.0009
Vinyl chloride	mg/kg	0.646	~	~	~	2	0.7	<0.026	<0.32	<0.00060	<0.031	<0.025	<0.029	<0.031	<0.032	<0.00036	<0.22	<0.00049	<0.53	<0.004	<0.007	<0.01	<0.003	<0.0008
m/p-xylene	mg/kg	~	~	~	~	170000	12000	29.5	47.4	<0.00065	0.280	10.6	41.7	0.321	2.23	0.00085 J	4.05	0.0047	15.3	<0.007	<0.012	<0.016	<0.006	<0.001
o-xylene	mg/kg	~	~	~	~	170000	12000	19.4	26.8	<0.00060	0.0723 J	4.91	18.8	0.0960 J	1.92	0.00075 J	1.95	0.0027	9.18	0.003 J	<0.005	<0.007	<0.002	<0.0005
Xylenes, total	mg/kg	10	~	0.12	~	170000	12000	48.9	74.2	<0.00060	0.352	15.5	60.5	0.417	4.15	0.0016 J	6.00	0.0074	24.5	NA	NA	NA	NA	NA
Total VOC Alkanes	mg/kg	~	~	~	~	~	~	73 J	361 J	0.16 J	0	17.7 J	49 J	8.3 J	0	0.165 J	0	0.06 J	25 J	16 J	1.0 J	4.0 J	2.7 J	1.5 J
Total VOC TICs	mg/kg	~	~	~	~	~	~	163.2 J	559 J	1.572 J	50.6 J	81.3 J	216 J	35.2 J	116.6 J	0.521 J	141.9 J	0	506 J	44 J	4.2 J	11 J	2.7 J	1.6 J

Kleinfelder
2 South Gold Drive, Suite A, Hamilton, New Jersey

TABLE 1A
SOIL ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment	NJ ECO Saline Estuary Sediment	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-1013				ASB-1014		ASB-1015			ASB-1016							ASB-193
Date								2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	1999-04-20
Start Depth								13	1.5	3.5	4	1.5	14	0	2	11	0	3	4	7	8	10.5	12	2
End Depth								13.5	2	4	4.5	2	14.5	0.5	2.5	11.5	0.5	3.5	4.5	7.5	8.5	11	12.5	4
Grid Cell (Figures 1A through 1E)								C3				C3		C3			B3							B1
Chemical	Units																							
1,1,1-Trichloroethane	mg/kg	29.8	~	~	~	~	160000	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	NA
1,1,2,2-Tetrachloroethane	mg/kg	0.127	~	~	~	3	1	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	~	~	~	~	~	~	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	NA
1,1,2-Trichloroethane	mg/kg	28.6	~	~	~	6	2	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
1,1-Dichloroethane	mg/kg	~	~	~	~	24	8	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
1,1-Dichloroethene	mg/kg	8.28	~	~	~	150	11	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
1,2,3-trichlorobenzene	mg/kg	20	~	~	~	~	~	<0.007	<0.034	<0.064	<0.059	<0.008	<0.007	<0.015	<0.007	<0.006	<0.012	<0.029	<0.022	<0.016	<0.018	<0.051	<0.006	NA
1,2,4-trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.007	<0.034	<0.064	<0.059	<0.008	<0.007	<0.015	<0.007	<0.006	<0.012	<0.029	<0.022	<0.016	<0.018	<0.051	<0.006	NA
1,2-dibromo-3-chloropropane	mg/kg	~	~	~	0.0048	0.2	0.08	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA
1,2-dibromoethane	mg/kg	~	~	~	~	0.04	0.008	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
1,2-Dichloroethane	mg/kg	21.2	~	~	~	3	0.9	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	<0.002
1,2-dichloroethylene, total	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	mg/kg	32.7	~	~	~	5	2	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
1,4-Dichlorobenzene	mg/kg	0.546	~	~	0.11	13	5	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA
1-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5
2-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	mg/kg	~	~	~	~	44000	3100	<0.001	0.036 J	0.051 J	0.061 J	0.011 J	0.004 J	0.042	0.011 J	<0.001	0.045	0.027 J	0.034 J	0.014 J	0.015 J	0.056 J	<0.001	NA
2-Hexanone	mg/kg	~	~	~	~	~	~	<0.001	<0.007	<0.013	<0.012	<0.002	<0.001	<0.003	<0.001	<0.001	<0.002	<0.006	<0.004	<0.003	<0.004	<0.010	<0.001	NA
4-methyl-2-pentanone	mg/kg	~	~	~	~	~	~	<0.001	<0.007	<0.013	<0.012	<0.002	<0.001	<0.003	<0.001	<0.001	<0.002	<0.006	<0.004	<0.003	<0.004	<0.010	<0.001	NA
Acetone	mg/kg	~	~	~	~	~	70000	0.024 J	0.37	0.53	0.82	0.064	0.050	0.26	0.15	0.037	0.37	0.38	0.27	0.34	0.22	0.66	0.035	<0.01
Benzene	mg/kg	0.255	~	0.34	~	5	2	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	0.002 J	<0.0007	<0.0006	<0.001	0.004 J	0.003 J	<0.002	<0.002	<0.005	<0.0006	*3.1*
bromochloromethane	mg/kg	~	~	~	~	~	~	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	NA
Bromodichloromethane	mg/kg	0.54	~	~	~	3	1	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	<0.002
Bromoform	mg/kg	15.9	~	~	~	280	81	<0.007	<0.034	<0.064	<0.059	<0.008	<0.007	<0.015	<0.007	<0.006	<0.012	<0.029	<0.022	<0.016	<0.018	<0.051	<0.006	NA
Bromomethane	mg/kg	0.235	~	~	~	59	25	<0.001	<0.005	<0.009	<0.008	<0.001	<0.001	<0.002	<0.001	<0.0008	<0.002	<0.004	<0.003	<0.002	<0.003	<0.007	<0.0008	<0.002
Carbon disulfide	mg/kg	~	~	~	~	110000	7800	0.003 J	0.043	0.13	0.083	0.023	0.009	0.029	0.010	0.009	0.034	0.033	0.020 J	0.014 J	0.015 J	0.092	0.002 J	<0.01
Carbon tetrachloride	mg/kg	2.98	~	~	~	4	2	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
Chlorobenzene	mg/kg	13.1	~	~	~	7400	510	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	<0.002
Chloroethane	mg/kg	~	~	~	~	1100	220	<0.001	<0.007	<0.013	<0.012	<0.002	<0.001	<0.003	<0.001	<0.001	<0.002	<0.006	<0.004	<0.003	<0.004	<0.010	<0.001	NA
Chloroform	mg/kg	1.19	~	~	~	2	0.6	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	NA
Chloromethane	mg/kg	~	~	~	~	12	4	<0.0008	<0.004	0.010 J	0.015 J	0.001 J	<0.0008	0.004 J	0.002 J	0.0008 J	<0.001	0.005 J	0.004 J	0.006 J	0.007 J	0.034 J	0.0008 J	<0.01
cis-1,2-Dichloroethene	mg/kg	~	~	~	~	560	230	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
cis-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA
cyclohexane	mg/kg	~	~	~	~	~	~	<0.0007	<0.003	0.008 J	0.007 J	<0.0008	<0.0007	<0.002	0.0009 J	<0.0006	0.003 J	0.011 J	0.029	0.002 J	<0.002	<0.005	<0.0006	NA
Dibromochloromethane	mg/kg	2.05	~	~	~	8	3	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA
Dichlorodifluoromethane	mg/kg	~	~	~	~	230000	490	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	NA
Ethylbenzene	mg/kg	5.16	~	1.4	~	110000	7800	<0.0005	<0.003	<0.005	<0.005	0.002 J	<0.0006	0.002 J	<0.0006	<0.0004	0.001 J	0.003 J	0.006 J	<0.001	<0.001	<0.004	<0.0004	NA
Hexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100
isopropylbenzene	mg/kg	~	~	~	~	~	~	<0.0005	<0.003	<0.005	<0.005	<0.0006	<0.0006	<0.001	<0.0006	<0.0004	<0.001	0.006 J	0.013 J	<0.001	<0.001	<0.004	<0.0004	NA
methyl acetate	mg/kg	~	~	~	~	~	78000	<0.001	<0.007	<0.013	<0.012	<0.002	<0.001	<0.003	0.005 J	<0.001	0.003 J	<0.006	<0.004	<0.003	<0.004	<0.010	<0.001	NA
methyl cyclohexane	mg/kg	~	~	~	~	~	~	<0.0008	<0.004	<0.008	<0.007	0.027	<0.0008	0.002 J	0.002 J	<0.0007	0.006 J	0.023 J	0.071	0.005 J	0.004 J	<0.006	<0.0007	NA
Methyl Tertiary Butyl Ether	mg/kg	~	~	~	~	320	110	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	<0.02
Methylene chloride	mg/kg	4.05	~	~	~	230	46	<0.003	<0.014	<0.026	<0.024	<0.003	<0.003	<0.006	<0.003	<0.002	<0.005	<0.012	<0.009	<0.006	<0.007	<0.020	<0.002	<0.002
n-Propylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	mg/kg	4.69	300	~	~	260	90	<0.0004	<0.002	<0.004	<0.004	<0.0005	<0.0004	<0.0009	<0.0004	<0.0003	<0.0007	<0.002	<0.001	<0.0009	<0.001	<0.003	<0.0003	NA
tert-Butyl alcohol	mg/kg	~	~	~	~	11000	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	mg/kg	9.92	~	0.45	~	1500	43	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
Toluene	mg/kg	200	~	2.5	~	91000	6300	<0.0008	<0.004	<0.008	<0.007	0.001 J	<0.0008	0.003 J	<0.0009	<0.0007	0.005 J	<0.003	0.003 J	<0.002	<0.002	<0.006	<0.0007	NA
trans-1,2-Dichloroethene	mg/kg	0.784	~	~	~	720	300	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA
trans-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.0004	<0.002	<0.004	<0.004	<0.0005	<0.0004	<0.0009	<0.0004	<0.0003	<0.0007	<0.002	<0.001	<0.0009	<0.001	<0.003	<0.0003	<0.002
Trichloroethene	mg/kg	12.4	~	1.6	~	10	3	<0.0007	<0.003	<0.006	<0.006	<0.0008	<0.0007	<0.002	<0.0007	<0.0006	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	<0.002
Trichlorofluoromethane	mg/kg	~	~	~	~	340000	23000	<0.001	<0.005	<0.009	<0.008	<0.001	<0.001	<0.002	<0.001	<0.0008	<0.002	<0.004	<0.003	<0.002	<0.003	<0.007	<0.0008	NA
Vinyl chloride	mg/kg	0.646	~	~	~	2	0.7	<0.0008	<0.004	<0.008	<0.007	<0.0009	<0.0008	<0.002	<0.0009	<0.0007	<0.001	<0.003	<0.003	<0.002	<0.002	<0.006	<0.0007	<0.002
m/p-xylene	mg/kg	~	~	~	~	170000	12000	<0.001	<0.007	<0.013	<0.012	<0.002	<0.001	0.004 J	<0.001	<0.001	<0.002	<0.006	<0.004	<0.003	<0.004	<0.010	<0.001	NA
o-xylene	mg/kg	~	~	~	~	170000	12000	<0.0005	<0.003	<0.005	<0.005	0.001 J	<0.0006	0.004 J	<0.0006	<0.0004	0.001 J	0.006 J	0.009 J	<0.001	<0.001	<0.004	<0.0004	NA
Xylenes, total	mg/kg	10	~	0.12	~	170000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160
Total VOC Alkanes	mg/kg	~	~	~	~	~	~	0 J	0 J	0.077 J	0.16 J	7.2 J	0 J	2.2 J	0.31 J	0 J	0.43 J	1.8 J	4.6 J	0.43 J	0.20 J	0 J	0 J	NA
Total VOC TICs	mg/kg	~	~	~	~	~	~	0.036 J	0.95 J	0.88 J	1.3 J	12 J	0.02 J	28 J	0.86 J	0.006 J	3.0 J	3.3 J	8.0 J	0.87 J	0.42 J	0.081 J	0 J	NA

Kleinfelder
2 South Gold Drive, Suite A, Hamilton, New Jersey

TABLE 1A
SOIL ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment	NJ ECO Saline Estuary Sediment	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-208	ASB-217	ASB-218	ASB-85	ASB-858			ASB-859		ASB-86		ASB-860			ASB-861		
Date								1999-04-19	1999-04-19	1999-04-19	1993-11-09	2016-10-06	2016-10-06	2016-10-06	2016-10-06	2016-10-06	1993-11-09		2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05
Start Depth								0	0	0	4	7	11	17	17.5	9.5	2	4	3	6.5	9	11.5	5.5	2.5
End Depth								2	2	2	6	7.5	11.5	17.5	18	10	4	6	3.5	6.5	9.5	12	6	3
Grid Cell (Figures 1A through 1E)								B2	C1	D3	B1	A1			A1		A1		B2			B2		
Chemical	Units																							
1,1,1-Trichloroethane	mg/kg	29.8	~	~	~	~	160000	NA	NA	NA	<82.00 J	<0.0076	<0.0087	<0.0095	<0.00012	<0.013	<0.01 J	<1.50 J	<0.19	<0.17	<0.023	<0.024	<0.016	<0.17
1,1,2,2-Tetrachloroethane	mg/kg	0.127	~	~	~	3	1	NA	NA	NA	NA	<0.011	<0.012	<0.014	<0.00017	<0.019	<0.01 J	<1.50 J	<0.28	<0.25	<0.033	<0.034	<0.023	<0.25
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<0.022	<0.025	<0.028	<0.00035	<0.038	NA	NA	<0.56	<0.50	<0.067	<0.068	<0.046	<0.50
1,1,2-Trichloroethane	mg/kg	28.6	~	~	~	6	2	NA	NA	NA	<82.00 J	<0.015	<0.017	<0.018	<0.00023	<0.025	<0.01 J	<1.50 J	<0.38	<0.34	<0.044	<0.046	<0.031	<0.33
1,1-Dichloroethane	mg/kg	~	~	~	~	24	8	NA	NA	NA	<82.00 J	<0.0085	<0.0098	<0.011	<0.00014	<0.015	<0.01 J	<1.50 J	<0.22	<0.19	<0.026	<0.026	<0.018	<0.19
1,1-Dichloroethene	mg/kg	8.28	~	~	~	150	11	NA	NA	NA	<82.00 J	<0.0069	<0.0080	<0.0087	<0.00011	<0.012	<0.01 J	<1.50 J	<0.18	<0.16	<0.021	<0.022	<0.014	<0.16
1,2,3-trichlorobenzene	mg/kg	20	~	~	~	~	~	NA	NA	NA	NA	<0.010	<0.012	<0.013	<0.00016	<0.018	NA	NA	<0.26	<0.24	<0.031	<0.032	<0.021	<0.23
1,2,4-trichlorobenzene	mg/kg	20	~	~	~	820	73	NA	NA	NA	<2.20 J	<0.0083	<0.0095	<0.010	<0.00013	<0.014	<0.38	<10.00	<0.21	<0.19	<0.025	<0.026	<0.017	<0.19
1,2-dibromo-3-chloropropane	mg/kg	~	~	~	0.0048	0.2	0.08	NA	NA	NA	NA	<0.022	<0.025	<0.028	<0.00035	<0.038	NA	NA	<0.56	<0.50	<0.067	<0.068	<0.046	<0.50
1,2-dibromoethane	mg/kg	~	~	~	~	0.04	0.008	NA	NA	NA	<160.00 J	<0.011	<0.013	<0.014	<0.00018	<0.019	<0.02 J	<3.00 J	<0.28	<0.25	<0.033	<0.034	<0.023	<0.25
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	NA	NA	NA	<2.20	<0.0078	<0.0089	<0.0098	<0.00012	<0.013	<0.38	<10.00	<0.20	<0.18	<0.024	<0.024	<0.016	<0.18
1,2-Dichloroethane	mg/kg	21.2	~	~	~	3	0.9	<1700	<890	<1600	NA	<0.0078	<0.0089	<0.0098	<0.00012	<0.013	<0.01 J	<1.50 J	<0.20	<0.18	<0.024	<0.024	<0.016	<0.18
1,2-dichloroethylene, total	mg/kg	~	~	~	~	~	~	NA	NA	NA	<82.00 J	NA	NA	NA	NA	NA	<0.01 J	<1.50 J	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	mg/kg	32.7	~	~	~	5	2	NA	NA	NA	NA	<0.014	<0.016	<0.018	<0.00022	<0.024	<0.01 J	<1.50 J	<0.36	<0.32	<0.043	<0.044	<0.029	<0.32
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	NA	NA	NA	<2.20	<0.0062	<0.0072	<0.0078	<0.00010	<0.011	<0.38	<10.00	<0.16	<0.14	<0.019	<0.019	<0.013	<0.14
1,4-Dichlorobenzene	mg/kg	0.546	~	~	0.11	13	5	NA	NA	NA	<2.20	<0.0069	<0.0080	<0.0087	<0.00011	<0.012	<0.38	<10.00	<0.18	<0.16	<0.021	<0.022	<0.014	<0.16
1-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	<4100.00 J	NA	NA	NA	NA	NA	<0.57 J	<74.00 J	NA	NA	NA	NA	NA	NA
2-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	<4100.00 J	NA	NA	NA	NA	NA	<0.57 J	<74.00 J	NA	NA	NA	NA	NA	NA
2-butanone	mg/kg	~	~	~	~	44000	3100	NA	NA	NA	<82.00 J	<0.080	<0.092	<0.10	<0.0013	<0.14	<0.01 J	<1.50 J	<2.0	<1.8	<0.24	<0.25	<0.17	<1.8
2-Hexanone	mg/kg	~	~	~	~	~	~	NA	NA	NA	<82.00 J	<0.063	<0.073	<0.079	<0.0010	<0.11	<0.01 J	<1.50 J	<1.6	<1.4	<0.19	<0.20	<0.13	<1.4
4-methyl-2-pentanone	mg/kg	~	~	~	~	~	~	NA	NA	NA	<82.00 J	<0.039	<0.044	<0.049	<0.00062	<0.067	<0.01 J	<1.50 J	<0.99	<0.88	<0.12	<0.12	<0.080	<0.87
Acetone	mg/kg	~	~	~	~	~	70000	<8700	<4400	<8200	<82.00 J	<0.23	<0.26	<0.29	<0.0036	<0.39	<0.02 J	<1.50 J	<5.8	<5.2	<0.69	<0.71	<0.47	<5.1
Benzene	mg/kg	0.255	~	0.34	~	5	2	**5300**	**2100**	**4700**	**27.00 J**	0.0352	<0.0063	<0.0069	<0.000087	0.715	<0.01 J	1.10 J	**26.1**	2.17	0.124	0.518	**11.7**	**6.00**
bromochloromethane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<0.014	<0.017	<0.018	<0.00023	<0.025	NA	NA	<0.37	<0.33	<0.044	<0.045	<0.030	<0.33
Bromodichloromethane	mg/kg	0.54	~	~	~	3	1	<1700	<890	<1600	NA	<0.0069	<0.0079	<0.0087	<0.00011	<0.012	<0.01 J	<1.50 J	<0.18	<0.16	<0.021	<0.022	<0.014	<0.16
Bromoform	mg/kg	15.9	~	~	~	280	81	NA	NA	NA	<82.00 J	<0.012	<0.014	<0.015	<0.00019	<0.021	<0.01 J	<1.50 J	<0.31	<0.28	<0.037	<0.038	<0.025	<0.27
Bromomethane	mg/kg	0.235	~	~	~	59	25	<1700	<890	<1600	<82.00 J	<0.022	<0.025	<0.028	<0.00035	<0.038	<0.01 J	<1.50 J	<0.56	<0.50	<0.067	<0.069	<0.046	<0.50
Carbon disulfide	mg/kg	~	~	~	~	110000	7800	<8700	<4400	<8200	<82.00 J	<0.0077	<0.0089	<0.0097	<0.00012	0.0329 J	<0.01 J	<1.50 J	<0.20	<0.18	0.0273 J	0.0827 J	<0.016	0.785 J
Carbon tetrachloride	mg/kg	2.98	~	~	~	4	2	NA	NA	NA	NA	<0.0075	<0.0087	<0.0095	<0.00012	<0.013	<0.01 J	<1.50 J	<0.19	<0.17	<0.023	<0.023	<0.016	<0.17
Chlorobenzene	mg/kg	13.1	~	~	~	7400	510	<1700	*1100*	<1600	<82.00 J	<0.0074	<0.0085	<0.0093	<0.00012	<0.013	<0.01 J	<1.50 J	<0.19	<0.17	<0.022	<0.023	<0.015	<0.17
Chloroethane	mg/kg	~	~	~	~	1100	220	NA	NA	NA	<82.00 J	<0.019	<0.022	<0.025	<0.00031	<0.034	<0.01 J	<1.50 J	<0.50	<0.45	<0.059	<0.061	<0.041	<0.44
Chloroform	mg/kg	1.19	~	~	~	2	0.6	NA	NA	NA	NA	<0.011	<0.012	<0.014	<0.00017	<0.019	<0.01 J	0.51 J	<0.28	<0.25	<0.033	<0.034	<0.022	<0.24
Chloromethane	mg/kg	~	~	~	~	12	4	<8700	<4400	<8200	NA	<0.0096	<0.011	<0.012	<0.00015	<0.017	NA	NA	<0.25	<0.22	<0.029	<0.030	<0.020	<0.22
cis-1,2-Dichloroethene	mg/kg	~	~	~	~	560	230	NA	NA	NA	NA	<0.020	<0.023	<0.025	<0.00032	<0.034	NA	NA	<0.51	<0.46	<0.060	<0.062	<0.041	<0.45
cis-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	NA	NA	NA	NA	<0.0089	<0.010	<0.011	<0.00014	<0.015	<0.01 J	<1.50 J	<0.23	<0.20	<0.027	<0.028	<0.019	<0.20
cyclohexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	2.05	0.168	0.0939 J	<0.00040	0.448	NA	NA	117	12.6	0.386	2.53 J	4.27	85.4
Dibromochloromethane	mg/kg	2.05	~	~	~	8	3	NA	NA	NA	<82.00 J	<0.0068	<0.0078	<0.0086	<0.00011	<0.012	<0.01 J	<1.50 J	<0.17	<0.16	<0.021	<0.021	<0.014	<0.15
Dichlorodifluoromethane	mg/kg	~	~	~	~	230000	490	NA	NA	NA	NA	<0.025	<0.028	<0.031	<0.00040	<0.043	NA	NA	<0.63	<0.57	<0.075	<0.077	<0.051	<0.56
Ethylbenzene	mg/kg	5.16	~	1.4	~	110000	7800	NA	NA	NA	160.00 J	0.315	<0.0078	0.0186 J	<0.00011	0.499	<0.01 J	5.10 J	142	14.7	0.344	4.45	82.8	56.3
Hexane	mg/kg	~	~	~	~	~	~	23000	5100 J	35000 DJ	220.00 J	NA	NA	NA	NA	NA	<0.02 J	29.00 J	NA	NA	NA	NA	NA	NA
isopropylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	0.436	0.0684 J	0.0511 J	<0.00011	0.159 J	NA	NA	39.1	4.98	0.178 J	1.61	23.9	28.2
methyl acetate	mg/kg	~	~	~	~	~	78000	NA	NA	NA	NA	<0.092	<0.11	<0.12	<0.0015	0.582	NA	NA	<2.4	<2.1	<0.28	0.869 J	<0.19	<2.1
methyl cyclohexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	7.49	0.333	0.205	<0.00037	1.14	NA	NA	396	36.5	1.33	6.20	155	217
Methyl Tertiary Butyl Ether	mg/kg	~	~	~	~	320	110	<17000	<8900	<16000	<160.00 J	<0.012	<0.014	<0.015	<0.00019	<0.021	<0.02 J	<3.00 J	<0.31	<0.28	<0.036	<0.037	<0.025	<0.27
Methylene chloride	mg/kg	4.05	~	~	~	230	46	<1700	<890	<1600	26.00 J	<0.045	0.0558 J	<0.057	0.00095 J	0.0987 J	<0.01 J	<1.50 J	<1.2	1.45 J	0.175 J	0.225 J	<0.094	<1.0
n-Propylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	61.00 J	NA	NA	NA	NA	NA	<0.02 J	9.90 J	NA	NA	NA	NA	NA	NA
Styrene	mg/kg	4.69	300	~	~	260	90	NA	NA	NA	<82.00 J	<0.0066	<0.0076	<0.0083	<0.00011	<0.011	<0.01 J	<1.50 J	<0.17	<0.15	<0.020	<0.021	<0.014	<0.15
tert-Butyl alcohol	mg/kg	~	~	~	~	11000	1400	NA	NA	NA	<160.00 J	NA	NA	NA	NA	NA	<0.02 J	<3.00 J	NA	NA	NA	NA	NA	NA
Tetrachloroethene	mg/kg	9.92	~	0.45	~	1500	43	NA	NA	NA	NA	0.0149 J	0.0278 J	<0.016	<0.00020	0.0296 J	<0.01 J	<1.50 J	0.543 J	0.432 J	0.0755 J	0.0993 J	<0.027	0.664 J
Toluene	mg/kg	200	~	2.5	~	91000	6300	NA	NA	NA	200.00 J	0.0496	0.0176 J	<0.0071	<0.000091	0.360	<0.01 J	3.00 J	133	11.5	0.299	1.38	18.5	18.4
trans-1,2-Dichloroethene	mg/kg	0.784	~	~	~	720	300	NA	NA	NA	NA	<0.0072	<0.0083	<0.0090	<0.00011	<0.012	NA	NA	<0.18	<0.16	<0.022	<0.022	<0.015	<0.16
trans-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<1700	<890	<1600	NA	<0.010	<0.012	<0.013	<0.00016	<0.017	<0.01 J	<1.50 J	<0.26	<0.23	<0.030	<0.031	<0.021	<0.23
Trichloroethene	mg/kg	12.4	~	1.6	~	10	3	<1700	<890	<1600	NA	<0.0086	<0.0099	<0.011	<0.00014	<0.015	<0.01 J	<1.50 J	<0.22	<0.20	<0.026	<0.027	<0.018	<0.20
Trichlorofluoromethane	mg/kg	~	~	~	~	340000	23000	NA	NA	NA	NA	<0.029	<0.033	<0.036	<0.00046	<0.049	NA	NA	<0.73	<0.65	<0.087	<0.089	<0.059	<0.65
Vinyl chloride	mg/kg	0.646	~	~	~	2	0.7	<1700	<890	<1600	NA	<0.0092	<0.011	<0.012	<0.00015	<0.016	<0.01 J	<1.50 J	<0.23	<0.21	<0.028	<0.029	<0.019	<0.21
m/p-xylene	mg/kg	~	~	~	~	170000	12000	NA	NA	NA	NA	0.0354 J	0.0250 J	0.0266 J	0.00022 J	1.16	NA	NA	376	38.2	0.856	6.65	145	149
o-xylene	mg/kg	~	~	~	~	170000	12000	NA	NA	NA	NA	0.0543	0.0137 J	<0.012	<0.00015	0.507	NA	NA	178	19.2	0.603	3.66	73.6	93.8
Xylenes, total	mg/kg	10	~	0.12	~	170000	12000	150000	46000	150000	600.00 J	0.0897	0.0387 J	0.0266 J	0.00022 J	1.67	<0.01 J	16.00 J	554	57.4	1.46	10.3	219	243
Total VOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	0	2.1 J	2.4 J	0	11.3 J	NA	NA	1270 J	50 J	14.7 J	30.8 J	130 J	739 J
Total VOC TICs	mg/kg	~	~	~	~	~	~	477000	NA	NA	2880.00	131.6 J	23.6 J	21 J	0	13.5 J	0.12	80.80	1826 J	1007 J	74.3 J	88.7 J	251 J	1209 J

Kleinfelder
2 South Gold Drive, Suite A, Hamilton, New Jersey

TABLE 1A
SOIL ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment	NJ ECO Saline Estuary Sediment	NJDEP NRDCSRS	NJDEP RDCSRS	GMW-123	GMW-126	GMW-137	GMW-138	GMW-688		GMW-689		GMW-690		GMW-691		SB-10	SB-11		
Date								1998-11-13	1998-11-12	1998-11-13	1998-11-13	2016-10-10	2016-10-10	2016-10-10	2016-10-10	2016-10-07	2016-10-07	2016-10-11	2016-10-11	2015-09-18	2015-10-05	2015-10-05	2015-10-05
Start Depth								2	0	4	4	2	14.5	14.5	2	11	19.5	2.5	14.5	4	9.5	11.5	20
End Depth								4	2	6	6	2.5	15	15	2.5	11.5	20	3	15	4.5	10	12	20.5
Grid Cell (Figures 1A through 1E)								C3	D3	C1	B3	B2		B2		B2		B2		B3		B2	
Chemical	Units																						
1,1,1-Trichloroethane	mg/kg	29.8	~	~	~	~	160000	NA	NA	NA	NA	<1.5	<0.00016	<0.00014	<0.0094	<0.052	<0.00014	<1.2	<0.00016	<0.0016	<0.41	<0.0094	<0.00013
1,1,2,2-Tetrachloroethane	mg/kg	0.127	~	~	~	3	1	NA	NA	NA	NA	<2.1	<0.00023	<0.00021	<0.013	<0.074	<0.00021	<1.7	<0.00023	<0.0018	<0.49	<0.011	<0.00015
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<4.3	<0.00047	<0.00042	<0.027	<0.15	<0.00042	<3.5	<0.00046	<0.0047	<1.2	<0.028	<0.00039
1,1,2-Trichloroethane	mg/kg	28.6	~	~	~	6	2	NA	NA	NA	NA	<2.9	<0.00031	<0.00028	<0.018	<0.10	<0.00028	<2.3	<0.00031	<0.0015	<0.41	<0.0093	<0.00013
1,1-Dichloroethane	mg/kg	~	~	~	~	24	8	NA	NA	NA	NA	<1.7	<0.00018	<0.00016	<0.011	<0.058	<0.00016	<1.3	<0.00018	<0.0015	<0.39	<0.0089	<0.00012
1,1-Dichloroethene	mg/kg	8.28	~	~	~	150	11	NA	NA	NA	NA	<1.4	<0.00015	<0.00013	<0.0086	<0.048	<0.00013	<1.1	<0.00015	<0.0062	<1.6	<0.037	<0.00052
1,2,3-trichlorobenzene	mg/kg	20	~	~	~	~	~	NA	NA	NA	NA	<2.0	<0.00022	<0.00020	<0.013	<0.070	<0.00019	<1.6	<0.00022	<0.0018	<0.49	<0.011	<0.00015
1,2,4-trichlorobenzene	mg/kg	20	~	~	~	820	73	NA	NA	NA	NA	<1.6	<0.00018	<0.00016	<0.010	<0.057	<0.00016	<1.3	<0.00017	<0.0018	<0.47	<0.011	<0.00015
1,2-dibromo-3-chloropropane	mg/kg	~	~	~	0.0048	0.2	0.08	NA	NA	NA	NA	<4.3	<0.00047	<0.00042	<0.027	<0.15	<0.00042	<3.5	<0.00046	NA	<1.5	<0.034	<0.00048
1,2-dibromoethane	mg/kg	~	~	~	~	0.04	0.008	NA	NA	NA	NA	<2.1	<0.00024	<0.00021	<0.014	<0.075	<0.00021	<1.7	<0.00023	NA	<0.36	<0.0082	<0.00011
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	NA	NA	NA	NA	<1.5	<0.00017	<0.00015	<0.0096	<0.053	<0.00015	<1.2	<0.00016	<0.0013	<0.34	<0.0077	<0.00011
1,2-Dichloroethane	mg/kg	21.2	~	~	~	3	0.9	<32000	<20000	<2200	<4000	<1.5	<0.00017	<0.00015	<0.0096	<0.053	<0.00015	<1.2	<0.00016	<0.0014	<0.37	<0.0084	<0.00012
1,2-dichloroethylene, total	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	mg/kg	32.7	~	~	~	5	2	NA	NA	NA	NA	<2.7	<0.00030	<0.00027	<0.017	<0.096	<0.00027	<2.2	<0.00030	<0.0025	<0.66	<0.015	<0.00021
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	NA	NA	NA	NA	<1.2	<0.00013	<0.00012	<0.0077	<0.043	<0.00012	<0.98	<0.00013	<0.0016	<0.44	<0.0099	<0.00014
1,4-Dichlorobenzene	mg/kg	0.546	~	~	0.11	13	5	NA	NA	NA	NA	<1.4	<0.00015	<0.00013	<0.0086	<0.048	<0.00013	<1.1	<0.00015	<0.0023	<0.63	<0.014	<0.00020
1-Butanol	mg/kg	~	~	~	~	~	~	<1400	<780	<1500	<660	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	mg/kg	~	~	~	~	44000	3100	NA	NA	NA	NA	<16	<0.0017	0.0066 J	<0.099	<0.55	0.0056 J	<13	<0.0017	<0.020	<5.3	0.510 J	<0.0017
2-Hexanone	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<12	<0.0014	<0.0012	<0.078	<0.43	<0.0012	<10	<0.0013	<0.014	<3.7	<0.084	<0.0012
4-methyl-2-pentanone	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<7.5	<0.00082	<0.00073	<0.048	<0.26	<0.00073	<6.1	<0.00081	<0.0048	<1.3	<0.029	<0.00040
Acetone	mg/kg	~	~	~	~	~	70000	<32000	<20000	<2200	NA	<44	0.0428	0.0394	<0.28	2.15 J	0.0312	<36	0.0066 J	<0.023	<6.2	<0.14	0.0052 J
Benzene	mg/kg	0.255	~	0.34	~	5	2	<32000	**1800 J**	**320 J**	**1200 J**	**6.83**	0.0011	0.00083	0.315	*2.22*	0.0103	**21.8**	0.00016 J	<0.0014	**60.7**	0.372	0.00021 J
bromochloromethane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<2.8	<0.00031	<0.00028	<0.018	<0.099	<0.00027	<2.3	<0.00030	<0.0032	<0.86	<0.019	<0.00027
Bromodichloromethane	mg/kg	0.54	~	~	~	3	1	<32000	<20000	<2200	<4000	<1.3	<0.00015	<0.00013	<0.0086	<0.047	<0.00013	<1.1	<0.00015	<0.0016	<0.43	<0.0098	<0.00014
Bromoform	mg/kg	15.9	~	~	~	280	81	NA	NA	NA	NA	<2.4	<0.00026	<0.00023	<0.015	<0.083	<0.00023	<1.9	<0.00025	<0.0025	<0.66	<0.015	<0.00021
Bromomethane	mg/kg	0.235	~	~	~	59	25	<32000	<20000	<2200	<4000	<4.3	<0.00047	<0.00042	<0.027	<0.15	<0.00042	<3.5	<0.00046	<0.0038	<1.0	<0.023	<0.00032
Carbon disulfide	mg/kg	~	~	~	~	110000	7800	<32000	<20000	<2200	<4000	<1.5	0.00075 J	0.00040 J	0.0417 J	0.205 J	<0.00015	<1.2	<0.00016	0.0580	<0.63	<0.014	<0.00020
Carbon tetrachloride	mg/kg	2.98	~	~	~	4	2	NA	NA	NA	NA	<1.5	<0.00016	<0.00014	<0.0094	<0.052	<0.00014	<1.2	<0.00016	<0.0024	<0.64	<0.014	<0.00020
Chlorobenzene	mg/kg	13.1	~	~	~	7400	510	<32000	<20000	<2200	<4000	<1.4	<0.00016	<0.00014	<0.0091	<0.050	<0.00014	<1.2	<0.00015	<0.0016	<0.43	<0.0098	<0.00014
Chloroethane	mg/kg	~	~	~	~	1100	220	NA	NA	NA	NA	<3.8	<0.00042	<0.00037	<0.024	<0.13	<0.00037	<3.1	<0.00041	<0.0050	<1.3	<0.030	<0.00042
Chloroform	mg/kg	1.19	~	~	~	2	0.6	NA	NA	NA	NA	<2.1	<0.00023	<0.00021	<0.013	<0.074	<0.00020	<1.7	<0.00023	<0.0016	<0.41	<0.0094	<0.00013
Chloromethane	mg/kg	~	~	~	~	12	4	<32000	<20000	<2200	<4000	<1.9	<0.00021	<0.00018	<0.012	<0.066	<0.00018	<1.5	<0.00020	<0.0027	<0.73	<0.016	<0.00023
cis-1,2-Dichloroethene	mg/kg	~	~	~	~	560	230	NA	NA	NA	NA	<3.9	<0.00043	<0.00038	<0.025	<0.14	<0.00038	<3.1	<0.00042	<0.0081	<2.2	<0.049	<0.00068
cis-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	NA	NA	NA	NA	<1.7	<0.00019	<0.00017	<0.011	<0.061	<0.00017	<1.4	<0.00019	<0.0012	<0.33	<0.0074	<0.00010
cyclohexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	51.6	<0.00053	0.00058 J	4.70	39.9	0.0016 J	56.4	0.00095 J	0.0083 J	164	0.978	0.00044 J
Dibromochloromethane	mg/kg	2.05	~	~	~	8	3	NA	NA	NA	NA	<1.3	<0.00015	<0.00013	<0.0085	<0.047	<0.00013	<1.1	<0.00014	<0.0021	<0.57	<0.013	<0.00018
Dichlorodifluoromethane	mg/kg	~	~	~	~	230000	490	NA	NA	NA	NA	<4.8	<0.00053	<0.00047	<0.031	<0.17	<0.00047	<3.9	<0.00052	<0.0038	<1.0	<0.023	<0.00032
Ethylbenzene	mg/kg	5.16	~	1.4	~	110000	7800	NA	NA	NA	NA	54.5	0.00035 J	0.00033 J	4.50	34.3	0.0029	89.9	0.00072 J	<0.0017	225	1.16	0.00035 J
Hexane	mg/kg	~	~	~	~	~	~	36000 J	28000 J	1000 J	14000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	21.9	<0.00015	0.00024 J	3.02	14.1	0.00028 J	25.7	0.00025 J	<0.0011	45.1	0.292	<0.000093
methyl acetate	mg/kg	~	~	~	~	~	78000	NA	NA	NA	NA	<18	<0.0020	<0.0018	0.631	4.87	<0.0017	<15	<0.0019	<0.0090	<2.4	<0.054	<0.00075
methyl cyclohexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	169	0.0034	0.0014 J	18.6	110	0.00073 J	128	0.0044	<0.0024	421	3.39	0.0027
Methyl Tertiary Butyl Ether	mg/kg	~	~	~	~	320	110	<63000	<39000	<4500	<8100	<2.4	<0.00026	<0.00023	<0.015	<0.083	<0.00023	<1.9	<0.00025	<0.0016	<0.43	<0.0096	<0.00013
Methylene chloride	mg/kg	4.05	~	~	~	230	46	<32000	<20000	<2200	<4000	<8.9	<0.00097	<0.00087	<0.056	<0.31	0.0010 J	<7.2	<0.00096	<0.010	<2.7	<0.062	<0.00086
n-Propylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	mg/kg	4.69	300	~	~	260	90	NA	NA	NA	NA	<1.3	<0.00014	<0.00013	<0.0082	<0.045	<0.00012	<1.0	<0.00014	<0.0019	<0.50	<0.011	<0.00016
tert-Butyl alcohol	mg/kg	~	~	~	~	11000	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	mg/kg	9.92	~	0.45	~	1500	43	NA	NA	NA	NA	<2.5	<0.00027	<0.00024	<0.016	<0.088	<0.00024	<2.0	<0.00027	<0.0031	<0.84	<0.019	<0.00026
Toluene	mg/kg	200	~	2.5	~	91000	6300	NA	NA	NA	NA	39.8	<0.00012	0.00026 J	0.953	20.9	0.00026 J	127	0.00069 J	<0.0022	397	1.72	0.00044 J
trans-1,2-Dichloroethene	mg/kg	0.784	~	~	~	720	300	NA	NA	NA	NA	<1.4	<0.00015	<0.00014	<0.0089	<0.049	<0.00014	<1.1	<0.00015	<0.0062	<1.7	<0.037	<0.00052
trans-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<32000	<20000	<2200	<4000	<2.0	<0.00021	<0.00019	<0.012	<0.069	<0.00019	<1.6	<0.00021	<0.0018	<0.49	<0.011	<0.00015
Trichloroethene	mg/kg	12.4	~	1.6	~	10	3	<32000	<20000	<2200	<4000	<1.7	<0.00018	<0.00016	<0.011	<0.059	<0.00016	<1.4	<0.00018	<0.0015	<0.41	<0.0093	<0.00013
Trichlorofluoromethane	mg/kg	~	~	~	~	340000	23000	NA	NA	NA	NA	<5.6	<0.00061	<0.00054	<0.035	<0.20	<0.00054	<4.5	<0.00060	<0.0026	<0.69	<0.016	<0.00022
Vinyl chloride	mg/kg	0.646	~	~	~	2	0.7	<32000	<20000	<2200	<4000	<1.8	<0.00020	<0.00017	<0.011	<0.063	<0.00017	<1.4	<0.00019	<0.0021	<0.55	<0.012	<0.00017
m/p-xylene	mg/kg	~	~	~	~	170000	12000	NA	NA	NA	NA	163	<0.00021	0.0010	11.4	87.8	<0.00019	293	0.0022	<0.0037	792	3.97	0.00096
o-xylene	mg/kg	~	~	~	~	170000	12000	NA	NA	NA	NA	84.7	0.00062 J	0.00067 J	9.78	48.9	<0.00017	126	0.00097	<0.0029	295	1.51	0.00038 J
Xylenes, total	mg/kg	10	~	0.12	~	170000	12000	36000	69000	8300 J	21000	248	0.00062 J	0.0017	21.2	137	<0.00017	419	0.0032	<0.0029	1090	5.47	0.0013
Total VOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	670 J	0	0	179.2 J	185 J	0	400 J	0.01 J	0	1150 J	52.3 J	0
Total VOC TICs	mg/kg	~	~	~	~	~	~	NA	568000	NA	NA	1680 J	0.038 J	0.0516 J	107 J	551 J	0.034 J	1732 J	0.011 J	0.559 J	1500 J	17.4 J	0.0046 J

Kleinfelder
2 South Gold Drive, Suite A, Hamilton, New Jersey

TABLE 1A
SOIL ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment	NJ ECO Saline Estuary Sediment	NJDEP NRDCSRS	NJDEP RDCSRS	SB-12		SB-13		SB-14	SB-15	SB-16		SB-3			SB-4			SB-5	
Date								2015-10-08	2015-10-08	2015-10-08	2015-10-08	2015-09-25	2015-09-18	2015-10-09	2015-10-09	2015-10-05	2015-10-05	2015-10-05	2008-09-15	2015-11-18	2015-11-18	2015-10-07	2015-10-07
Start Depth								6	12	1	13	2.5	3.5	11	12.5	1	2.5	19	0	1.5	9.5	20.5	4
End Depth								6.5	12.5	1.5	13.5	3	4	11.5	13	1.5	3	19.5	0.5	2	10	21	4.5
Grid Cell (Figures 1A through 1E)								B3		B3		B3	C4	B2			B1			B1		B2	
Chemical	Units																						
1,1,1-Trichloroethane	mg/kg	29.8	~	~	~	~	160000	<0.00028	<0.00019	<0.27	<0.00017	<0.0011	<0.00088	<0.040	<0.0095	<0.26	<0.12	<0.00015	<0.00061	<0.11	<0.00018	<0.00013	<0.022
1,1,2,2-Tetrachloroethane	mg/kg	0.127	~	~	~	3	1	<0.00032	<0.00022	<0.32	<0.00020	<0.0012	<0.0010	<0.047	<0.011	<0.30	<0.14	<0.00018	<0.00029	<0.13	<0.00021	<0.00015	<0.026
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	~	~	~	~	~	~	<0.00083	<0.00056	<0.81	<0.00052	<0.0032	<0.0026	<0.12	<0.028	<0.78	<0.35	<0.00046	NA	<0.32	<0.00054	<0.00039	<0.067
1,1,2-Trichloroethane	mg/kg	28.6	~	~	~	6	2	<0.00027	<0.00018	<0.27	<0.00017	<0.0010	<0.00087	<0.039	<0.0093	<0.26	<0.11	<0.00015	<0.00029	<0.11	<0.00018	<0.00013	<0.022
1,1-Dichloroethane	mg/kg	~	~	~	~	24	8	<0.00026	<0.00018	<0.26	<0.00016	<0.0010	<0.00083	<0.038	<0.0089	<0.25	<0.11	<0.00014	<0.00045	<0.10	<0.00017	<0.00012	<0.021
1,1-Dichloroethene	mg/kg	8.28	~	~	~	150	11	<0.0011	<0.00074	<1.1	<0.00069	<0.0042	<0.0035	<0.16	<0.038	<1.0	<0.46	<0.00060	<0.00060	<0.43	<0.00071	<0.00051	<0.089
1,2,3-trichlorobenzene	mg/kg	20	~	~	~	~	~	<0.00033	<0.00022	<0.32	<0.00021	<0.0012	<0.0010	<0.047	<0.011	<0.31	<0.14	<0.00018	NA	<0.13	<0.00021	<0.00015	<0.026
1,2,4-trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.00031	<0.00021	<0.31	<0.00020	<0.0012	<0.0010	<0.045	<0.011	<0.29	<0.13	<0.00017	<0.019	<0.12	<0.00020	<0.00015	<0.025
1,2-dibromo-3-chloropropane	mg/kg	~	~	~	0.0048	0.2	0.08	<0.0010	<0.00068	<0.99	<0.00064	<0.0039	NA	<0.15	<0.035	<0.95	<0.42	<0.00055	NA	<0.39	<0.00065	<0.00047	<0.082
1,2-dibromoethane	mg/kg	~	~	~	~	0.04	0.008	<0.00024	<0.00016	<0.24	<0.00015	<0.00093	NA	<0.035	<0.0083	<0.23	<0.10	<0.00013	NA	<0.095	<0.00016	<0.00011	<0.020
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.00023	<0.00015	<0.22	<0.00014	<0.00086	<0.00072	<0.033	<0.0077	<0.21	<0.095	<0.00012	<0.019	<0.088	<0.00015	<0.00010	0.205
1,2-Dichloroethane	mg/kg	21.2	~	~	~	3	0.9	<0.00025	<0.00017	<0.24	<0.00016	<0.00095	<0.00079	<0.036	<0.0085	<0.23	<0.10	<0.00014	<0.00049	<0.097	<0.00016	<0.00012	<0.020
1,2-dichloroethylene, total	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00037	NA	NA	NA	NA
1,2-Dichloropropane	mg/kg	32.7	~	~	~	5	2	<0.00044	<0.00030	<0.43	<0.00028	<0.0017	<0.0014	<0.064	<0.015	<0.41	<0.18	<0.00024	<0.00045	<0.17	<0.00028	<0.00020	<0.036
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.00029	<0.00020	<0.28	<0.00018	<0.0011	<0.00093	<0.042	<0.010	<0.27	<0.12	<0.00016	<0.015	<0.11	<0.00019	<0.00013	<0.024
1,4-Dichlorobenzene	mg/kg	0.546	~	~	0.11	13	5	<0.00042	<0.00028	<0.41	<0.00026	<0.0016	<0.0013	<0.060	<0.014	<0.39	<0.17	<0.00023	<0.014	<0.16	<0.00027	<0.00019	0.152
1-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	mg/kg	~	~	~	~	44000	3100	<0.0035	<0.0024	<3.5	<0.0022	<0.014	<0.011	<0.51	<0.12	<3.3	<1.5	<0.0019	0.0124	<1.4	<0.0023	<0.0016	<0.29
2-Hexanone	mg/kg	~	~	~	~	~	~	<0.0025	<0.0017	<2.4	<0.0016	<0.0095	<0.0079	<0.36	<0.085	<2.3	<1.0	<0.0014	<0.0022	<0.97	<0.0016	<0.0012	<0.20
4-methyl-2-pentanone	mg/kg	~	~	~	~	~	~	<0.00085	<0.00057	<0.83	<0.00054	<0.0033	<0.0027	<0.12	<0.029	<0.80	<0.36	<0.00047	<0.0027	<0.33	<0.00055	<0.00039	<0.069
Acetone	mg/kg	~	~	~	~	~	70000	0.0273	0.0277	<4.1	0.0182	<0.016	0.0737	<0.60	<0.14	<3.9	<1.7	<0.0023	0.0707	<1.6	0.0259	0.0092	<0.34
Benzene	mg/kg	0.255	~	0.34	~	5	2	0.0024	<0.00017	**6.49**	0.0012	<0.00094	<0.00079	*4.14*	0.0374	**19.1**	*4.97*	<0.00014	<0.00040	**5.58**	0.010	0.00029 J	**34.0**
bromochloromethane	mg/kg	~	~	~	~	~	~	<0.00057	<0.00039	<0.56	<0.00036	<0.0022	<0.0018	<0.083	<0.020	<0.54	<0.24	<0.00031	NA	<0.22	<0.00037	<0.00027	<0.047
Bromodichloromethane	mg/kg	0.54	~	~	~	3	1	<0.00029	<0.00020	<0.28	<0.00018	<0.0011	<0.00092	<0.042	<0.0099	<0.27	<0.12	<0.00016	<0.00030	<0.11	<0.00019	<0.00013	<0.023
Bromoform	mg/kg	15.9	~	~	~	280	81	<0.00044	<0.00030	<0.43	<0.00028	<0.0017	<0.0014	<0.063	<0.015	<0.41	<0.18	<0.00024	<0.00039	<0.17	<0.00028	<0.00020	<0.036
Bromomethane	mg/kg	0.235	~	~	~	59	25	<0.00067	<0.00046	<0.66	<0.00043	<0.0026	<0.0021	<0.098	<0.023	<0.63	<0.28	<0.00037	<0.0010	<0.26	<0.00044	<0.00031	<0.055
Carbon disulfide	mg/kg	~	~	~	~	110000	7800	0.0078	0.0038	<0.41	0.0017 J	0.0378	0.0699	1.30	0.0145 J	<0.40	<0.18	<0.00023	0.0028 J	<0.16	0.0031	<0.00020	0.322
Carbon tetrachloride	mg/kg	2.98	~	~	~	4	2	<0.00043	<0.00029	<0.42	<0.00027	<0.0016	<0.0014	<0.062	<0.015	<0.40	<0.18	<0.00023	<0.0011	<0.17	<0.00027	<0.00020	<0.035
Chlorobenzene	mg/kg	13.1	~	~	~	7400	510	<0.00029	<0.00019	<0.28	<0.00018	<0.0011	<0.00092	<0.042	<0.0098	<0.27	<0.12	<0.00016	<0.00034	<0.11	<0.00019	<0.00013	<0.023
Chloroethane	mg/kg	~	~	~	~	1100	220	<0.00089	<0.00060	<0.87	<0.00056	<0.0034	<0.0028	<0.13	<0.031	<0.84	<0.37	<0.00049	<0.00078	<0.35	<0.00057	<0.00041	<0.072
Chloroform	mg/kg	1.19	~	~	~	2	0.6	<0.00028	<0.00019	<0.27	<0.00017	<0.0011	<0.00088	<0.040	<0.0095	<0.26	<0.12	<0.00015	<0.00053	<0.11	<0.00018	<0.00013	<0.022
Chloromethane	mg/kg	~	~	~	~	12	4	<0.00048	<0.00033	<0.48	<0.00031	<0.0019	<0.0015	<0.070	<0.017	<0.46	<0.20	<0.00027	<0.00081	<0.19	<0.00031	<0.00023	<0.039
cis-1,2-Dichloroethene	mg/kg	~	~	~	~	560	230	<0.0014	<0.00098	<1.4	<0.00091	<0.0055	<0.0046	<0.21	<0.049	<1.4	<0.60	<0.00079	<0.00042	<0.56	<0.00093	<0.00067	<0.12
cis-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.00022	<0.00015	<0.21	<0.00014	<0.00084	<0.00070	<0.032	<0.0075	<0.21	<0.092	<0.00012	<0.00028	<0.085	<0.00014	<0.00010	<0.018
cyclohexane	mg/kg	~	~	~	~	~	~	0.0017 J	<0.00040	32.9	0.0269	<0.0022	<0.0019	35.5	0.220	111	44.6	0.00052 J	NA	42.6	0.0011 J	0.00059 J	112
Dibromochloromethane	mg/kg	2.05	~	~	~	8	3	<0.00038	<0.00026	<0.37	<0.00024	<0.0015	<0.0012	<0.055	<0.013	<0.36	<0.16	<0.00021	<0.00031	<0.15	<0.00025	<0.00018	<0.031
Dichlorodifluoromethane	mg/kg	~	~	~	~	230000	490	<0.00067	<0.00045	<0.65	<0.00042	<0.0026	<0.0021	<0.097	<0.023	<0.63	<0.28	<0.00037	NA	<0.26	<0.00043	<0.00031	<0.054
Ethylbenzene	mg/kg	5.16	~	1.4	~	110000	7800	0.0044	<0.00020	52.5	0.0187	<0.0012	<0.00096	36.9	0.288	97.5	35.4	0.00045 J	<0.00047	41.6	0.00050 J	0.00066 J	164
Hexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	mg/kg	~	~	~	~	~	~	0.00092 J	<0.00013	14.8	0.0060	<0.00075	<0.00063	11.0	0.0813 J	28.1	16.0	0.00020 J	NA	17.1	<0.00013	0.00021 J	36.4
methyl acetate	mg/kg	~	~	~	~	~	78000	<0.0016	<0.0011	<1.6	<0.0010	<0.0061	<0.0051	<0.23	<0.055	<1.5	5.81	<0.00088	NA	<0.62	<0.0010	<0.00074	<0.13
methyl cyclohexane	mg/kg	~	~	~	~	~	~	0.0034 J	<0.00028	81.7	0.0840	<0.0016	<0.0013	81.0	0.654	295	185	0.0021	NA	151	0.0011 J	0.0020	243
Methyl Tertiary Butyl Ether	mg/kg	~	~	~	~	320	110	<0.00028	<0.00019	<0.28	<0.00018	<0.0011	<0.00090	<0.041	<0.0097	<0.27	<0.12	<0.00016	NA	<0.11	<0.00018	<0.00013	<0.023
Methylene chloride	mg/kg	4.05	~	~	~	230	46	<0.0018	<0.0012	<1.8	<0.0011	<0.0070	<0.0058	<0.26	<0.062	<1.7	<0.76	<0.0010	0.0015 J	<0.71	<0.0012	<0.00084	<0.15
n-Propylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	mg/kg	4.69	300	~	~	260	90	<0.00033	<0.00022	<0.32	<0.00021	<0.0013	<0.0011	<0.048	<0.011	<0.31	<0.14	<0.00018	<0.00033	<0.13	<0.00021	<0.00015	<0.027
tert-Butyl alcohol	mg/kg	~	~	~	~	11000	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	mg/kg	9.92	~	0.45	~	1500	43	<0.00056	<0.00038	<0.55	<0.00035	<0.0021	<0.0018	<0.081	<0.019	<0.52	<0.23	<0.00031	<0.00054	<0.22	<0.00036	<0.00026	<0.045
Toluene	mg/kg	200	~	2.5	~	91000	6300	0.00058 J	<0.00026	22.7	0.0064	<0.0015	0.0013 J	15.5	0.132	126	25.8	0.00029 J	<0.00038	35.4	0.0017	0.00091	216
trans-1,2-Dichloroethene	mg/kg	0.784	~	~	~	720	300	<0.0011	<0.00074	<1.1	<0.00069	<0.0042	<0.0035	<0.16	<0.038	<1.0	<0.46	<0.00060	<0.00037	<0.43	<0.00071	<0.00051	<0.089
trans-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.00033	<0.00022	<0.32	<0.00021	<0.0013	<0.0010	<0.048	<0.011	<0.31	<0.14	<0.00018	<0.00029	<0.13	<0.00021	<0.00015	<0.027
Trichloroethene	mg/kg	12.4	~	1.6	~	10	3	<0.00027	<0.00018	<0.27	<0.00017	<0.0010	<0.00087	<0.039	<0.0093	<0.26	<0.11	<0.00015	<0.00034	<0.11	<0.00018	<0.00013	<0.022
Trichlorofluoromethane	mg/kg	~	~	~	~	340000	23000	<0.00046	<0.00031	<0.45	<0.00029	<0.0018	<0.0015	<0.067	<0.016	<0.43	<0.19	<0.00025	NA	<0.18	<0.00030	<0.00021	<0.037
Vinyl chloride	mg/kg	0.646	~	~	~	2	0.7	<0.00036	<0.00025	<0.36	<0.00023	<0.0014	<0.0012	<0.053	<0.012	<0.34	<0.15	<0.00020	<0.00073	<0.14	<0.00024	<0.00017	<0.030
m/p-xylene	mg/kg	~	~	~	~	170000	12000	0.0081	<0.00044	88.0	0.0379	<0.0025	<0.0021	78.1	0.576	268	111	0.00080 J	NA	122	0.00092 J	0.0020	547
o-xylene	mg/kg	~	~	~	~	170000	12000	0.0052	<0.00034	48.0	0.0185	<0.0019	<0.0016	41.4	0.271	122	55.3	0.00076 J	NA	63.3	0.00079 J	0.00086	222
Xylenes, total	mg/kg	10	~	0.12	~	170000	12000	0.0133	<0.00034	136	0.0565	<0.0019	<0.0016	119	0.847	390	166	0.0016	0.00089 J	186	0.0017	0.0028	769
Total VOC Alkanes	mg/kg	~	~	~	~	~	~	0	0	209 J	0.478 J	0	0	146 J	6.39 J	309 J	429 J	0.0201 J	NA	152 J	0	0	98 J
Total VOC TICs	mg/kg	~	~	~	~	~	~	0.175 J	0.0063 J	694 J	0.644 J	0	0	212 J	9.01 J	1299 J	1009 J	0.0812 J	1.506 J	588 J	0.0074 J	0.0303 J	308.9 J

Kleinfelder
2 South Gold Drive, Suite A, Hamilton, New Jersey

TABLE 1A
SOIL ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment	NJ ECO Saline Estuary Sediment	NJDEP NRDCSRS	NJDEP RDCSRS	SB-6	SB-7		SB-8		SB-9	
Date								2015-09-25	2015-11-19	2015-11-19	2015-11-19	2015-11-19	2015-11-18	2015-11-18
Start Depth								4.5	5.5	10.5	6	10.5	1.5	12.5
End Depth								5	6	11	6.5	11	2	13
Grid Cell (Figures 1A through 1E)								B3	B1		B1		B2	
Chemical	Units													
1,1,1-Trichloroethane	mg/kg	29.8	~	~	~	~	160000	<0.0019	<0.038	<0.00016	<0.085	<0.00019	<0.20	<0.00017
1,1,2,2-Tetrachloroethane	mg/kg	0.127	~	~	~	3	1	<0.0022	<0.044	<0.00019	<0.10	<0.00023	<0.24	<0.00020
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	~	~	~	~	~	~	<0.0056	<0.11	<0.00048	<0.25	<0.00058	<0.61	<0.00051
1,1,2-Trichloroethane	mg/kg	28.6	~	~	~	6	2	<0.0018	<0.037	<0.00016	<0.084	<0.00019	<0.20	<0.00017
1,1-Dichloroethane	mg/kg	~	~	~	~	24	8	<0.0018	<0.036	<0.00015	<0.080	<0.00018	<0.19	<0.00016
1,1-Dichloroethene	mg/kg	8.28	~	~	~	150	11	<0.0074	<0.15	<0.00063	<0.34	<0.00077	<0.80	<0.00067
1,2,3-trichlorobenzene	mg/kg	20	~	~	~	~	~	<0.0022	<0.044	<0.00019	<0.10	<0.00023	<0.24	<0.00020
1,2,4-trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.0021	<0.043	<0.00018	<0.096	<0.00022	<0.23	<0.00019
1,2-dibromo-3-chloropropane	mg/kg	~	~	~	0.0048	0.2	0.08	<0.0068	<0.14	<0.00058	<0.31	<0.00071	<0.74	<0.00061
1,2-dibromoethane	mg/kg	~	~	~	~	0.04	0.008	<0.0016	<0.033	<0.00014	<0.075	<0.00017	<0.18	<0.00015
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.0015	<0.031	<0.00013	<0.069	<0.00016	<0.17	<0.00014
1,2-Dichloroethane	mg/kg	21.2	~	~	~	3	0.9	<0.0017	<0.034	<0.00014	<0.076	<0.00017	<0.18	<0.00015
1,2-dichloroethylene, total	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	mg/kg	32.7	~	~	~	5	2	<0.0030	<0.060	<0.00025	<0.14	<0.00031	<0.32	<0.00027
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.0020	<0.040	<0.00017	<0.089	<0.00020	<0.21	<0.00018
1,4-Dichlorobenzene	mg/kg	0.546	~	~	0.11	13	5	<0.0028	<0.057	<0.00024	<0.13	<0.00029	<0.31	<0.00025
1-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
2-Butanol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
2-butanone	mg/kg	~	~	~	~	44000	3100	<0.024	<0.48	<0.0020	<1.1	<0.0025	<2.6	<0.0022
2-Hexanone	mg/kg	~	~	~	~	~	~	<0.017	<0.34	<0.0014	<0.76	<0.0017	<1.8	<0.0015
4-methyl-2-pentanone	mg/kg	~	~	~	~	~	~	<0.0057	<0.12	<0.00049	<0.26	<0.00060	<0.62	<0.00052
Acetone	mg/kg	~	~	~	~	~	70000	<0.028	<0.57	0.0238	<1.3	0.0325	<3.0	0.0116
Benzene	mg/kg	0.255	~	0.34	~	5	2	<0.0017	0.695	0.0025	1.54	0.0052	**16.1**	0.00091
bromochloromethane	mg/kg	~	~	~	~	~	~	<0.0039	<0.078	<0.00033	<0.18	<0.00040	<0.42	<0.00035
Bromodichloromethane	mg/kg	0.54	~	~	~	3	1	<0.0020	<0.039	<0.00017	<0.089	<0.00020	<0.21	<0.00018
Bromoform	mg/kg	15.9	~	~	~	280	81	<0.0030	<0.060	<0.00025	<0.13	<0.00031	<0.32	<0.00027
Bromomethane	mg/kg	0.235	~	~	~	59	25	<0.0046	<0.092	<0.00039	<0.21	<0.00047	<0.49	<0.00041
Carbon disulfide	mg/kg	~	~	~	~	110000	7800	0.132	<0.058	0.0038	<0.13	0.0042	<0.31	0.0098
Carbon tetrachloride	mg/kg	2.98	~	~	~	4	2	<0.0029	<0.058	<0.00025	<0.13	<0.00030	<0.31	<0.00026
Chlorobenzene	mg/kg	13.1	~	~	~	7400	510	<0.0019	<0.039	<0.00017	<0.088	<0.00020	<0.21	<0.00017
Chloroethane	mg/kg	~	~	~	~	1100	220	<0.0060	<0.12	<0.00052	<0.27	<0.00062	<0.65	<0.00054
Chloroform	mg/kg	1.19	~	~	~	2	0.6	<0.0019	<0.038	<0.00016	<0.085	<0.00019	<0.20	<0.00017
Chloromethane	mg/kg	~	~	~	~	12	4	<0.0033	<0.066	<0.00028	<0.15	<0.00034	<0.36	<0.00030
cis-1,2-Dichloroethene	mg/kg	~	~	~	~	560	230	<0.0097	<0.20	<0.00083	<0.44	<0.0010	<1.1	<0.00088
cis-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.0015	<0.030	<0.00013	<0.067	<0.00015	<0.16	<0.00013
cyclohexane	mg/kg	~	~	~	~	~	~	0.0051 J	8.31	0.0045	14.5	0.0466	81.5	0.0047
Dibromochloromethane	mg/kg	2.05	~	~	~	8	3	<0.0026	<0.052	<0.00022	<0.12	<0.00027	<0.28	<0.00023
Dichlorodifluoromethane	mg/kg	~	~	~	~	230000	490	<0.0045	<0.091	<0.00039	<0.21	<0.00047	<0.49	<0.00041
Ethylbenzene	mg/kg	5.16	~	1.4	~	110000	7800	<0.0020	10.1	0.0024	17.1	0.0317	84.0	0.0034
Hexane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	mg/kg	~	~	~	~	~	~	<0.0013	5.27	0.00087 J	9.33	0.0119	23.7	0.0013 J
methyl acetate	mg/kg	~	~	~	~	~	78000	<0.011	1.93	<0.00092	4.22	<0.0011	<1.2	<0.00097
methyl cyclohexane	mg/kg	~	~	~	~	~	~	<0.0028	41.2	0.0116	73.2	0.140	247	0.0131
Methyl Tertiary Butyl Ether	mg/kg	~	~	~	~	320	110	0.0030 J	<0.039	<0.00016	<0.087	<0.00020	<0.21	<0.00017
Methylene chloride	mg/kg	4.05	~	~	~	230	46	<0.012	<0.25	<0.0011	<0.56	<0.0013	<1.3	<0.0011
n-Propylbenzene	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
Styrene	mg/kg	4.69	300	~	~	260	90	<0.0022	<0.045	<0.00019	<0.10	<0.00023	<0.24	<0.00020
tert-Butyl alcohol	mg/kg	~	~	~	~	11000	1400	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	mg/kg	9.92	~	0.45	~	1500	43	<0.0038	<0.076	<0.00032	<0.17	<0.00039	<0.41	<0.00034
Toluene	mg/kg	200	~	2.5	~	91000	6300	<0.0026	6.37	0.00073 J	12.2	0.0269	84.9	0.0022
trans-1,2-Dichloroethene	mg/kg	0.784	~	~	~	720	300	<0.0074	<0.15	<0.00064	<0.34	<0.00077	<0.81	<0.00067
trans-1,3-Dichloropropene	mg/kg	~	~	~	~	7	2	<0.0022	<0.045	<0.00019	<0.10	<0.00023	<0.24	<0.00020
Trichloroethene	mg/kg	12.4	~	1.6	~	10	3	<0.0018	<0.037	<0.00016	<0.084	<0.00019	<0.20	<0.00017
Trichlorofluoromethane	mg/kg	~	~	~	~	340000	23000	<0.0031	<0.063	<0.00027	<0.14	<0.00032	<0.34	<0.00028
Vinyl chloride	mg/kg	0.646	~	~	~	2	0.7	<0.0025	<0.050	<0.00021	<0.11	<0.00026	<0.27	<0.00022
m/p-xylene	mg/kg	~	~	~	~	170000	12000	<0.0044	31.8	0.0061	50.7	0.0972	266	0.0099
o-xylene	mg/kg	~	~	~	~	170000	12000	<0.0034	13.0	0.0039	29.1	0.0524	129	0.0051
Xylenes, total	mg/kg	10	~	0.12	~	170000	12000	<0.0034	44.8	0.0100	79.8	0.150	396	0.0150
Total VOC Alkanes	mg/kg	~	~	~	~	~	~	0	30 J	0.0233 J	60 J	0.13 J	573 J	0.0077 J
Total VOC TICs	mg/kg	~	~	~	~	~	~	0.14 J	185.6 J	0.1489 J	382 J	0.661 J	824 J	0.156 J

Notes:

~	No standard exists for this compound in this classification.
VOC	Volatile organic compound
TICs	Tentatively identified compounds
mg/kg	Milligrams per kilogram
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
N	Presumptive evidence of a compound
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
ESC	NJDEP Ecological Screening Criteria
NJDEP ECOLOGICAL LSSL	NJDEP Lower Ecological Soil Screening Level (March 2009)
NJDEP ECOLOGICAL USSL	NJDEP Upper Ecological Soil Screening Level (March 2009)
ER-L	NJDEP Saline Estuary Sediment Criteria (Effects Range – Low) (March 2009)
ER-M	NJDEP Saline Estuary Sediment Criteria (Effects Range – Medium) (March 2009)
NJDEP RDCSRS	NJDEP Residential Direct Contact Soil Remediation Standards (September 2017)
NJDEP NRDCSRS	NJDEP Non-Residential Direct Contact Soil Remediation Standards (September 2017)
Italics	Concentration exceeds the NJDEP RDCSRS
Bold	Concentration exceeds the NRDCSRS
Gray highlight	Concentration exceeds NJDEP Ecological Soil Screening Levels
Yellow highlight	Concentration exceeds NJDEP Saline Estuary Sediment Criteria

If more than one applicable SRS or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.

ESCs do not apply to soil borings SB-3, ASB-85, ASB-859 and GMW-690.

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TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	AGRO-1	AGRO-2	AGRO-3	AGRO-4	AGRO-5	AGRO-6	AGRO-7	AGRO-8	AGRO-9	AGRO-10	AGRO-11	AGRO-12
Date								2016-11-02	2016-11-02	2016-11-02	2016-11-03	2016-11-02	2016-11-03	2016-11-03	2016-11-07	2016-11-07	2016-11-07	2016-11-09	2016-11-09
Start Depth								0	0	0	0	0	0	0	0	0	0	0	0
End Depth								1	1	1	1	1	1	1	1	1	1	1	1
Grid Cell (Figures 1A through 1E)								B3	D3	C3	C3	C2	C2	C2	C1	C2	C2	D3	D3
Chemical	Units																		
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	<0.26	<0.26	<0.28	<0.15	<0.28	<0.26	<0.35	<0.056	<1.6	<0.60	<0.098	<0.087
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	<0.32	<0.32	<0.35	<0.18	<0.35	<0.32	<0.43	<0.070	<2.0	<0.74	<0.12	<0.11
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	<0.45	<0.44	<0.49	<0.25	<0.48	<0.45	<0.60	<0.097	<2.8	<1.0	<0.17	<0.15
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	<0.94	<0.92	<1.0	<0.53	<1.0	<0.93	<1.3	<0.20	<5.9	<2.2	<0.35	<0.31
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	<2.0	<1.9	<2.1	<1.1	<2.1	<2.0	<2.7	<0.43	<12	<4.6	<0.75	<0.66
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	<0.56	<0.55	<0.61	<0.32	<0.60	<0.56	<0.76	<0.12	<3.5	<1.3	<0.21	<0.19
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	<0.43	<0.43	6.73	<0.24	<0.46	<0.43	7.08	<0.093	<2.7	<1.0	0.222 J	<0.15
2-nitrophenol	mg/kg	~	~	~	~	~	~	<0.35	<0.34	<0.38	<0.20	<0.37	<0.35	<0.47	<0.075	<2.2	<0.80	<0.13	<0.12
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	<1.4	<1.4	<1.5	<0.79	<1.5	<1.4	<1.9	<0.30	<8.8	<3.2	<0.53	<0.47
phenol	mg/kg	120	~	0.665	2.6	210000	18000	<0.28	<0.27	<0.30	1.10	<0.29	<0.27	2.06	<0.059	<1.7	<0.63	<0.10	<0.092
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	<0.39	<0.39	<0.43	<0.22	<0.42	<0.39	<0.53	<0.085	<2.5	<0.91	<0.15	<0.13
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	<0.31	<0.31	<0.34	<0.18	<0.34	<0.31	<0.42	<0.068	<2.0	<0.72	<0.12	<0.11
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	2.66	3.34	2.27	0.851	3.99	2.51	5.54	<0.039	13.6	3.56	<0.069	0.0946 J
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	<0.27	<0.26	<0.29	<0.15	<0.29	<0.27	<0.36	0.108 J	<1.7	<0.62	0.409	0.255
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	11.9	6.50	4.81	4.39	11.3	6.16	<0.43	0.256	31.3	6.24	0.789	0.538
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	*6.85*	*6.38*	*5.61*	2.57	*11.1*	4.29	*9.19*	0.318	**36.2**	*7.07*	0.767	0.650
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	**5.65**	**4.25**	**3.40**	**2.14**	**6.59**	**2.80**	**6.58**	0.336	**21.4**	**3.55**	*0.874*	*0.850*
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	3.68	4.02	4.12	2.74	*9.13*	4.23	*8.11*	0.783	*13.9*	2.86	1.62	1.69
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	5.80	4.93	4.26	2.79	9.04	4.61	6.61	0.733	11.3	1.99	1.32	1.31
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	0.581	0.757	0.551 J	0.660	1.87	1.26	1.40	0.0969 J	3.67	0.679 J	0.291	0.239
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	<0.13	<0.12	<0.14	<0.071	<0.13	<0.12	<0.17	<0.027	<0.79	<0.29	<0.047	<0.042
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	<0.20	<0.20	<0.22	<0.11	<0.22	<0.20	<0.27	<0.044	<1.3	<0.47	<0.077	<0.068
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	<0.13	<0.13	<0.14	<0.073	<0.14	<0.13	<0.17	1.50	<0.81	<0.30	<0.049	<0.043
4-chloroaniline	mg/kg	~	~	~	~	~	~	<0.19	<0.19	<0.21	<0.11	<0.20	<0.19	<0.26	<0.041	<1.2	<0.44	<0.072	<0.064
Carbazole	mg/kg	~	~	~	~	96	24	<0.076	<0.075	<0.083	<0.043	<0.082	<0.076	<0.10	<0.016	<0.48	<0.18	<0.029	<0.026
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	19.3	12.5	12.9	7.55	30.7	13.8	34.8	0.647	50.5	11.5	2.46	1.86
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	<0.11	<0.11	<0.12	<0.064	<0.12	<0.11	<0.15	<0.024	<0.71	<0.26	<0.043	<0.038
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	<0.23	<0.22	<0.25	<0.13	<0.24	<0.23	<0.31	<0.049	<1.4	<0.52	<0.086	<0.076
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	<0.19	<0.19	<0.20	<0.11	<0.20	<0.19	<0.25	<0.041	<1.2	<0.44	<0.072	<0.063
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	<0.17	<0.17	<0.18	<0.096	<0.18	<0.17	<0.23	<0.037	<1.1	<0.39	<0.065	<0.057
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	<0.020	<0.019	<0.022	<0.023	<0.024	<0.00027	<0.17	<0.00037	<0.40	<0.24	<0.00045	0.0327 J
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	<0.16	<0.16	<0.18	<0.092	<0.17	<0.16	<0.22	<0.035	<1.0	<0.38	<0.062	<0.055
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	<0.26	<0.26	<0.29	<0.15	<0.28	<0.26	<0.36	<0.057	<1.7	<0.61	<0.10	<0.089
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	<0.44	<0.43	<0.48	<0.25	<0.47	<0.44	<0.59	<0.095	<2.8	<1.0	<0.17	<0.15
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	*1.37*	*1.56*	*1.73*	*1.00*	**4.09**	*1.70*	**3.10**	0.176	**7.07**	*1.25*	0.441	0.384
Dibenzofuran	mg/kg	~	~	~	~	~	~	4.71	5.59	4.68	1.50	6.81	2.39	8.81	0.0589 J	<1.3	5.36	<0.081	<0.072
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	0.939 J	1.01	2.87	<0.048	4.52	3.23	12.2	<0.019	<0.54	<0.20	<0.032	<0.029
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	<0.13	<0.13	<0.14	<0.074	<0.14	<0.13	<0.18	<0.028	<0.82	<0.30	<0.050	<0.044
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	<0.11	<0.11	<0.12	<0.063	<0.12	<0.11	<0.15	<0.024	<0.70	<0.26	<0.042	<0.038
dimethyl phthalate	mg/kg	~	~	~	~	~	~	<0.094	<0.092	<0.10	<0.053	<0.10	<0.093	<0.13	<0.020	<0.59	<0.22	<0.035	<0.031
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	5.26	1.18	<0.13	1.16	1.33	1.70	5.53	2.68	<0.77	<0.28	5.08	2.74
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	6.17	3.53	2.31	2.80	8.81	3.67	10.2	0.481	15.4	4.20	1.21	0.942
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	8.80	8.58	6.72	2.24	17.5	<0.24	24.1	0.0703 J	35.7	9.18	<0.092	<0.081
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	<0.13	<0.13	<0.14	<0.075	<0.14	<0.13	<0.18	<0.029	<0.84	<0.31	<0.050	<0.045
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	<0.21	<0.21	<0.23	<0.12	<0.23	<0.21	<0.29	<0.046	<1.3	<0.49	<0.080	<0.071
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	<0.21	<0.21	<0.23	<0.12	<0.22	<0.21	<0.28	<0.045	<1.3	<0.48	<0.079	<0.070
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	<0.26	<0.26	<0.28	<0.15	<0.28	<0.26	<0.35	<0.056	<1.6	<0.60	<0.099	<0.087
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	2.41	2.23	2.37	1.69	4.79	2.51	4.23	0.362	*6.29*	1.19 J	0.772	0.766
isophorone	mg/kg	139	~	~	~	2000	510	<0.11	<0.11	<0.12	<0.064	<0.12	<0.11	<0.15	<0.024	<0.71	<0.26	<0.043	<0.038
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	22.9	50.8	54.0	5.66	32.6	4.22	47.0	0.409	178	100	0.607	0.430
2-nitroaniline	mg/kg	~	~	~	~	23000	39	<0.12	<0.12	<0.13	<0.070	<0.13	<0.12	<0.17	<0.027	<0.78	<0.29	<0.047	<0.042
3-nitroaniline	mg/kg	~	~	~	~	~	~	<0.13	<0.13	<0.14	<0.074	<0.14	<0.13	<0.18	<0.028	<0.83	<0.30	<0.050	<0.044
4-nitroaniline	mg/kg	~	~	~	~	~	~	<0.14	<0.13	<0.15	<0.077	<0.15	<0.14	<0.18	<0.029	<0.86	<0.31	<0.052	<0.046
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	*7.28*	**31.3**	**23.5**	3.90	*7.57*	2.59	*10.9*	0.225	**49.6**	**40.0**	0.512	0.247
nitrobenzene	mg/kg	1.31	~	~	~	14	5	<0.20	<0.20	<0.22	<0.11	<0.22	<0.20	<0.27	<0.044	<1.3	<0.47	<0.077	<0.068
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	<0.15	<0.15	<0.16	<0.086	<0.16	<0.15	<0.20	<0.033	<0.96	<0.35	<0.058	<0.051
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	<0.19	<0.19	<0.21	<0.11	<0.21	<0.19	<0.26	<0.042	<1.2	<0.44	<0.073	<0.065
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	<0.50	<0.49	<0.54	<0.28	<0.53	<0.49	<0.67	<0.11	<3.1	<1.1	<0.19	<0.17
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	32.6	34.1	18.8	6.67	55.8	2.78	77.6	0.398	95.5	22.0	0.685	0.586
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	37.7	21.6	11.2	8.88	37.6	19.6	43.9	0.663	73.7	14.5	3.52	2.19
2-Methylphenol	mg/kg	~	~	~	~	3400	310	<0.34	<0.33	<0.36	<0.19	<0.36	<0.33	<0.45	<0.073	<2.1	<0.78	<0.13	<0.11
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.022	<0.021	<0.025	<0.026	<0.027	<0.00030	<0.19	<0.00041	<0.45	<0.27	<0.00051	0.0324 J
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.018	<0.017	<0.020	<0.021	<0.021	<0.00024	<0.15	<0.00033	<0.36	<0.21	<0.00041	<0.021
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.024	<0.023	<0.026	<0.028	<0.029	<0.00032	<0.20	<0.00044	<0.48	<0.28	<0.00054	0.110 J
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	3.13	5.86	5.31	1.65	4.96	<0.072	6.76	0.0665 J	17.3	7.35	0.133 J	0.0975 J
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	<0.13	<0.13	<0.15	<0.076	<0.14	<0.13	<0.18	<0.029	<0.84	<0.31	<0.051	<0.045
1,4-Dioxane	mg/kg	~	~	~	~	~	~	<0.35	<0.34	<0.38	<0.20	<0.37	<0.35	<0.47	<0.075	<2.2	<0.80	<0.13	<0.12
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	<0.35	<0.34	<0.38	<0.20	<0.37	<0.35	<0.47	<0.075	<2.2	<0.80	<0.13	<0.12
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	mg/kg	~	~	~	~	5	2	<0.11	<0.11	<0.12	<0.064	<0.12	<0.11	<0.15	<0.024	<0.71	<0.26	<0.043	<0.038
Atrazine	mg/kg	~	~	~	~	2400	210	<0.23	<0.22	<0.24	<0.13	<0.24	<0.22	<0.30	<0.049	<1.4	<0.52	<0.085	<0.076
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	<0.13	<0.13	<0.14	<0.074	<0.14	<0.13	<0.18	<0.028	<0.82	<0.30	<0.049	<0.044
Caprolactam	mg/kg	~	~	~	~	340000	31000	<0.21	<0.20	<0.23	<0.12	<0.22	<0.21	<0.28	<0.045	<1.3	<0.48	<0.079	<0.070
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	183 J	275 J	332 J	45 J	652 J	70 J	620 J	0	419 J	717 J	0	4.7 J
Total SVOC TICs	mg/kg	~	~	~	~	~	~	301 J	380 J	237 J	361.8 J	415 J	562 J	153 J	97.1 J	975 J	425 J	156.9 J	132 J

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-1012										ASB-1013							
Date								2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20
Start Depth								1.5	3.5	7.5	8	10	0	2	6	8	10	13	0	1.5	3.5	2	4	4	13
End Depth								2	4	8	8.5	10.5	2	4	8	10	11	13.5	2	2	4	4	4.5	5	14
Grid Cell (Figures 1A through 1E)								B3										C3							
Chemical	Units																								
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	NA	NA	NA	NA	NA	<2.4	1.3	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	NA	NA	NA	NA	NA	<53	<9.4	<3.2	<1.8	<0.47	NA	<1.7	NA	NA	<2.3	NA	<2.5	<0.48
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	NA	NA	NA	NA	NA	<24	<4.3	<1.5	<0.82	<0.22	NA	<0.77	NA	NA	<1.0	NA	<1.1	<0.22
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	NA	NA	NA	NA	NA	<24	<4.3	<1.5	<0.82	<0.22	NA	<0.77	NA	NA	<1.0	NA	<1.1	<0.22
phenol	mg/kg	120	~	0.665	2.6	210000	18000	NA	NA	NA	NA	NA	<3.4	<0.60	<0.21	<0.11	<0.030	NA	<0.11	NA	NA	<0.15	NA	<0.16	<0.031
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	NA	NA	NA	NA	NA	<0.49	0.40 J	<0.029	<0.016	<0.004	NA	<0.015	NA	NA	<0.021	NA	<0.023	<0.004
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	NA	NA	NA	NA	NA	0.64 J	<0.085	<0.029	<0.016	<0.004	NA	0.12	NA	NA	0.049 J	NA	0.071 J	0.007 J
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	NA	NA	NA	NA	NA	1.7 J	7.0	0.097 J	0.19	0.007 J	NA	0.38	NA	NA	0.050 J	NA	0.030 J	0.005 J
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	NA	NA	NA	NA	NA	0.63 J	0.81	0.046 J	0.043 J	<0.004	NA	0.32	NA	NA	0.068 J	NA	0.063 J	0.01 J
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	NA	NA	NA	NA	NA	*1.1 J*	*0.68*	<0.059	0.033 J	<0.009	NA	0.37	NA	NA	0.061 J	NA	0.059 J	0.01 J
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	NA	NA	NA	NA	NA	2.0 J	0.69	0.060 J	0.037 J	<0.004	NA	0.28	NA	NA	0.067 J	NA	0.097 J	0.016 J
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	NA	NA	NA	NA	NA	2.3 J	1.1	<0.059	<0.033	<0.009	NA	0.19	NA	NA	0.050 J	NA	<0.046	<0.009
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	NA	NA	NA	NA	NA	0.51 J	0.19 J	<0.029	0.019 J	<0.004	NA	0.12	NA	NA	0.052 J	NA	<0.023	<0.004
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	NA	NA	NA	NA	NA	<0.97	<0.17	<0.059	<0.033	<0.009	NA	<0.031	NA	NA	<0.041	NA	<0.046	<0.009
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
4-chloroaniline	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<4.9	<0.85	<0.29	<0.16	<0.043	NA	<0.15	NA	NA	<0.21	NA	<0.23	<0.044
Carbazole	mg/kg	~	~	~	~	96	24	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	NA	NA	NA	NA	NA	3.6	1.3	0.11 J	0.064 J	0.005 J	NA	0.78	NA	NA	0.098 J	NA	0.099 J	0.015 J
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	NA	NA	NA	NA	NA	<3.4	<0.60	<0.21	<0.11	<0.030	NA	<0.11	NA	NA	<0.15	NA	<0.16	<0.031
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	<0.003	<0.005	<0.007	<0.002	<0.0005	NA	NA	NA	NA	NA	<0.0005	NA	<0.003	<0.005	NA	<0.005	NA	NA
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	NA	NA	NA	NA	NA	<15	<2.6	<0.88	<0.49	<0.13	NA	<0.46	NA	NA	<0.62	NA	<0.69	<0.13
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	NA	NA	NA	NA	NA	<0.49	0.35 J	<0.029	<0.016	<0.004	NA	0.046 J	NA	NA	0.028 J	NA	<0.023	<0.004
Dibenzofuran	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
dimethyl phthalate	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	0.43 J	NA	NA	<0.41	NA	<0.46	<0.087
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	NA	NA	NA	NA	NA	1.3 J	2.1	0.092 J	0.063 J	<0.004	NA	0.41	NA	NA	0.065 J	NA	0.041 J	0.007 J
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	NA	NA	NA	NA	NA	<0.49	<0.085	<0.029	<0.016	<0.004	NA	0.11	NA	NA	0.033 J	NA	0.023 J	0.005 J
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	NA	NA	NA	NA	NA	<0.49	<0.085	<0.029	<0.016	<0.004	NA	<0.015	NA	NA	<0.021	NA	<0.023	<0.004
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	NA	NA	NA	NA	NA	<24	<4.3	<1.5	<0.82	<0.22	NA	<0.77	NA	NA	<1.0	NA	<1.1	<0.22
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	NA	NA	NA	NA	NA	<4.9	<0.85	<0.29	<0.16	<0.043	NA	<0.15	NA	NA	<0.21	NA	<0.23	<0.044
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	NA	NA	NA	NA	NA	1.0 J	0.59	<0.059	<0.033	<0.009	NA	0.094	NA	NA	<0.041	NA	<0.046	<0.009
isophorone	mg/kg	139	~	~	~	2000	510	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	NA	NA	NA	NA	NA	<1.5	0.74 J	<0.088	<0.049	<0.013	NA	0.14 J	NA	NA	<0.062	NA	<0.069	<0.013
2-nitroaniline	mg/kg	~	~	~	~	23000	39	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
3-nitroaniline	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
4-nitroaniline	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	NA	NA	NA	NA	NA	<0.97	1.5	<0.059	<0.033	<0.009	NA	0.072 J	NA	NA	<0.041	NA	<0.046	0.047
nitrobenzene	mg/kg	1.31	~	~	~	14	5	NA	NA	NA	NA	NA	<3.9	<0.68	<0.24	<0.13	<0.034	NA	<0.12	NA	NA	<0.17	NA	<0.18	<0.035
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	NA	NA	NA	NA	NA	<2.9	<0.51	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	NA	NA	NA	NA	NA	<5.3	<0.94	<0.32	<0.18	<0.047	NA	<0.17	NA	NA	<0.23	NA	<0.25	<0.048
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	NA	NA	NA	NA	NA	1.7 J	3.0	0.057 J	0.072 J	<0.004	NA	<0.015	NA	NA	0.032 J	NA	0.031 J	<0.004
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	NA	NA	NA	NA	NA	2.2 J	4.2	0.22	0.17	0.01 J	NA	0.79	NA	NA	0.091 J	NA	0.072 J	0.007 J
2-Methylphenol	mg/kg	~	~	~	~	3400	310	NA	NA	NA	NA	NA	<3.9	<0.68	<0.24	<0.13	<0.034	NA	<0.12	NA	NA	<0.17	NA	<0.18	<0.035
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.004	<0.006	<0.008	<0.003	<0.0007	NA	NA	NA	NA	NA	<0.0007	NA	<0.003	<0.006	NA	<0.006	NA	NA
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.004	<0.006	<0.008	<0.003	<0.0007	NA	NA	NA	NA	NA	<0.0007	NA	<0.003	<0.006	NA	<0.006	NA	NA
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.035	<0.062	<0.082	<0.029	<0.007	NA	NA	NA	NA	NA	<0.007	NA	<0.034	<0.064	NA	<0.059	NA	NA
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	NA	NA	NA	NA	NA	<2.4	<0.43	<0.15	<0.082	<0.022	NA	<0.077	NA	NA	<0.10	NA	<0.11	<0.022
1,4-Dioxane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<15	<2.6	<0.88	<0.49	<0.13	NA	<0.46	NA	NA	<0.62	NA	<0.69	<0.13
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	NA	NA	NA	NA	<2.9	0.70 J	<0.18	<0.098	<0.026	NA	<0.092	NA	NA	<0.12	NA	<0.14	<0.026
Acetophenone	mg/kg	~	~	~	~	5	2	NA	NA	NA	NA	NA	<3.4	<0.60	<0.21	<0.11	<0.030	NA	<0.11	NA	NA	<0.15	NA	<0.16	<0.031
Atrazine	mg/kg	~	~	~	~	2400	210	NA	NA	NA	NA	NA	<4.9	<0.85	<0.29	<0.16	<0.043	NA	<0.15	NA	NA	<0.21	NA	<0.23	<0.044
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	NA	NA	NA	NA	NA	<9.7	<1.7	<0.59	<0.33	<0.086	NA	<0.31	NA	NA	<0.41	NA	<0.46	<0.087
Caprolactam	mg/kg	~	~	~	~	340000	31000	NA	NA	NA	NA	NA	<4.9	<0.85	<0.29	<0.16	<0.043	NA	<0.15	NA	NA	<0.21	NA	<0.23	<0.044
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	1200 J	320 J	97 JB	55 JB	6.4 JB	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment FRJ	NJ ECO Saline Estuary Sediment FRJM	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-1014				ASB-1015					
Date								2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20
Start Depth								1.5	0	14	14	0	0	2	2	11	11
End Depth								2	2	14.5	14.5	0.5	0.5	2.5	2.5	11.5	13
Grid Cell (Figures 1A through 1E)								C3				C3					
Chemical	Units																
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	NA	<3.7	NA	<0.49	NA	<0.85	NA	<1.7	NA	<0.47
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	NA	<1.7	NA	<0.22	NA	<0.39	NA	<0.79	NA	<0.21
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	mg/kg	~	~	~	~	~	~	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	NA	<1.7	NA	<0.22	NA	<0.39	NA	<0.79	NA	<0.21
phenol	mg/kg	120	~	0.665	2.6	210000	18000	NA	<0.23	NA	<0.031	NA	<0.054	NA	<0.11	NA	<0.030
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	NA	<0.033	NA	<0.004	NA	<0.008	NA	<0.016	NA	<0.004
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	NA	0.65	NA	0.006 J	NA	0.081	NA	0.032 J	NA	<0.004
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	NA	0.63	NA	<0.004	NA	0.12	NA	0.035 J	NA	<0.004
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	NA	0.63	NA	0.008 J	NA	0.14	NA	0.050 J	NA	0.006 J
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	NA	0.60	NA	0.012 J	NA	0.24	NA	0.072 J	NA	<0.009
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	NA	1.1	NA	0.015 J	NA	0.30	NA	0.087	NA	0.012 J
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	NA	0.96	NA	<0.009	NA	0.26	NA	0.069 J	NA	<0.009
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	NA	0.26	NA	0.005 J	NA	0.11	NA	0.041 J	NA	0.008 J
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	NA	<0.066	NA	<0.009	NA	<0.015	NA	<0.032	NA	<0.009
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
4-chloroaniline	mg/kg	~	~	~	~	~	~	NA	<0.33	NA	<0.045	NA	<0.077	NA	<0.16	NA	<0.043
Carbazole	mg/kg	~	~	~	~	96	24	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	NA	1.5	NA	0.013 J	NA	0.28	NA	0.078 J	NA	0.007 J
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	NA	<0.23	NA	<0.031	NA	<0.054	NA	<0.11	NA	<0.030
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	<0.0006	NA	<0.0006	NA	<0.001	NA	<0.0006	NA	<0.0004	NA
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	NA	<1.0	NA	<0.13	NA	<0.23	NA	<0.48	NA	<0.13
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	NA	0.22	NA	<0.004	NA	0.074	NA	<0.016	NA	<0.004
Dibenzofuran	mg/kg	~	~	~	~	~	~	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
dimethyl phthalate	mg/kg	~	~	~	~	~	~	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	NA	6.3	NA	<0.090	NA	0.25 J	NA	<0.32	NA	<0.085
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	NA	0.85	NA	0.006 J	NA	0.25	NA	0.043 J	NA	<0.004
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	NA	<0.033	NA	<0.004	NA	0.024 J	NA	<0.016	NA	<0.004
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	NA	<0.033	NA	<0.004	NA	<0.008	NA	<0.016	NA	<0.004
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	NA	<1.7	NA	<0.22	NA	<0.39	NA	<0.79	NA	<0.21
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	NA	<0.33	NA	<0.045	NA	<0.077	NA	<0.16	NA	<0.043
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	NA	0.50	NA	<0.009	NA	0.15	NA	0.068 J	NA	<0.009
isophorone	mg/kg	139	~	~	~	2000	510	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	NA	0.55	NA	<0.013	NA	0.11	NA	<0.048	NA	<0.013
2-nitroaniline	mg/kg	~	~	~	~	23000	39	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
3-nitroaniline	mg/kg	~	~	~	~	~	~	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
4-nitroaniline	mg/kg	~	~	~	~	~	~	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	NA	0.36	NA	<0.009	NA	0.067	NA	<0.032	NA	<0.009
nitrobenzene	mg/kg	1.31	~	~	~	14	5	NA	<0.27	NA	<0.036	NA	<0.062	NA	<0.13	NA	<0.034
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	NA	<0.37	NA	<0.049	NA	<0.085	NA	<0.17	NA	<0.047
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	NA	0.44	NA	<0.004	NA	0.14	NA	0.024 J	NA	<0.004
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	NA	1.5	NA	<0.004	NA	0.25	NA	0.070 J	NA	<0.004
2-Methylphenol	mg/kg	~	~	~	~	3400	310	NA	<0.27	NA	<0.036	NA	<0.062	NA	<0.13	NA	<0.034
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.0008	NA	<0.0007	NA	<0.002	NA	<0.0007	NA	<0.0006	NA
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.0008	NA	<0.0007	NA	<0.002	NA	<0.0007	NA	<0.0006	NA
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.008	NA	<0.007	NA	<0.015	NA	<0.007	NA	<0.006	NA
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	NA	<0.17	NA	<0.022	NA	<0.039	NA	<0.079	NA	<0.021
1,4-Dioxane	mg/kg	~	~	~	~	~	~	NA	<1.0	NA	<0.13	NA	<0.23	NA	<0.48	NA	<0.13
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	<0.20	NA	<0.027	NA	<0.046	NA	<0.095	NA	<0.026
Acetophenone	mg/kg	~	~	~	~	5	2	NA	<0.23	NA	<0.031	NA	<0.054	NA	<0.11	NA	<0.030
Atrazine	mg/kg	~	~	~	~	2400	210	NA	<0.33	NA	<0.045	NA	<0.077	NA	<0.16	NA	<0.043
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	NA	<0.66	NA	<0.090	NA	<0.15	NA	<0.32	NA	<0.085
Caprolactam	mg/kg	~	~	~	~	340000	31000	NA	<0.33	NA	<0.045	NA	<0.077	NA	<0.16	NA	<0.043
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment FP-I	NJ ECO Saline Estuary Sediment FP-M	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-1016														ASB-193	ASB-208	ASB-217
Date								2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	1999-04-20	1999-04-19	1999-04-19
Start Depth								0	3	4	7	8	10.5	12	0	2	4	6	8	10	12	2	0	0
End Depth								0.5	3.5	4.5	7.5	8.5	11	12.5	2	4	6	8	10	12	13	4	2	2
Grid Cell (Figures 1A through 1E)								B3														B1	B2	C1
Chemical	Units																							
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	NA	NA	NA	NA	NA	NA	NA	<48	<1.5	<1.5	<1.1	<0.97	<2.2	<0.47	<0.025	<30000	<67000
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	NA	NA	NA	NA	NA	NA	NA	<22	<0.70	<0.68	<0.48	<0.44	<1.0	<0.21	NA	NA	NA
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<22	<0.70	<0.68	<0.48	<0.44	<1.0	<0.21	NA	NA	NA
phenol	mg/kg	120	~	0.665	2.6	210000	18000	NA	NA	NA	NA	NA	NA	NA	<3.0	<0.098	<0.096	<0.067	<0.062	<0.14	<0.030	NA	NA	NA
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	NA	NA	NA
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	NA	NA	NA
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	NA	NA	NA	NA	NA	NA	NA	4.3	0.059 J	<0.014	<0.01	<0.009	<0.020	<0.004	NA	NA	NA
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	NA	NA	NA	NA	NA	NA	NA	<0.43	<0.014	<0.014	<0.01	<0.009	<0.020	<0.004	NA	NA	NA
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	NA	NA	NA	NA	NA	NA	NA	11	0.19	0.021 J	0.016 J	<0.009	0.023 J	<0.004	NA	NA	NA
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	NA	NA	NA	NA	NA	NA	NA	2.8	0.058 J	0.014 J	0.010 J	<0.009	<0.020	<0.004	**240 D**	**5200 J**	**5500 J**
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	NA	NA	NA	NA	NA	NA	NA	**2.3**	0.061 J	<0.027	<0.019	<0.018	<0.040	<0.009	**160 D**	**2400 J**	**3600 J**
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	NA	NA	NA	NA	NA	NA	NA	3.1	0.073	<0.014	<0.01	<0.009	0.030 J	<0.004	**70 D**	**2500 J**	**4100 J**
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	NA	NA	NA	NA	NA	NA	NA	3.1	0.078	<0.027	<0.019	<0.018	<0.040	<0.009	NA	NA	NA
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	NA	NA	NA	NA	NA	NA	NA	1.1 J	0.027 J	0.014 J	<0.01	<0.009	0.024 J	<0.004	51	**1600 J**	<27000
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<0.87	<0.028	<0.027	<0.019	<0.018	<0.040	<0.009	NA	NA	NA
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	NA	NA	NA
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
4-chloroaniline	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<4.3	<0.14	<0.14	<0.096	<0.088	<0.20	<0.043	NA	NA	NA
Carbazole	mg/kg	~	~	~	~	96	24	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	<0.01	<12000	<27000
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	NA	NA	NA	NA	NA	NA	NA	11	0.19	0.018 J	0.019 J	<0.009	0.031 J	0.005 J	240 D	**11000 J**	**16000 J**
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	NA	NA	NA	NA	NA	NA	NA	<3.0	<0.098	<0.096	<0.067	<0.062	<0.14	<0.030	<0.01	<12000	<27000
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	<0.001	<0.002	<0.002	<0.001	<0.001	<0.004	<0.0004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	<0.01	<12000	<27000
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	<0.01	<12000	<27000
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	NA	NA	NA	NA	NA	NA	NA	<13	<0.42	<0.41	<0.29	<0.27	<0.60	<0.13	NA	NA	NA
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	NA	NA	NA	NA	NA	NA	NA	*0.96 J*	<0.014	<0.014	<0.01	<0.009	<0.020	<0.004	**47 D**	<12000	<27000
Dibenzofuran	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
dimethyl phthalate	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	<0.01	<12000	<27000
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	NA	NA	NA	NA	NA	NA	NA	9.4	0.12	0.018 J	0.014 J	0.01 J	0.028 J	<0.004	NA	NA	NA
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	NA	NA	NA	NA	NA	NA	NA	11	0.16	0.014 J	0.017 J	<0.009	0.027 J	<0.004	NA	NA	NA
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	NA	NA	NA	NA	NA	NA	NA	<0.43	<0.014	<0.014	<0.01	<0.009	<0.020	<0.004	<0.01	<12000	<27000
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	NA	NA	NA
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	NA	NA	NA	NA	NA	NA	NA	<22	<0.70	<0.68	<0.48	<0.44	<1.0	<0.21	NA	NA	NA
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	NA	NA	NA	NA	NA	NA	NA	<4.3	<0.14	<0.14	<0.096	<0.088	<0.20	<0.043	NA	NA	NA
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	NA	NA	NA	NA	NA	NA	NA	1.6 J	0.045 J	<0.027	<0.019	<0.018	<0.040	<0.009	**27 DJ**	<12000	<27000
isophorone	mg/kg	139	~	~	~	2000	510	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	NA	NA	NA	NA	NA	NA	NA	3.3 J	0.063 J	<0.041	<0.029	<0.027	<0.060	<0.013	NA	NA	NA
2-nitroaniline	mg/kg	~	~	~	~	23000	39	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	NA	NA	NA
3-nitroaniline	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
4-nitroaniline	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	NA	NA	NA	NA	NA	NA	NA	<0.87	0.045 J	<0.027	<0.019	<0.018	<0.040	<0.009	NA	NA	NA
nitrobenzene	mg/kg	1.31	~	~	~	14	5	NA	NA	NA	NA	NA	NA	NA	<3.5	<0.11	<0.11	<0.077	<0.071	<0.16	<0.034	NA	NA	NA
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	<0.01	<12000	<27000
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	NA	NA	NA	NA	NA	NA	NA	<4.8	<0.15	<0.15	<0.11	<0.097	<0.22	<0.047	<0.025	<30000	<67000
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	NA	NA	NA	NA	NA	NA	NA	83	1.2	0.082	0.079	0.021 J	0.10	0.010 J	NA	NA	NA
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	NA	NA	NA	NA	NA	NA	NA	32	0.46	0.044 J	0.038 J	<0.009	0.054 J	0.007 J	NA	NA	NA
2-Methylphenol	mg/kg	~	~	~	~	3400	310	NA	NA	NA	NA	NA	NA	NA	<3.5	<0.11	<0.11	<0.077	<0.071	<0.16	<0.034	NA	NA	NA
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.001	<0.003	<0.002	<0.002	<0.002	<0.005	<0.0006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.012	<0.029	<0.022	<0.016	<0.018	<0.051	<0.006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	NA	NA	NA	NA	NA	NA	NA	3.6 J	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<2.2	<0.070	<0.068	<0.048	<0.044	<0.10	<0.021	NA	NA	NA
1,4-Dioxane	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<13	<0.42	<0.41	<0.29	<0.27	<0.60	<0.13	NA	NA	NA
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	NA	NA	NA	NA	NA	NA	<2.6	<0.084	<0.082	<0.058	<0.053	<0.12	<0.026	NA	NA	NA
Acetophenone	mg/kg	~	~	~	~	5	2	NA	NA	NA	NA	NA	NA	NA	<3.0	<0.098	<0.096	<0.067	<0.062	<0.14	<0.030	NA	NA	NA
Atrazine	mg/kg	~	~	~	~	2400	210	NA	NA	NA	NA	NA	NA	NA	<4.3	<0.14	<0.14	<0.096	<0.088	<0.20	<0.043	NA	NA	NA
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	NA	NA	NA	NA	NA	NA	NA	<8.7	<0.28	<0.27	<0.19	<0.18	<0.40	<0.086	NA	NA	NA
Caprolactam	mg/kg	~	~	~	~	340000	31000	NA	NA	NA	NA	NA	NA	NA	<4.3	<0.14	<0.14	<0.096	<0.088	<0.20	<0.043	NA	NA	NA
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	2400 J	48 J	33 JB	25 JB	17 JB	76 JB	19 JB	NA	1580000	NA

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment FR.I	NJ ECO Saline Estuary Sediment FR.M	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-218	ASB-85	ASB-858			ASB-859		ASB-86		ASB-860			ASB-861			GMW-123	GMW-126
Date								1999-04-19	1993-11-09	2016-10-06	2016-10-06	2016-10-06	2016-10-06	2016-10-06	1993-11-09		2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	1998-11-13	1998-11-12
Start Depth								0	4	7	11	17	17.5	9.5	2	4	3	6.5	9	11.5	5.5	2.5	2	0
End Depth								2	6	7.5	11.5	17.5	18	10	4	6	3.5	6.5	9.5	12	6	3	4	2
Grid Cell (Figures 1A through 1E)								D3	B1		A1		A1		A1			B2			B2		C3	D3
Chemical	Units																							
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	NA	<2.20	<0.11	<0.018	<0.11	<0.10	<0.13	<0.38	<10.00	<0.15	<0.70	<0.20	<0.030	<0.61	<0.66	NA	NA
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.14	<0.023	<0.14	<0.13	<0.17	<0.38	<10.00	<0.18	<0.87	<0.25	<0.038	<0.75	<0.82	NA	NA
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	NA	<2.20 J	<0.19	<0.032	<0.19	<0.18	<0.23	<0.38	<10.00	<0.25	<1.2	<0.34	<0.053	<1.0	<1.1	NA	NA
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	NA	<2.20 J	<0.40	<0.066	<0.40	<0.37	<0.48	<0.38	<10.00	<0.53	119	4.66	<0.11	<2.2	<2.4	NA	NA
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	<30000	<5.30 J	<0.84	<0.14	<0.84	<0.79	<1.0	NA	NA	<1.1	<5.4	<1.5	<0.23	<4.6	<5.0	<140000	<65000
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	NA	<5.30 J	<0.24	<0.040	<0.24	<0.22	<0.29	<0.91 J	<24.00 J	<0.32	<1.5	<0.43	<0.066	<1.3	<1.4	NA	NA
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	<0.18	<0.030	<0.18	<0.17	<0.22	NA	NA	<0.24	<1.2	<0.33	<0.051	<1.0	<1.1	NA	NA
2-nitrophenol	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.15	<0.025	<0.15	<0.14	<0.18	<0.38	<10.00	<0.20	<0.94	<0.26	<0.041	<0.81	<0.88	NA	NA
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	NA	<5.30 J	<0.60	<0.099	<0.60	<0.56	<0.72	<0.91	<24.00	<0.79	<3.8	<1.1	<0.16	<3.3	<3.6	NA	NA
phenol	mg/kg	120	~	0.665	2.6	210000	18000	NA	<2.20	<0.12	<0.019	<0.12	<0.11	<0.14	<0.38	<10.00	<0.15	<0.74	<0.21	<0.032	<0.64	<0.70	NA	NA
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	NA	<5.30 J	<0.17	<0.028	<0.17	<0.16	<0.20	<0.91	<24.00	<0.22	<1.1	<0.30	<0.046	<0.92	<1.0	NA	NA
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	NA	<2.20 J	<0.13	<0.022	<0.13	<0.12	<0.16	<0.38	<10.00	<0.18	<0.85	<0.24	<0.037	<0.73	<0.80	NA	NA
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	NA	2.20 J	0.210 J	0.106	<0.077	<0.072	<0.093	<0.38	<10.00	9.49	20.2	1.20	0.0798	6.10	9.13	NA	NA
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	NA	<2.20 J	<0.11	<0.019	<0.11	<0.11	<0.14	<0.38	<10.00	<0.15	<0.72	<0.20	<0.031	<0.62	<0.68	NA	NA
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	NA	1.40 J	<0.14	0.0985	<0.14	<0.13	<0.17	<0.38	<10.00	16.6	43.3	1.64	0.199	14.4	15.9	NA	NA
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	**22000**	<1.70 J	<0.063	0.0986	<0.064	<0.059	<0.076	<0.38	NA	*5.03*	**296**	*6.08*	0.175	*6.36*	*6.56*	**3800 J**	**24000 J**
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	**12000**	*2.00 J*	<0.10	0.0610	<0.10	<0.095	<0.12	0.09 J	NA	**3.37**	**122**	**2.95**	0.113	**4.62**	**4.36**	**2000 J**	**12000**
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	**7700 J**	1.50 J	<0.099	0.0749	<0.099	<0.093	<0.12	0.14 J	NA	1.88	**121**	2.37	0.0781	2.54	3.06	<57000	**7700 J**
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	NA	1.50 J	<0.11	0.0212 J	<0.11	<0.10	<0.13	0.11 J	<10.00	2.52	62.9	1.04	0.0826	3.61	3.12	NA	NA
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	**3800 J**	0.83 J	<0.10	0.0214 J	<0.10	<0.098	<0.13	0.07 J	NA	0.370	17.0	0.491	<0.029	<0.57	0.682 J	<57000	**2500 J**
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	NA	<2.20 J	<0.053	<0.0088	<0.053	<0.050	<0.064	<0.38	<10.00	<0.070	<0.34	<0.095	<0.015	<0.29	<0.32	NA	NA
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.086	<0.014	<0.087	<0.081	<0.10	<0.38	<10.00	<0.11	<0.55	<0.15	<0.024	<0.47	<0.52	NA	NA
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	NA	<2.20 J	<0.055	<0.0090	<0.055	<0.051	<0.066	<0.38	<10.00	<0.072	<0.35	<0.098	<0.015	<0.30	<0.33	NA	NA
4-chloroaniline	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.081	<0.013	<0.081	<0.075	<0.097	<0.38	<10.00	<0.11	<0.51	<0.14	<0.022	<0.44	<0.48	NA	NA
Carbazole	mg/kg	~	~	~	~	96	24	<12000	<2.20 J	<0.032	<0.0054	<0.033	<0.030	<0.039	<0.38	<10.00	1.69	11.7	<0.058	<0.0089	<0.18	<0.19	<57000	<26000
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	**36000**	6.10 J	<0.071	0.0760	<0.071	<0.066	<0.085	0.11 J	<10.00	9.09	401	7.28	0.307	12.6	12.7	**4800 J**	**29000**
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.048	<0.0079	<0.048	<0.045	<0.058	<0.38	<10.00	<0.063	<0.30	<0.086	<0.013	<0.26	<0.29	NA	NA
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	<12000	<2.20	<0.097	<0.016	<0.097	<0.090	<0.12	<0.38	NA	<0.13	<0.61	<0.17	<0.027	<0.53	<0.58	<57000	<26000
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	NA	NA	<0.080	<0.013	<0.081	<0.075	<0.097	NA	NA	<0.11	<0.51	<0.14	<0.022	<0.44	<0.48	NA	NA
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.073	<0.012	<0.073	<0.068	<0.087	<0.38	<10.00	<0.096	<0.46	<0.13	<0.020	<0.40	<0.43	NA	NA
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	NA	<2.20	<0.0069	<0.0080	<0.0087	<0.00011	<0.012	<0.38	<10.00	<0.18	<0.16	<0.021	<0.022	<0.014	<0.16	NA	NA
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	<12000	<2.20 J	<0.069	<0.011	<0.070	<0.065	<0.083	<0.38	NA	<0.092	<0.44	<0.12	<0.019	<0.38	<0.41	<57000	<26000
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	<12000	<2.20 J	<0.11	<0.019	<0.11	<0.11	<0.14	<0.38	NA	<0.15	<0.72	<0.20	<0.031	<0.62	<0.67	<57000	<26000
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	NA	<2.20 J	<0.19	<0.031	<0.19	<0.17	<0.22	<0.38	NA	<0.25	<1.2	<0.33	<0.051	<1.0	<1.1	NA	NA
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	<12000	NA	<0.099	<0.016	<0.099	<0.093	<0.12	0.05 J	NA	*0.563*	**72.5**	*1.25*	0.0271 J	*0.620 J*	<0.59	<57000	<26000
Dibenzofuran	mg/kg	~	~	~	~	~	~	NA	2.50 J	<0.091	<0.015	<0.091	<0.085	<0.11	0.05 J	<10.00	<0.12	<0.58	<0.16	0.189	<0.50	<0.54	NA	NA
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	NA	<2.20 J	<0.037	<0.0060	<0.037	<0.034	<0.044	<0.38	<10.00	<0.048	<0.23	<0.065	<0.010	<0.20	<0.22	NA	NA
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	NA	<2.20 J	<0.056	<0.0092	<0.056	<0.052	<0.067	0.03 J	<10.00	<0.074	<0.35	<0.10	<0.015	<0.31	<0.33	NA	NA
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	NA	<2.20 J	<0.048	<0.0079	<0.048	<0.045	<0.057	<0.38	<10.00	<0.063	<0.30	<0.085	<0.013	<0.26	<0.29	NA	NA
dimethyl phthalate	mg/kg	~	~	~	~	~	~	NA	<2.20 J	<0.040	<0.0066	<0.040	<0.037	<0.048	<0.38	<10.00	<0.053	<0.25	<0.071	<0.011	<0.22	<0.24	NA	NA
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	<12000	<2.20 J	<0.052	<0.0087	<0.053	<0.049	<0.063	<1.60	<24.00	<0.069	<0.33	<0.094	<0.014	<0.29	<0.31	<57000	<26000
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	NA	2.60 J	<0.10	0.241	<0.10	<0.093	<0.12	0.06 J	<10.00	3.86	38.4	1.17	0.0853	5.27	5.40	NA	NA
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	NA	3.40 J	0.863	0.469	<0.10	<0.096	<0.12	0.12 J	<10.00	20.5	36.3	1.62	0.234	17.8	25.6	NA	NA
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	<12000	NA	<0.057	<0.0094	<0.057	<0.053	<0.068	<0.38	NA	<0.075	<0.36	<0.10	<0.016	<0.31	<0.34	<57000	<26000
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	NA	<2.20 J	<0.090	<0.015	<0.090	<0.084	<0.11	<0.38	<10.00	<0.12	<0.57	<0.16	<0.025	<0.49	<0.54	NA	NA
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	NA	<2.20 J	<0.089	<0.015	<0.089	<0.083	<0.11	<0.38	<10.00	<0.12	<0.57	<0.16	<0.025	<0.49	<0.53	NA	NA
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	NA	<2.20 J	<0.11	<0.018	<0.11	<0.10	<0.13	<0.38	<10.00	<0.15	<0.71	<0.20	<0.031	<0.61	<0.66	NA	NA
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	<12000	0.82 J	<0.11	0.0272 J	<0.11	<0.098	<0.13	0.04 J	<10.00	1.09	**47.3**	0.920	0.0451 J	1.38	<0.63	<57000	**2100 J**
isophorone	mg/kg	139	~	~	~	2000	510	NA	<2.20 J	<0.048	<0.0079	<0.048	<0.045	<0.058	<0.38	<10.00	<0.063	<0.30	<0.086	<0.013	<0.26	<0.29	NA	NA
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	NA	34.00 J	9.36	0.494	<0.051	<0.047	0.513 J	0.11 J	NA	*362*	196	8.06	2.94	*274*	*301*	NA	NA
2-nitroaniline	mg/kg	~	~	~	~	23000	39	NA	<5.30 J	<0.053	<0.0088	<0.053	<0.049	<0.064	<0.91	<24.00	<0.070	<0.34	<0.094	<0.015	<0.29	<0.32	NA	NA
3-nitroaniline	mg/kg	~	~	~	~	~	~	NA	<5.30 J	<0.056	<0.0093	<0.056	<0.052	<0.067	<0.91	<24.00	<0.074	<0.36	<0.10	<0.015	<0.31	<0.33	NA	NA
4-nitroaniline	mg/kg	~	~	~	~	~	~	NA	<5.30 J	<0.058	<0.0096	<0.058	<0.054	<0.070	<0.91	<24.00	<0.077	<0.37	<0.10	<0.016	<0.32	<0.35	NA	NA
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	NA	34.00 J	1.33	<0.010	<0.063	<0.059	0.340	0.06 J	<10.00	189	65.0	2.76	1.53	93.6	122	NA	NA
nitrobenzene	mg/kg	1.31	~	~	~	14	5	NA	<2.20 J	<0.086	<0.014	<0.087	<0.081	<0.10	<0.38	<10.00	<0.11	<0.55	<0.15	<0.024	<0.47	<0.52	NA	NA
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	<12000	NA	<0.065	<0.011	<0.065	<0.061	<0.078	<0.38	NA	<0.085	<0.41	<0.12	<0.018	<0.36	<0.39	<57000	<26000
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	NA	<2.20 J	<0.082	<0.014	<0.082	<0.077	<0.099	<0.38	<10.00	<0.11	<0.52	<0.15	<0.023	<0.45	<0.49	NA	NA
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	<30000	<5.30 J	<0.21	<0.035	<0.21	<0.20	<0.25	<0.91	<24.00	<0.28	<1.3	<0.38	<0.058	<1.2	<1.3	<140000	<85000
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	NA	6.90 J	0.479	0.440	<0.075	<0.070	<0.090	0.40	<10.00	87.7	139	4.83	0.783	58.0	81.1	NA	NA
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	NA	9.30 J	<0.072	0.196	<0.072	<0.067	<0.086	0.28 J	<10.00	26.7	165	4.20	0.439	26.5	27.8	NA	NA
2-Methylphenol	mg/kg	~	~	~	~	3400	310	NA	<2.20 J	<0.14	<0.024	<0.14	<0.13	<0.17	<0.38	<10.00	<0.19	<0.91	<0.26	<0.039	<0.79	<0.86	NA	NA
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	NA	<2.20	<0.0078	<0.0089	<0.0098	<0.00012	<0.013	<0.38	<10.00	<0.20	<0.18	<0.024	<0.024	<0.016	<0.18	NA	NA
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	NA	<2.20	<0.0062	<0.0072	<0.0078	<0.00010	<0.011	<0.38	<10.00	<0.16	<0.14	<0.019	<0.019	<0.013	<0.14	NA	NA
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	NA	<2.20 J	<0.0083	<0.0095	<0.010	<0.00013	<0.014	<0.38	<10.00	<0.21	<0.19	<0.025	<0.026	<0.017	<0.19	NA	NA
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	NA	NA	<0.031	<0.0051	<0.031	<0.029	<0.037	NA	NA	23.4	28.6	1.09	0.341	25.9	32.2	NA	NA
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	NA	NA	<0.057	<0.0094	<0.057	<0.053	<0.068	NA	NA	<0.075	<0.36	<0.10	<0.016	<0.31	<0.34	NA	NA
1,4-Dioxane	mg/kg	~	~	~	~	~	~	NA	NA	<0.15	<0.025	<0.15	<0.14	<0.18	NA	NA	<0.20	<0.94	<0.26	<0.041	<0.81	<0.88	NA	NA
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	NA	NA	<0.15	<0.025	<0.15	<0.14	<0.18	NA	NA	<0.20	<0.94	<0.26	<0.041	<0.81	<0.89	NA	NA
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	<2.20 J	NA	NA	NA	NA	NA	<0.38	<10.00	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	mg/kg	~	~	~	~	5	2	NA	NA	<0.048	<0.0080	<0.048	<0.045	<0.058	NA	NA	<0.064	<0.31	<0.086	<0.013	<0.26	<0.29	NA	NA
Atrazine	mg/kg	~	~	~	~	2400	210	NA	NA	<0.096	<0.016	<0.096	<0.090	<0.12	NA	NA	<0.13	<0.61	<0.17	<0.026	<0.53	<0.57	NA	NA
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	NA	NA	<0.056	<0.0092	<0.056	<0.052	<0.067	NA	NA	<0.073	<0.35	<0.099	<0.015	<0.30	<0.33	NA	NA
Caprolactam	mg/kg	~	~	~	~	340000	31000	NA	NA	<0.088	<0.015	<0.089	<0.083	<0.11	NA	NA	<0.12	<0.56	<0.16	<0.024	<0.49	<0.53	NA	NA
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	52.7 J	23 J	2.7 J	0	0	NA	NA	323 J	1632 J	148 J	25.3 J	2201 J	2039 J	NA	NA
Total SVOC TICs	mg/kg	~	~	~	~	~	~	NA	464.10	80.6 J	26.35 J	0	0	15 J	9.54	26.60	353 J	1483 J	230.3 J	21 J	1045 J	1553 J	NA	2420000

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	GMW-137	GMW-138	GMW-688		GMW-689		GMW-690		GMW-691		SB-10	SB-11			SB-12	
Date								1998-11-13	1998-11-13	2016-10-10	2016-10-10	2016-10-10	2016-10-10	2016-10-07	2016-10-07	2016-10-11	2016-10-11	2015-09-18	2015-10-05	2015-10-05	2015-10-05	2015-10-08	2015-10-08
Start Depth								4	4	2	14.5	14.5	2	11	19.5	2.5	14.5	4	9.5	11.5	20	6	12
End Depth								6	6	2.5	15	15	2.5	11.5	20	3	15	4.5	10	12	20.5	6.5	12.5
Grid Cell (Figures 1A through 1E)								C1	B3	B2		B2		B2		B2		B3	B2			B3	
Chemical	Units																						
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	NA	NA	<0.94	<0.019	<0.018	<0.097	<0.32	<0.019	<0.73	<0.017	<0.15	<0.033	<0.029	<0.026	<0.052	<0.032
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	<1.2	<0.024	<0.022	<0.12	<0.40	<0.024	<0.91	<0.021	<0.19	<0.040	<0.036	<0.032	<0.064	<0.040
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	NA	NA	<1.6	<0.033	<0.031	<0.17	<0.56	<0.033	<1.3	<0.029	<0.16	<0.035	<0.032	<0.028	<0.056	<0.035
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	NA	NA	<3.4	<0.069	<0.065	<0.35	<1.2	<0.069	<2.6	<0.061	<0.38	<0.081	<0.073	<0.065	<0.13	<0.080
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	<150000	<65000	<7.1	<0.15	<0.14	<0.74	<2.4	<0.15	<5.6	<0.13	<0.90	<0.19	<0.17	<0.16	<0.31	<0.19
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	NA	NA	<2.0	<0.042	<0.039	<0.21	<0.70	<0.041	<1.6	<0.037	<0.39	<0.084	<0.076	<0.067	<0.13	<0.083
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	NA	NA	<1.6	<0.032	<0.030	<0.16	<0.54	<0.032	<1.2	<0.028	<0.20	1.03	<0.038	<0.034	<0.067	<0.042
2-nitrophenol	mg/kg	~	~	~	~	~	~	NA	NA	<1.3	<0.026	<0.024	<0.13	<0.43	<0.026	<0.98	<0.023	<0.19	<0.041	<0.037	<0.033	<0.065	<0.040
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	NA	NA	<5.1	<0.10	<0.098	<0.52	<1.7	<0.10	<3.9	<0.092	<0.35	<0.075	<0.068	<0.060	<0.12	<0.075
phenol	mg/kg	120	~	0.665	2.6	210000	18000	NA	NA	<0.99	<0.020	<0.019	<0.10	<0.34	<0.020	<0.77	<0.018	<0.15	<0.033	<0.030	<0.027	<0.053	<0.033
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	NA	NA	<1.4	<0.029	<0.027	<0.15	<0.49	<0.029	<1.1	<0.026	<0.19	<0.040	<0.036	<0.032	<0.063	<0.039
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	NA	NA	<1.1	<0.023	<0.022	<0.12	<0.39	<0.023	<0.88	<0.021	<0.17	<0.036	<0.032	<0.029	<0.057	<0.035
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	NA	NA	35.4	<0.013	<0.013	2.17	4.26	<0.013	23.6	<0.012	<0.19	0.844	<0.038	<0.033	0.184	<0.041
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	NA	NA	<0.96	<0.020	<0.019	<0.099	<0.33	<0.020	<0.75	<0.017	<0.022	<0.0047	0.0773	<0.0037	<0.0074	<0.0046
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	NA	NA	82.8	<0.024	<0.022	3.29	6.68	<0.024	26.6	<0.021	<0.018	0.554	0.0911	<0.0031	0.696	<0.0038
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	**7300 J**	**4700 J**	**403**	0.0308 J	<0.010	*11.6*	**17.9**	<0.011	**34.1**	<0.0097	<0.040	0.447	0.345	<0.0069	0.451	<0.0085
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	**5100 J**	**2200 J**	**221**	<0.018	<0.017	**6.47**	**9.90**	<0.018	**18.4**	<0.016	<0.044	0.264	*0.540*	<0.0076	0.341	<0.0093
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	**5500 J**	**2300 J**	**130**	<0.017	<0.016	4.35	*5.84*	<0.017	*11.2*	<0.015	<0.042	0.194	0.673	<0.0073	0.362	<0.0090
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	NA	NA	81.4	<0.019	<0.018	2.66	3.43	<0.019	8.46	<0.017	<0.062	0.173	0.381	<0.011	0.513	<0.013
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	**1500 J**	**1100 J**	21.4	<0.018	<0.017	0.892	1.24	<0.018	2.81	<0.016	<0.046	0.0413 J	0.220	<0.0079	0.0749	<0.0098
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	NA	NA	<0.45	<0.0093	<0.0087	<0.047	<0.16	<0.0092	<0.35	<0.0082	<0.029	<0.0063	<0.0057	<0.0051	<0.010	<0.0063
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	NA	<0.73	<0.015	<0.014	<0.076	<0.25	<0.015	<0.57	<0.013	<0.047	<0.010	<0.0091	<0.0081	<0.016	<0.010
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	NA	NA	<0.46	<0.0095	<0.0089	<0.048	<0.16	<0.0095	<0.36	<0.0084	<0.11	<0.024	<0.022	<0.019	<0.038	<0.024
4-chloroaniline	mg/kg	~	~	~	~	~	~	NA	NA	<0.68	<0.014	<0.013	<0.071	<0.23	<0.014	<0.53	<0.012	<0.055	<0.012	<0.011	<0.0094	<0.019	<0.012
Carbazole	mg/kg	~	~	~	~	96	24	<60000	<26000	*30.7*	<0.0057	<0.0053	<0.028	2.61	<0.0056	<0.21	<0.0050	<0.023	<0.0049	0.0158 J	<0.0039	<0.0078	<0.0049
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	**18000 J**	**11000 J**	424	0.0297 J	<0.012	13.2	18.1	<0.012	50.0	<0.011	<0.033	0.719	0.328	<0.0057	1.15	0.0228 J
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	NA	NA	<0.41	<0.0083	<0.0078	<0.042	<0.14	<0.0083	<0.32	<0.0074	<0.047	<0.010	<0.0090	<0.0081	<0.016	<0.0099
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	<60000	<26000	<0.82	<0.017	<0.016	<0.084	<0.28	<0.017	<0.64	<0.015	<0.086	<0.018	<0.017	<0.015	<0.029	<0.018
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	NA	NA	<0.68	<0.014	<0.013	<0.070	<0.23	<0.014	<0.53	<0.012	<0.047	<0.010	<0.0091	<0.0081	<0.016	<0.010
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	NA	NA	<0.61	<0.013	<0.012	<0.063	<0.21	<0.013	<0.48	<0.011	<0.039	<0.0083	<0.0075	<0.0067	<0.013	<0.0082
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	NA	NA	<1.4	<0.00015	<0.00013	<0.0086	<0.048	<0.00013	<1.1	<0.00015	<0.0023	<0.63	<0.014	<0.00020	<0.00042	<0.00028
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	<60000	<26000	<0.59	<0.012	<0.011	<0.061	<0.20	<0.012	<0.46	<0.011	<0.039	<0.0083	<0.0075	<0.0067	<0.013	<0.0082
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	<60000	<26000	<0.95	<0.020	<0.018	<0.098	<0.33	<0.019	<0.74	<0.017	<0.053	<0.011	<0.010	<0.0092	<0.018	<0.011
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	NA	NA	<1.6	<0.033	<0.031	<0.16	<0.54	<0.032	<1.2	<0.029	<0.13	<0.029	<0.026	<0.023	<0.046	<0.029
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	<60000	<26000	**94.5**	<0.017	<0.016	**2.45**	**3.60**	<0.017	**5.38**	<0.015	<0.074	0.0879	0.0929	<0.013	0.199	<0.016
Dibenzofuran	mg/kg	~	~	~	~	~	~	NA	NA	<0.77	<0.016	<0.015	<0.080	4.52	<0.016	<0.60	<0.014	<0.029	<0.0062	0.0126 J	<0.0049	<0.0098	<0.0061
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	NA	NA	<0.31	<0.0064	<0.0060	<0.032	<0.11	<0.0063	<0.24	<0.0056	<0.024	<0.0052	<0.0047	<0.0042	<0.0083	<0.0052
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	NA	NA	<0.47	<0.0097	<0.0091	<0.049	<0.16	<0.0097	<0.37	<0.0086	<0.028	<0.0060	<0.0054	<0.0048	<0.0095	<0.0059
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	NA	NA	<0.40	<0.0083	<0.0078	<0.042	<0.14	<0.0083	<0.32	<0.0073	<0.026	<0.0056	<0.0051	<0.0045	<0.0089	<0.0056
dimethyl phthalate	mg/kg	~	~	~	~	~	~	NA	NA	<0.34	<0.0069	<0.0065	<0.035	<0.12	<0.0069	<0.26	<0.0061	<0.029	<0.0063	<0.0057	<0.0051	<0.010	<0.0063
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	<60000	<26000	<0.44	<0.0091	<0.0086	<0.046	<0.15	<0.0091	<0.35	<0.0081	<0.072	<0.015	<0.014	<0.012	<0.025	<0.015
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	NA	NA	49.3	<0.017	<0.016	2.01	3.10	<0.017	15.2	<0.015	<0.025	0.315	0.348	<0.0043	0.430	<0.0053
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	NA	NA	67.6	<0.018	<0.017	2.95	6.39	<0.018	39.6	<0.016	<0.025	1.44	0.0211 J	<0.0042	0.618	<0.0052
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	<60000	<26000	<0.48	<0.0099	<0.0093	<0.050	<0.16	<0.0098	<0.37	<0.0087	<0.041	<0.0087	<0.0078	<0.0070	<0.014	<0.0086
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	NA	NA	<0.76	<0.016	<0.015	<0.079	<0.26	<0.016	<0.59	<0.014	<0.055	<0.012	<0.011	<0.0094	<0.019	<0.012
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	NA	NA	<0.75	<0.016	<0.015	<0.078	<0.26	<0.015	<0.59	<0.014	<0.33	<0.071	<0.063	<0.056	<0.11	<0.070
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	NA	NA	<0.94	<0.019	<0.018	<0.097	<0.32	<0.019	<0.73	<0.017	<0.067	<0.014	<0.013	<0.012	<0.023	<0.014
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	**2200 J**	<26000	**61.9**	<0.018	<0.017	1.92	2.50	<0.018	*5.59*	<0.016	<0.11	0.110	0.424	<0.018	0.273	<0.023
isophorone	mg/kg	139	~	~	~	2000	510	NA	NA	<0.41	<0.0083	<0.0078	<0.042	<0.14	<0.0083	<0.32	<0.0074	<0.039	<0.0083	<0.0075	<0.0066	<0.013	<0.0082
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	NA	NA	*482*	0.0225 J	<0.0083	36.0	42.9	<0.0088	*670*	<0.0078	<0.039	31.4	<0.0075	<0.0066	2.91	0.0256 J
2-nitroaniline	mg/kg	~	~	~	~	23000	39	NA	NA	<0.45	<0.0092	<0.0086	<0.046	<0.15	<0.0092	<0.35	<0.0081	<0.047	<0.010	<0.0090	<0.0081	<0.016	<0.0099
3-nitroaniline	mg/kg	~	~	~	~	~	~	NA	NA	<0.47	<0.0097	<0.0092	<0.049	<0.16	<0.0097	<0.37	<0.0086	<0.059	<0.013	<0.011	<0.010	<0.020	<0.012
4-nitroaniline	mg/kg	~	~	~	~	~	~	NA	NA	<0.49	<0.010	<0.0095	<0.051	<0.17	<0.010	<0.38	<0.0089	<0.069	<0.015	<0.013	<0.012	<0.023	<0.015
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	NA	NA	102	<0.011	<0.010	7.55	12.5	<0.011	369	<0.0097	<0.033	16.9	0.0197 J	<0.0057	1.13	<0.0070
nitrobenzene	mg/kg	1.31	~	~	~	14	5	NA	NA	<0.73	<0.015	<0.014	<0.076	<0.25	<0.015	<0.57	<0.013	<0.065	<0.014	<0.013	<0.011	<0.022	<0.014
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	<60000	<26000	<0.55	<0.011	<0.011	<0.057	<0.19	<0.011	<0.43	<0.010	<0.061	<0.013	<0.012	<0.011	<0.021	<0.013
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	NA	NA	<0.69	<0.014	<0.013	<0.072	<0.24	<0.014	<0.54	<0.013	<0.11	<0.023	<0.021	<0.019	<0.037	<0.023
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	<150000	<65000	<1.8	<0.037	<0.034	<0.18	<0.61	<0.036	<1.4	<0.032	<0.50	<0.11	<0.097	<0.087	<0.17	<0.11
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	NA	NA	307	0.0256 J	<0.012	10.5	23.5	<0.013	127	<0.012	<0.023	3.07	0.116	<0.0039	3.27	0.0597
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	NA	NA	119	<0.012	<0.012	7.21	10.3	<0.012	48.0	<0.011	<0.026	0.971	0.403	<0.0044	1.56	0.0360 J
2-Methylphenol	mg/kg	~	~	~	~	3400	310	NA	NA	<1.2	<0.025	<0.023	<0.13	<0.42	<0.025	<0.95	<0.022	<0.30	<0.064	<0.058	<0.052	<0.10	<0.064
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	NA	NA	<1.5	<0.00017	<0.00015	<0.0096	<0.053	<0.00015	<1.2	<0.00016	<0.0013	<0.34	<0.0077	<0.00011	<0.00023	<0.00015
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	NA	NA	<1.2	<0.00013	<0.00012	<0.0077	<0.043	<0.00012	<0.98	<0.00013	<0.0016	<0.44	<0.0099	<0.00014	<0.00029	<0.00020
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	NA	NA	<1.6	<0.00018	<0.00016	<0.010	<0.057	<0.00016	<1.3	<0.00017	<0.0018	<0.47	<0.011	<0.00015	<0.00031	<0.00021
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	NA	NA	*63.1*	<0.0053	<0.0050	<0.027	6.40	<0.0053	60.3	<0.0047	<0.038	1.43	<0.0074	<0.0066	0.182	<0.0081
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	NA	NA	<0.48	<0.0099	<0.0093	<0.050	<0.17	<0.0098	<0.38	<0.0087	<0.050	<0.011	<0.0096	<0.0085	<0.017	<0.011
1,4-Dioxane	mg/kg	~	~	~	~	~	~	NA	NA	<1.3	<0.026	<0.024	<0.13	<0.43	<0.026	<0.98	<0.023	<0.14	<0.030	<0.027	<0.024	<0.048	<0.030
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	NA	NA	<1.3	<0.026	<0.024	<0.13	<0.43	<0.026	<0.98	<0.023	<0.19	<0.042	<0.037	<0.033	<0.066	<0.041
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	mg/kg	~	~	~	~	5	2	NA	NA	<0.41	<0.0084	<0.0079	<0.042	<0.14	<0.0083	<0.32	<0.0074	<0.035	<0.0075	<0.0068	<0.0060	<0.012	<0.0075
Atrazine	mg/kg	~	~	~	~	2400	210	NA	NA	<0.81	<0.017	<0.016	<0.084	<0.28	<0.017	<0.63	<0.015	<0.085	<0.018	<0.016	<0.015	<0.029	<0.018
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	NA	NA	<0.47	<0.0097	<0.0091	<0.049	<0.16	<0.0096	<0.37	<0.0085	<0.052	<0.011	<0.010	<0.0089	<0.018	<0.011
Caprolactam	mg/kg	~	~	~	~	340000	31000	NA	NA	<0.75	<0.015	<0.014	<0.077	<0.26	<0.015	<0.58	<0.014	<0.13	<0.028	0.0268 J	<0.023	<0.045	<0.028
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	NA	NA	2540 J	0.16 J	0	266 J	399 J	0	3610 J	0	0	36.9 J	0	0	23.5 J	0.53 J
Total SVOC TICs	mg/kg	~	~	~	~	~	~	NA	NA	3080 J	0	0	157.9 J	496 J	0	1270 J	1.73 J	2.91 J	47.8 J	0.88 J	0	58.9 J	0.4 J

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment FR.I	NJ ECO Saline Estuary Sediment FR.M	NJDEP NRDCSRS	NJDEP RDCSRS	SB-13		SB-14	SB-15	SB-16		SB-3			SB-4			SB-5		SB-6	SB-7	
Date								2015-10-08	2015-10-08	2015-09-25	2015-09-18	2015-10-09	2015-10-09	2015-10-05	2015-10-05	2015-10-05	2008-09-15	2015-11-18	2015-11-18	2015-10-07	2015-10-07	2015-09-25	2015-11-19	2015-11-19
Start Depth								1	13	2.5	3.5	11	12.5	1	2.5	19	0	1.5	9.5	20.5	4	4.5	5.5	10.5
End Depth								1.5	13.5	3	4	11.5	13	1.5	3	19.5	0.5	2	10	21	4.5	5	6	11
Grid Cell (Figures 1A through 1E)								B3		B3	C4	B2		B1			B1			B2		B3	B1	
Chemical	Units																							
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	<1.1	<0.033	<0.27	<0.097	<1.4	<0.030	<0.48	<0.43	<0.025	<0.030	<0.045	<0.033	<0.027	<0.38	<0.56	<0.33	<0.29
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	<1.4	<0.040	<0.33	<0.12	<1.7	<0.037	<0.59	<0.53	<0.031	<0.044	<0.055	<0.040	<0.034	<0.47	<0.69	<0.40	<0.36
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	<1.2	<0.035	<0.29	<0.10	<1.5	<0.033	<0.52	<0.47	<0.028	<0.037	<0.049	<0.036	<0.030	<0.41	<0.61	<0.36	<0.32
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	<2.8	<0.081	<0.67	<0.24	<3.4	<0.075	<1.2	<1.1	<0.063	<0.044	<0.11	<0.082	<0.068	<0.94	<1.4	<0.81	<0.73
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	<6.7	<0.19	<1.6	<0.57	<8.2	<0.18	<2.9	<2.6	<0.15	<0.39	<0.27	<0.20	<0.16	<2.3	<3.3	<2.0	<1.8
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	<2.9	<0.084	<0.70	<0.25	<3.5	<0.077	<1.2	<1.1	<0.066	<0.038	<0.12	<0.085	<0.071	<0.98	<1.4	<0.85	<0.76
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	<1.5	<0.042	<0.35	<0.13	9.00	0.0477 J	6.66	<0.56	<0.033	<0.048	<0.058	<0.043	<0.036	<0.49	<0.73	<0.43	<0.38
2-nitrophenol	mg/kg	~	~	~	~	~	~	<1.4	<0.041	<0.34	<0.12	<1.7	<0.038	<0.60	<0.54	<0.032	<0.038	<0.056	<0.041	<0.034	<0.47	<0.70	<0.41	<0.37
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	<2.6	<0.075	<0.62	<0.22	<3.2	<0.069	<1.1	<0.99	<0.059	<0.046	<0.10	<0.076	<0.063	<0.88	<1.3	<0.76	<0.68
phenol	mg/kg	120	~	0.665	2.6	210000	18000	<1.2	<0.033	<0.28	<0.098	<1.4	<0.031	<0.49	<0.44	<0.026	<0.027	<0.046	<0.033	<0.028	<0.39	<0.57	<0.33	<0.30
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	<1.4	<0.040	<0.33	<0.12	<1.7	<0.037	<0.59	<0.53	<0.031	<0.039	<0.055	<0.040	<0.034	<0.46	<0.69	<0.40	<0.36
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	<1.2	<0.036	<0.30	<0.11	<1.5	<0.033	<0.53	<0.47	<0.028	<0.048	<0.049	<0.036	<0.030	<0.41	<0.61	<0.36	<0.32
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	3.16	0.0642	<0.35	<0.12	18.9	0.0780	10.2	21.8	<0.033	0.130	<0.058	0.144	0.0351 J	7.30	<0.72	7.34	<0.38
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	<0.16	<0.0047	<0.039	<0.014	<0.20	<0.0043	<0.069	<0.061	<0.0036	0.0812	<0.0064	<0.0047	<0.0039	<0.054	<0.080	<0.047	<0.042
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	9.82	0.177	<0.032	<0.011	70.0	0.237	9.43	29.6	<0.0030	0.160	<0.0053	<0.0038	0.0739	16.2	<0.066	22.4	<0.035
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	7.42	0.0999	<0.071	<0.025	**41.7**	0.123	**30.4**	**304**	0.0278 J	0.202	<0.012	<0.0086	0.322	**91.3**	<0.15	**187**	0.212 J
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	**5.79**	0.0636	<0.078	<0.028	**27.8**	0.0738	**22.7**	**168**	0.0154 J	0.206	<0.013	<0.0095	0.179	**44.2**	<0.16	**116**	<0.085
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	4.01	0.0449	<0.076	<0.027	11.6	0.0513	14.8	**110**	<0.0071	0.235	<0.013	<0.0092	0.133	**35.0**	<0.16	**61.9**	<0.083
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	6.07	0.0774	<0.11	<0.039	25.1	0.0645	15.6	53.9	<0.010	0.216	<0.018	<0.013	0.0944	17.6	<0.23	26.6	<0.12
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	<0.34	<0.0099	<0.082	<0.029	<0.42	<0.0091	3.14	23.9	<0.0077	0.0769	<0.014	<0.010	0.0334 J	4.39	<0.17	5.48	<0.089
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	<0.22	<0.0063	<0.053	<0.019	<0.27	<0.0058	<0.094	<0.084	<0.0049	<0.016	<0.0087	<0.0064	<0.0053	<0.074	<0.11	<0.064	<0.057
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	<0.35	<0.010	<0.084	<0.030	<0.43	<0.0093	<0.15	<0.13	<0.0079	<0.020	<0.014	<0.010	<0.0085	<0.12	<0.17	<0.10	<0.091
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	<0.83	<0.024	<0.20	<0.071	<1.0	<0.022	<0.35	<0.32	<0.019	<0.018	<0.033	<0.024	<0.020	<0.28	<0.41	<0.24	<0.22
4-chloroaniline	mg/kg	~	~	~	~	~	~	<0.41	<0.012	<0.097	<0.035	<0.49	<0.011	<0.17	<0.15	<0.0092	<0.015	<0.016	<0.012	<0.0099	<0.14	<0.20	<0.12	<0.11
Carbazole	mg/kg	~	~	~	~	96	24	<0.17	<0.0049	<0.041	<0.015	<0.21	<0.0045	<0.073	<0.065	<0.0038	<0.015	<0.0068	<0.0050	<0.0041	4.28	<0.085	<0.049	<0.044
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	16.2	0.198	<0.059	<0.021	66.6	0.243	40.3	350	0.0261 J	0.275	<0.0098	0.0189 J	0.407	108	<0.12	167	0.234 J
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	<0.35	<0.010	<0.083	<0.030	<0.42	<0.0092	<0.15	<0.13	<0.0078	<0.018	<0.014	<0.010	<0.0085	<0.12	<0.17	<0.10	<0.091
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	<0.64	<0.018	<0.15	<0.055	<0.78	<0.017	<0.27	<0.24	<0.014	<0.017	<0.026	<0.019	<0.016	<0.21	<0.32	<0.19	<0.17
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	<0.35	<0.010	<0.084	<0.030	<0.43	<0.0093	<0.15	<0.13	<0.0079	<0.019	<0.014	<0.010	<0.0085	<0.12	<0.17	<0.10	<0.092
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	<0.29	<0.0083	<0.069	<0.025	<0.35	<0.0077	<0.12	<0.11	<0.0065	<0.024	<0.011	<0.0084	<0.0070	<0.097	<0.14	<0.084	<0.075
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	<0.41	<0.00026	<0.0016	<0.0013	<0.060	<0.014	<0.39	<0.17	<0.00023	<0.014	<0.16	<0.00027	<0.00019	0.152	<0.0028	<0.057	<0.00024
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	<0.29	<0.0083	<0.069	<0.025	<0.35	<0.0077	<0.12	<0.11	<0.0065	<0.020	<0.011	<0.0084	<0.0070	<0.097	<0.14	<0.084	<0.075
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	<0.40	<0.011	<0.095	<0.034	<0.48	<0.011	<0.17	<0.15	<0.0089	<0.016	<0.016	<0.012	<0.0096	<0.13	<0.20	<0.11	<0.10
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	<1.0	<0.029	<0.24	<0.086	<1.2	<0.027	<0.43	<0.38	<0.023	<0.062	<0.040	<0.029	<0.024	<0.34	<0.50	<0.29	<0.26
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	1.15 J	0.0211 J	<0.13	<0.047	**4.45**	0.0194 J	**10.5**	**62.7**	<0.012	0.0683	<0.022	<0.016	0.0864	**19.1**	<0.27	**27.0**	<0.14
Dibenzofuran	mg/kg	~	~	~	~	~	~	<0.21	0.115	<0.051	<0.018	<0.26	0.164	<0.091	<0.081	<0.0048	0.0705 J	<0.0085	<0.0062	<0.0052	<0.072	<0.11	9.83	<0.056
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	<0.18	<0.0052	<0.043	<0.015	<0.22	<0.0048	<0.077	<0.069	<0.0041	<0.022	<0.0072	<0.0053	<0.0044	<0.061	<0.090	<0.053	<0.047
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	<0.21	<0.0060	<0.050	<0.018	<0.25	<0.0055	<0.088	<0.079	<0.0047	<0.016	<0.0083	<0.0060	<0.0050	<0.069	<0.10	<0.060	<0.054
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	<0.20	<0.0056	<0.047	<0.017	<0.24	<0.0052	<0.083	<0.074	<0.0044	<0.016	<0.0078	<0.0057	<0.0047	<0.065	<0.097	<0.057	<0.051
dimethyl phthalate	mg/kg	~	~	~	~	~	~	<0.22	<0.0063	<0.053	<0.019	<0.27	<0.0058	<0.094	<0.084	<0.0049	<0.017	<0.0087	<0.0064	<0.0053	<0.074	<0.11	<0.064	<0.057
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	<0.54	<0.015	<0.13	<0.046	<0.65	<0.014	<0.23	<0.20	<0.012	0.170	<0.021	<0.016	<0.013	<0.18	<0.27	<0.16	<0.14
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	4.66	0.0717	<0.045	<0.016	24.1	0.0896	7.52	25.5	<0.0042	0.503	<0.0075	0.0353 J	0.0527	14.8	<0.093	13.1	<0.049
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	8.78	0.191	<0.044	<0.016	74.0	0.238	15.5	33.1	<0.0041	0.117	<0.0073	0.230	0.0789	18.5	<0.091	15.1	<0.048
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	<0.30	<0.0087	<0.072	<0.026	<0.37	<0.0080	<0.13	<0.12	<0.0068	<0.021	<0.012	<0.0088	<0.0073	<0.10	<0.15	<0.088	<0.079
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	<0.41	<0.012	<0.097	<0.035	<0.49	<0.011	<0.17	<0.15	<0.0092	<0.017	<0.016	<0.012	<0.0099	<0.14	<0.20	<0.12	<0.11
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	<2.4	<0.070	<0.58	<0.21	<3.0	<0.065	<1.0	<0.93	<0.055	<0.034	<0.097	<0.071	<0.059	<0.82	<1.2	<0.71	<0.64
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	<0.50	<0.014	<0.12	<0.043	<0.61	<0.013	<0.21	<0.19	<0.011	<0.023	<0.020	<0.014	<0.012	<0.17	<0.25	<0.14	<0.13
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	2.92	0.0328 J	<0.19	<0.068	8.63	0.0343 J	10.2	**45.6**	<0.018	0.126	<0.032	<0.023	0.0677	12.7	<0.39	**20.9**	<0.21
isophorone	mg/kg	139	~	~	~	2000	510	<0.29	<0.0083	<0.069	<0.025	<0.35	<0.0076	<0.12	<0.11	<0.0065	<0.032	<0.011	<0.0083	<0.0070	<0.096	<0.14	<0.083	<0.075
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	61.0	1.52	<0.069	<0.025	813	2.64	203	278	<0.0065	0.0925	<0.011	1.76	0.678	218	<0.14	187	0.228 J
2-nitroaniline	mg/kg	~	~	~	~	23000	39	<0.35	<0.010	<0.083	<0.030	<0.42	<0.0092	<0.15	<0.13	<0.0078	<0.026	<0.014	<0.010	<0.0085	<0.12	<0.17	<0.10	<0.091
3-nitroaniline	mg/kg	~	~	~	~	~	~	<0.44	<0.013	<0.10	<0.037	<0.53	<0.012	<0.19	<0.17	<0.0098	<0.015	<0.017	<0.013	<0.011	<0.15	<0.22	<0.13	<0.11
4-nitroaniline	mg/kg	~	~	~	~	~	~	<0.51	<0.015	<0.12	<0.044	<0.62	<0.014	<0.22	<0.19	<0.012	<0.023	<0.020	<0.015	<0.012	<0.17	<0.25	<0.15	<0.13
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	21.1	0.448	<0.059	<0.021	321	1.03	128	119	<0.0055	0.0703	<0.0098	0.247	0.249	97.5	<0.12	47.3	<0.064
nitrobenzene	mg/kg	1.31	~	~	~	14	5	<0.49	<0.014	<0.12	<0.041	<0.59	<0.013	<0.21	<0.18	<0.011	<0.016	<0.019	<0.014	<0.012	<0.16	<0.24	<0.14	<0.13
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	<0.46	<0.013	<0.11	<0.039	<0.55	<0.012	<0.19	<0.17	<0.010	<0.022	<0.018	<0.013	<0.011	<0.15	<0.23	<0.13	<0.12
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	<0.81	<0.023	<0.19	<0.069	<0.98	<0.021	<0.34	<0.31	<0.018	<0.024	<0.032	<0.023	<0.020	<0.27	<0.40	<0.23	<0.21
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	<3.8	<0.11	<0.90	<0.32	<4.6	<0.099	<1.6	<1.4	<0.084	<0.046	<0.15	<0.11	<0.091	<1.3	<1.9	<1.1	<0.98
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	38.5	0.799	<0.041	<0.015	295	1.00	42.8	173	0.0157 J	0.330	<0.0068	0.493	0.278	74.9	<0.085	78.8	<0.044
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	31.3	0.414	<0.046	<0.016	148	0.422	23.7	115	<0.0043	0.556	<0.0076	0.170	0.201	49.3	<0.095	38.9	<0.050
2-Methylphenol	mg/kg	~	~	~	~	3400	310	<2.2	<0.064	<0.53	<0.19	<2.7	<0.059	<0.95	<0.85	<0.050	<0.039	<0.089	<0.065	<0.054	<0.75	<1.1	<0.65	<0.58
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.22	<0.00014	<0.00086	<0.00072	<0.033	<0.0077	<0.21	<0.095	<0.00012	<0.019	<0.088	<0.00015	<0.00010	0.205	<0.0015	<0.031	<0.00013
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.28	<0.00018	<0.0011	<0.00093	<0.042	<0.010	<0.27	<0.12	<0.00016	<0.015	<0.11	<0.00019	<0.00013	<0.024	<0.0020	<0.040	<0.00017
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.31	<0.00020	<0.0012	<0.0010	<0.045	<0.011	<0.29	<0.13	<0.00017	<0.019	<0.12	<0.00020	<0.00015	<0.025	<0.0021	<0.043	<0.00018
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	6.23	0.152	<0.068	<0.024	86.3	0.339	12.9	23.1	<0.0064	NA	<0.011	<0.0083	0.0767	13.7	<0.14	17.6	<0.074
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	<0.37	<0.011	<0.088	<0.031	<0.45	<0.0098	<0.16	<0.14	<0.0083	NA	<0.015	<0.011	<0.0089	<0.12	<0.18	<0.11	<0.096
1,4-Dioxane	mg/kg	~	~	~	~	~	~	<1.0	<0.030	<0.25	<0.089	<1.3	<0.028	<0.44	<0.40	<0.023	NA	<0.041	<0.030	<0.025	<0.35	<0.52	<0.30	<0.27
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	<1.4	<0.042	<0.35	<0.12	<1.8	<0.038	<0.62	<0.55	<0.033	NA	<0.058	<0.042	<0.035	<0.48	<0.72	<0.42	<0.38
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	mg/kg	~	~	~	~	5	2	<0.26	<0.0075	<0.062	<0.022	<0.32	<0.0069	<0.11	<0.099	<0.0059	NA	<0.010	<0.0076	<0.0063	<0.088	<0.13	<0.076	<0.068
Atrazine	mg/kg	~	~	~	~	2400	210	<0.63	<0.018	<0.15	<0.054	<0.77	<0.017	<0.27	<0.24	<0.014	NA	<0.025	<0.018	<0.015	<0.21	<0.31	<0.18	<0.16
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	<0.39	<0.011	<0.092	<0.033	<0.47	<0.010	<0.16	<0.15	<0.0086	NA	<0.015	<0.011	<0.0093	<0.13	<0.19	<0.11	<0.10
Caprolactam	mg/kg	~	~	~	~	340000	31000	<0.99	<0.028	<0.24	<0.084	<1.2	<0.026	<0.42	<0.37	<0.022	NA	<0.039	<0.029	<0.024	<0.33	<0.49	<0.29	<0.26
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	914 J	22.87 J	0	0	1591 J	28.7 J	804 J	291 J	0	NA	0	37.92 J	23.21 J	690 J	0	213 J	0
Total SVOC TICs	mg/kg	~	~	~	~	~	~	981 J	15.49 J	0	1.49 J	1152 J	13.09 J	509 J	747 J	0	29.35 J	0	9.69 J	12.99 J	377 J	0	328 J	3.5 J

TABLE 1B
SOIL ANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	SB-8		SB-9	
Date								2015-11-19	2015-11-19	2015-11-18	2015-11-18
Start Depth								6	10.5	1.5	12.5
End Depth								6.5	11	2	13
Grid Cell (Figures 1A through 1E)								B1		B2	
Chemical	Units										
2-chlorophenol	mg/kg	0.243	~	~	0.008	2200	310	<0.11	<0.060	<0.036	<0.032
4-chloro-3-methylphenol	mg/kg	~	~	~	~	~	~	<0.14	<0.073	<0.045	<0.039
2,4-dichlorophenol	mg/kg	87.5	~	~	0.005	2100	180	<0.12	<0.065	<0.039	<0.035
2,4-dimethylphenol	mg/kg	0.01	~	~	~	14000	1200	<0.29	<0.15	<0.090	<0.080
2,4-dinitrophenol	mg/kg	0.0609	20	~	~	1400	120	<0.68	<0.36	<0.22	<0.19
4,6-dinitro-2-methylphenol	mg/kg	~	~	~	~	68	6	<0.30	<0.15	<0.094	<0.083
3- and 4-methylphenol	mg/kg	~	~	~	~	~	~	<0.15	<0.078	<0.047	<0.042
2-nitrophenol	mg/kg	~	~	~	~	~	~	<0.14	<0.075	<0.045	<0.040
4-nitrophenol	mg/kg	5.12	~	~	~	~	~	<0.26	<0.14	<0.084	<0.074
phenol	mg/kg	120	~	0.665	2.6	210000	18000	<0.12	<0.061	<0.037	<0.033
2,4,5-trichlorophenol	mg/kg	4	9	~	0.003	68000	6100	<0.14	<0.073	<0.044	<0.039
2,4,6-trichlorophenol	mg/kg	4	~	~	0.006	74	19	<0.13	<0.065	<0.040	<0.035
Acenaphthene	mg/kg	20	~	0.016	0.5	37000	3400	0.555	0.101	<0.046	<0.041
Acenaphthylene	mg/kg	682	~	0.044	0.64	300000	~	<0.016	<0.0085	<0.0052	<0.0046
Anthracene	mg/kg	1480	~	0.085	1.1	30000	17000	<0.013	0.251	<0.0042	<0.0038
benzo[a]anthracene	mg/kg	5.21	~	0.261	1.6	17	5	<0.030	1.54	<0.0095	<0.0084
benzo[a]pyrene	mg/kg	1.52	~	0.43	1.6	2	0.5	<0.033	0.972	<0.010	<0.0093
benzo[b]fluoranthene	mg/kg	59.8	~	~	1.8	17	5	<0.032	0.574	<0.010	<0.0090
benzo[g,h,i]perylene	mg/kg	119	~	0.17	~	30000	380000	<0.047	0.361	<0.015	<0.013
benzo[k]fluoranthene	mg/kg	148	~	0.24	~	170	45	<0.035	0.122	<0.011	<0.0097
2-chloronaphthalene	mg/kg	0.0122	~	~	~	~	~	<0.022	<0.012	<0.0070	0.0215 J
4-bromophenyl phenyl ether	mg/kg	~	~	~	~	~	~	<0.036	<0.019	<0.011	<0.0099
butyl benzyl phthalate	mg/kg	0.239	~	~	0.063	14000	1200	<0.084	<0.044	<0.027	<0.024
4-chloroaniline	mg/kg	~	~	~	~	~	~	<0.041	<0.022	<0.013	<0.012
Carbazole	mg/kg	~	~	~	~	96	24	<0.017	0.0685 J	<0.0055	<0.0048
Chrysene	mg/kg	4.73	~	0.384	2.8	1700	450	0.0957 J	1.56	0.0369 J	<0.0070
bis(2-chloroethoxy) methane	mg/kg	~	~	~	~	~	~	<0.035	<0.018	<0.011	<0.0099
bis(2-chloroethyl) ether	mg/kg	23.7	~	~	~	2	0.4	<0.065	<0.034	<0.021	<0.018
Bis(2-chloro-1-methylethyl) ether	mg/kg	19.9	~	~	~	67	23	<0.036	<0.019	<0.011	<0.010
4-chlorophenyl phenyl ether	mg/kg	~	~	~	~	~	~	<0.029	<0.015	<0.0093	<0.0082
1,4-dichlorobenzene	mg/kg	0.546	~	~	~	13	5	<0.13	<0.00029	<0.31	<0.00025
2,4-dinitrotoluene	mg/kg	1.28	~	~	~	3	0.7	<0.029	<0.015	<0.0093	<0.0082
2,6-dinitrotoluene	mg/kg	~	~	~	~	3	0.7	<0.040	<0.021	<0.013	<0.011
3,3-dichlorobenzidine	mg/kg	0.646	~	~	~	4	1	<0.10	<0.053	<0.032	<0.029
dibenz[a,h]anthracene	mg/kg	18.4	~	0.063	0.26	2	0.5	<0.056	0.324	<0.018	<0.016
Dibenzofuran	mg/kg	~	~	~	~	~	~	<0.022	<0.011	<0.0068	<0.0061
di-n-butyl phthalate	mg/kg	0.15	~	~	0.058	68000	6100	<0.018	<0.0096	<0.0058	<0.0051
di-n-octyl phthalate	mg/kg	~	~	~	~	27000	2400	<0.021	<0.011	<0.0066	<0.0059
diethyl phthalate	mg/kg	24.8	~	~	0.006	550000	49000	<0.020	<0.010	<0.0063	<0.0055
dimethyl phthalate	mg/kg	~	~	~	~	~	~	<0.022	<0.012	<0.0070	<0.0062
bis(2-ethylhexyl) phthalate	mg/kg	0.925	~	0.18216	2.64651	140	35	<0.054	<0.028	<0.017	<0.015
Fluoranthene	mg/kg	122	~	0.6	5.1	24000	2300	<0.019	0.156	<0.0060	<0.0053
Fluorene	mg/kg	122	~	0.019	0.54	24000	2300	0.898	0.194	<0.0059	<0.0052
hexachlorobenzene	mg/kg	0.199	~	0.02	~	1	0.3	<0.031	<0.016	<0.0097	<0.0086
hexachlorobutadiene	mg/kg	0.0398	~	~	0.0013	25	6	<0.041	<0.022	<0.013	<0.012
hexachlorocyclopentadiene	mg/kg	0.755	~	~	~	110	45	<0.25	<0.13	<0.078	<0.069
hexachloroethane	mg/kg	0.596	~	~	0.073	48	12	<0.050	<0.026	<0.016	<0.014
indeno[1,2,3-c,d]pyrene	mg/kg	109	~	0.2	~	17	5	<0.081	0.278	<0.025	<0.023
isophorone	mg/kg	139	~	~	~	2000	510	<0.029	<0.015	<0.0092	<0.0082
2-Methylnaphthalene	mg/kg	3.24	~	0.07	0.67	2400	230	8.45	1.52	3.99	0.109
2-nitroaniline	mg/kg	~	~	~	~	23000	39	<0.035	<0.018	<0.011	<0.0099
3-nitroaniline	mg/kg	~	~	~	~	~	~	<0.044	<0.023	<0.014	<0.012
4-nitroaniline	mg/kg	~	~	~	~	~	~	<0.052	<0.027	<0.016	<0.015
Naphthalene (extractable)	mg/kg	0.0994	~	0.16	2.1	17	6	0.950	0.429	<0.0079	0.0472
nitrobenzene	mg/kg	1.31	~	~	~	14	5	<0.049	<0.026	<0.016	<0.014
n-nitrosodi-n-propylamine	mg/kg	~	~	~	~	0.3	0.2	<0.046	<0.024	<0.015	<0.013
n-nitrosodiphenylamine	mg/kg	0.545	~	~	~	390	99	<0.082	<0.043	<0.026	<0.023
Pentachlorophenol	mg/kg	0.119	31	~	0.017	3	0.9	<0.38	<0.20	<0.12	<0.11
Phenanthrene	mg/kg	45.7	~	0.24	1.5	300000	~	1.80	0.727	1.80	0.0589
Pyrene	mg/kg	78.5	~	~	0.13	18000	1700	0.649	0.548	0.340	0.0193 J
2-Methylphenol	mg/kg	~	~	~	~	3400	310	<0.23	<0.12	<0.071	<0.063
1,2-Dichlorobenzene	mg/kg	2.96	~	~	~	59000	5300	<0.069	<0.00016	<0.17	<0.00014
1,3-Dichlorobenzene	mg/kg	37.7	~	~	~	59000	5300	<0.089	<0.00020	<0.21	<0.00018
1,2,4-Trichlorobenzene	mg/kg	20	~	~	~	820	73	<0.096	<0.00022	<0.23	<0.00019
1,1'-Biphenyl	mg/kg	60	~	~	~	240	61	<0.029	<0.015	<0.0091	0.0681 J
1,2,4,5-Tetrachlorobenzene	mg/kg	2.02	~	~	~	~	~	<0.037	<0.019	<0.012	<0.010
1,4-Dioxane	mg/kg	~	~	~	~	~	~	<0.11	<0.055	<0.033	<0.030
2,3,4,6-Tetrachlorophenol	mg/kg	~	~	~	~	~	~	<0.15	<0.076	<0.046	<0.041
4-Methylphenol	mg/kg	~	~	~	~	340	31	NA	NA	NA	NA
Acetophenone	mg/kg	~	~	~	~	5	2	<0.026	<0.014	<0.0084	<0.0074
Atrazine	mg/kg	~	~	~	~	2400	210	<0.064	<0.033	<0.020	<0.018
Benzaldehyde	mg/kg	~	~	~	~	68000	6100	<0.039	<0.020	<0.012	<0.011
Caprolactam	mg/kg	~	~	~	~	340000	31000	<0.10	<0.052	<0.032	<0.028
Total SVOC Alkanes	mg/kg	~	~	~	~	~	~	145.7 J	40.9 J	238.8 J	23.48 J
Total SVOC TICs	mg/kg	~	~	~	~	~	~	31 J	34.5 J	26.1 J	2.2 J

Notes:

~	No standard exists for this compound in this classification.
mg/kg	Milligrams per kilogram
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
N	Presumptive evidence of a compound
D	Concentration is based on a diluted sample analysis
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
ESC	NJDEP Ecological Screening Criteria
NJDEP ECOLOGICAL LSSL	NJDEP Lower Ecological Soil Screening Level (March 2009)
NJDEP ECOLOGICAL USSL	NJDEP Upper Ecological Soil Screening Level (March 2009)
ER-L	NJDEP Saline Estuary Sediment Criteria (Effects Range – Low) (March 2009)
ER-M	NJDEP Saline Estuary Sediment Criteria (Effects Range – Medium) (March 2009)
NJDEP RDCSRS	NJDEP Residential Direct Contact Soil Remediation Standards (September 2017)
NJDEP NRDCSRS	NJDEP Non-Residential Direct Contact Soil Remediation Standards (September 2017)
Italics	Concentration exceeds the NJDEP RDCSRS
Bold	Concentration exceeds the NRDCSRS
Gray highlight	Concentration exceeds NJDEP Ecological Soil Screening Levels
Yellow highlight	Concentration exceeds NJDEP Saline Estuary Sediment Criteria

If more than one applicable SRS or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.

ESCs do not apply to soil borings SB-3, ASB-85, ASB-859 and GMW-690.

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	AGRO-1	AGRO-10	AGRO-11	AGRO-12	AGRO-2	AGRO-3	AGRO-4	AGRO-5	AGRO-6	AGRO-7	AGRO-8	AGRO-9
Date								2016-11-02	2016-11-07	2016-11-09	2016-11-09	2016-11-02	2016-11-02	2016-11-03	2016-11-02	2016-11-03	2016-11-03	2016-11-07	2016-11-07
Start Depth								0	0	0	0	0	0	0	0	0	0	0	0
End Depth								1	1	1	1	1	1	1	1	1	1	1	1
Grid Cell (Figures 1A through								B3	D3	C3	C3	C2	C2	C2	C1	C2	C2	D3	D3
Chemical	**Units**																		
Aluminum	mg/kg	50	~	~	9.3	~	78000	9920	8590	27200	15900	15100	9710	16900	7820	12400	6710	11300	11000
Antimony	mg/kg	0.27	78	8.2	70	450	31	<3.1	<2.5	<4.6	<3.6	<3.0	<3.4	3.4	<3.4	3.1	3.1	<3.4	4.7
Arsenic	mg/kg	9.9	46	~	48	19	19	44.1	19.3	31.6	32.4	63.0	80.7	158	66.4	64.8	96.2	19.1	56.7
Barium	mg/kg	283	2000	~	~	59000	16000	1050	301	850	935	2290	2170	1580	669	1330	1510	376	423
Beryllium	mg/kg	10	40	1.2	9.6	140	16	0.67	0.56	1.1	0.89	0.67	0.52	0.98	0.41	0.67	0.44	0.95	0.71
Cadmium	mg/kg	0.36	140	~	~	78	78	2.2	<0.63	7.5	2.3	4.9	6.5	8.9	1.4	4.1	7.1	0.93	5.3
Calcium	mg/kg	~	~	81	370	~	~	8200	1570	9770	4350	17300	6200	22100	2680	3600	3850	2660	3030
Chromium	mg/kg	0.4	1	~	10	~	~	105	33.9	178	133	189	184	238	85.0	143	257	62.3	108
Cobalt	mg/kg	0.14	230	34	270	590	1600	<7.8	6.4	16.6	11.8	15.0	10.6	13.6	<8.6	7.8	5.6	11.2	9.4
Copper	mg/kg	5.4	100	~	~	45000	3100	353	81.7	569	407	1050	1180	1250	410	518	663	307	537
Iron	mg/kg	~	~	47	218	~	~	22800	24500	29300	32300	26600	29200	37700	14100	23300	15000	24900	25300
Lead	mg/kg	0.0537	1700	~	~	800	400	**5400**	*660*	**1680**	**1730**	**15100**	**40000**	**26400**	**11100**	**10500**	**8130**	**2800**	**11200**
Magnesium	mg/kg	~	~	~	260	~	~	5240	4290	8590	8400	10200	8930	9800	4080	5970	3350	6470	6240
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	149	143	251	227	304	198	320	86.3	143	109	225	231
Mercury	mg/kg	0.1	0.3	21	52	65	23	12.4	1.4	6.6	7.2	62.9	43.8	46.3	9.6	21.1	13.7	4.6	7.0
Nickel	mg/kg	13.6	280	~	~	23000	1600	62.2	18.5	84.9	61.1	166	156	116	33.0	52.9	49.9	41.5	48.6
Potassium	mg/kg	~	~	~	1	~	~	2050	2140	3830	3120	2250	2050	3220	1830	2470	1350	2920	2650
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	<3.1	2.9	5.9	4.4	5.8	7.6	10.3	8.5	7.6	24.5	<3.4	10.7
Silver	mg/kg	1.04	560	~	~	5700	390	1.3	1.1	3.0	1.4	2.7	8.9	10.9	1.3	3.9	14.4	2.3	3.9
Sodium	mg/kg	~	~	~	~	~	~	8270	5310	13900	11000	11800	14100	11800	7070	8900	4800	7360	9450
Thallium	mg/kg	1	~	~	57	~	~	<1.6	<1.3	<2.3	<1.8	<3.0	<86	<40	<1.7	<20	<10	<1.7	<1.6
Vanadium	mg/kg	2	280	150	410	1100	78	129	33.8	200	140	260	349	238	48.2	114	63.2	78.1	46.7
Zinc	mg/kg	6.62	160	~	~	110000	23000	582	91.8	913	610	1310	894	1080	360	679	578	454	1060
Molybdenum	mg/kg	2	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-1012					ASB-1013				ASB-1014		ASB-1015		
Date								2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20	2018-09-20
Start Depth								0	2	6	8	10	0	2	4	13	0	14	0	2	11
End Depth								2	4	8	10	11	2	4	5	14	2	14.5	0.5	2.5	13
Grid Cell (Figures 1A through								B3					C3				C3		C3		
Chemical	Units																				
Aluminum	mg/kg	50	~	~	9.3	~	78000	12600	18200	26900	38700	26300	29900	10700	10800	22500	24700	16500	16800	18000	19700
Antimony	mg/kg	0.27	78	8.2	70	450	31	<24.8	<8.35	<10.7	<8.21	<8.27	<6.59	<8.98	<9.22	<9.42	<3.12	<1.85	<3.61	<6.90	<7.94
Arsenic	mg/kg	9.9	46	~	48	19	19	74.5	32.6	66.6	6.85	8.72	50.4	7.01	5.08	2.78	31.2	2.74	16.5	12.1	3.81
Barium	mg/kg	283	2000	~	~	59000	16000	320	684	628	101	66.6	1030	99.3	37.1	588	1030	352	370	168	331
Beryllium	mg/kg	10	40	1.2	9.6	140	16	0.999	0.880 J	1.72	1.13	0.769	1.59	0.487 J	0.488 J	0.861	0.860	0.757	0.766	0.770 J	0.522
Cadmium	mg/kg	0.36	140	~	~	78	78	0.436 J	2.11	11.4	<0.243	<0.0490	5.62	0.305 J	<0.273	<0.0559	1.40	<0.0549	1.01	0.580 J	<0.0471
Calcium	mg/kg	~	~	81	370	~	~	2920	4250	7520	3430	423	4150	4510	4820	669	5210	965	2870	3640	586
Chromium	mg/kg	0.4	1	~	10	~	~	99.1	59.2	121	38.7	33.4	196	22.3	16.9	28.2	183	21.0	86.1	34.5	21.8
Cobalt	mg/kg	0.14	230	34	270	590	1600	14.8	8.42	40.6	15.3	12.8	15.2	3.76 J	3.85 J	6.67	9.81	5.89	8.06	6.35	6.55
Copper	mg/kg	5.4	100	~	~	45000	3100	313	487	588	11.1 J	13.9 J	555	87.9	11.4 J	11.1 J	664	8.46	233	92.7	8.19
Iron	mg/kg	~	~	47	218	~	~	67100	26000	70600	26900	32200	36800	12900	23700	14800	22100	11800	19300	15100	17000
Lead	mg/kg	0.0537	1700	~	~	800	400	**844**	*584*	**1900**	26.4	16.3	**1710**	82.6	22.1	12.7	**917**	13.2	**1140**	231	13.8
Magnesium	mg/kg	~	~	~	260	~	~	7060	10200	16100	9750	9030	11500	8090	8560	5760	7810	4860	7350	7260	3680
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	258	249	349	224	229	306	71.7	74.1	106	194	88.3	154	124	94.4
Mercury	mg/kg	0.1	0.3	21	52	65	23	16.6	1.69	0.717 J	0.152 J	<0.0403	14.8	0.528 J	<0.209	<0.0404	14.4	0.0506 J	4.01	0.375 J	<0.0374
Nickel	mg/kg	13.6	280	~	~	23000	1600	51.6	45.7	113	29.9	29.2	76.1	16.6	14.1	18.2	62.0	14.9	40.3	22.8	15.6
Potassium	mg/kg	~	~	~	1	~	~	3550	4710	8110	4350	5540	8150	3920	4140	5010	4180	2660	3930	4620	2600
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	<21.8	<7.36	<9.48	<7.25	<7.30	9.55 J	<7.93	<8.14	<8.31	6.29 J	<1.63	4.54 J	<6.09	<7.01
Silver	mg/kg	1.04	560	~	~	5700	390	2.55 J	<1.96	4.48 J	<1.93	<1.95	4.49 J	<2.11 K4	<2.17 K4	<0.443 K4	5.54	<0.435 K4	1.86 J	<1.62 K4	<0.374
Sodium	mg/kg	~	~	~	~	~	~	20300	31500	52100	17800	3060	25100	40600	44700	3490	13500	4320	10600	28600	2960
Thallium	mg/kg	1	~	~	57	~	~	<2.62	<4.42	<5.69	<4.35	<0.875	<3.49	<4.76	<4.88	<0.998	<1.65	<0.979	<1.91	<3.65	<0.841
Vanadium	mg/kg	2	280	150	410	1100	78	109	61.8	93.5	60.3	46.5	137	31.0	27.0	45.0	185	30.9	71.6	42.9	39.8
Zinc	mg/kg	6.62	160	~	~	110000	23000	270	261	1120	125	66.4	596	133	45.1	37.6	474	49.7	265	157	44.3
Molybdenum	mg/kg	2	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-1016							ASB-208	ASB-217	ASB-218	ASB-412	ASB-413	ASB-414	ASB-85
Date								2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	2018-09-21	1999-04-19	1999-04-19	1999-04-19	2003-12-23	2003-12-23	2003-12-23	1993-11-09
Start Depth								0	2	4	6	8	10	12	0	0	0	0	0	0	4
End Depth								2	4	6	8	10	12	13	2	2	2	0.5	0.5	0.5	6
Grid Cell (Figures 1A through								B3							B2	C1	D3	D2	D3	D2	B1
Chemical	Units																				
Aluminum	mg/kg	50	~	~	9.3	~	78000	18900	34500	25200	26100	22000	23400	15800	NA	NA	NA	NA	NA	NA	1930.00 J
Antimony	mg/kg	0.27	78	8.2	70	450	31	5.77 J	<6.35	6.66 J	4.36 J	3.89 J	<7.70	<1.77	3.4 BN	2.9 BN	3.8 BN	NA	NA	NA	5.90 J
Arsenic	mg/kg	9.9	46	~	48	19	19	29.4	6.29	16.4	12.6	7.22	9.27	3.44	59.5 *	83.1 *	66.9 *	NA	NA	NA	30.00
Barium	mg/kg	283	2000	~	~	59000	16000	256	94.7	58.8	65.2	64.5	129	307	606	864	300	NA	NA	NA	142.00 J
Beryllium	mg/kg	10	40	1.2	9.6	140	16	1.08	1.34	1.39	1.28	1.03	1.34	0.708	0.42 B	0.62 B	0.47 B	NA	NA	NA	<0.10 J
Cadmium	mg/kg	0.36	140	~	~	78	78	2.64	0.220 J	0.225 J	0.196 J	<0.110	0.304 J	<0.0526	2.5	2.7	2.8	NA	NA	NA	NA
Calcium	mg/kg	~	~	81	370	~	~	4070	3420	3230	2660	2390	5780	516	6210	2870	2510	NA	NA	NA	10200.00 J
Chromium	mg/kg	0.4	1	~	10	~	~	77.4	54.2	43.9	48.2	35.6	37.8	19.3	68.6	98.8	50.5	NA	NA	NA	33.00 J
Cobalt	mg/kg	0.14	230	34	270	590	1600	13.0	13.7	14.0	13.2	10.4	12.9	7.22	5.3 B	5.3 B	5.5 B	NA	NA	NA	5.40 J
Copper	mg/kg	5.4	100	~	~	45000	3100	246	32.0	18.9	19.4	13.9	21.0	9.32	790	470	489	NA	NA	NA	1090.00 J
Iron	mg/kg	~	~	47	218	~	~	46300	36000	59400	46900	31700	34400	15900	NA	NA	NA	NA	NA	NA	40000.00 J
Lead	mg/kg	0.0537	1700	~	~	800	400	**1140**	72.4	26.6	33.5	17.9	32.5	11.9	**25400**	**8820**	**12300**	NA	NA	NA	**18500.00 J**
Magnesium	mg/kg	~	~	~	260	~	~	9520	11600	11300	10500	8480	12800	3390	4100	3710	3940	NA	NA	NA	3880.00 J
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	303	324	452	536	306	327	89.0	126 N	76.5 N	120 N	NA	NA	NA	162.00 J
Mercury	mg/kg	0.1	0.3	21	52	65	23	3.67	0.201 J	<0.122	<0.0894	<0.0785	<0.182	<0.0393	13.1	3.2	2.2	NA	NA	NA	47.30 J
Nickel	mg/kg	13.6	280	~	~	23000	1600	51.5	40.4	38.5	34.8	27.1	32.9	14.6	74.2	34.1	33.7	NA	NA	NA	34.20 J
Potassium	mg/kg	~	~	~	1	~	~	4580	7840	5640	6040	5000	5970	2080	NA	NA	NA	3930	3240	3010	473.00 J
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	<3.27	<5.60	<4.54	<3.00	<3.28	<6.79	<1.56	NA	NA	NA	NA	NA	NA	5.40 J
Silver	mg/kg	1.04	560	~	~	5700	390	1.70 J	<1.49	<1.21	<0.799	<0.874	<1.81	<0.417	NA	NA	NA	NA	NA	NA	1.10 J
Sodium	mg/kg	~	~	~	~	~	~	13200	19500	18200	12100	11800	32700	3460	7880	4810	4310	NA	NA	NA	1670.00 J
Thallium	mg/kg	1	~	~	57	~	~	<1.96	<3.36	<2.72	<1.80	<1.97	<4.08	<0.939	1.3 B	<2.9	<2.4	NA	NA	NA	1.70 J
Vanadium	mg/kg	2	280	150	410	1100	78	95.2	68.8	61.7	61.6	51.7	58.7	28.9	86.5 *	75.5 *	23.2 *	NA	NA	NA	38.10 J
Zinc	mg/kg	6.62	160	~	~	110000	23000	623	114	116	110	80.2	88.9	36.0	297	379	607	NA	NA	NA	230.00 J
Molybdenum	mg/kg	2	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	6.2	3.8	6.1	NA	NA	NA	11.30 J
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	NA	NA	NA	NA	NA	NA	NA	<0.59 N	<0.73 N	<0.59 N	NA	NA	NA	NA

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP	NJDEP	NJ ECO	NJ ECO	NJDEP	NJDEP	ASB-858			ASB-859		ASB-86		ASB-860			ASB-861			ASB-87	GMW-123
Date		ECOLOGICAL	ECOLOGICAL	Saline	Saline	NRDCSRS	RDCSRS	2016-10-06	2016-10-06	2016-10-06	2016-10-06	2016-10-06	1993-11-09		2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	1994-02-15	1998-11-13
Start Depth		LSSL	USSL	Estuary	Estuary			7	11	17	17.5	9.5	2	4	3	6.5	9	11.5	5.5	2.5	2	2
End Depth				Sediment	Sediment			7.5	11.5	17.5	18	10	4	6	3.5	6.5	9.5	12	6	3	4	4
Grid Cell (Figures 1A through				ER-L	ER-M				A1			A1		A1		B2			B2		B2	C3
Chemical	Units																					
Aluminum	mg/kg	50	~	~	9.3	~	78000	9630	9730	10900	8490	16100	12100.00 J	9210.00 J	2440	1910	16700	5310	832	1780	4240.00	NA
Antimony	mg/kg	0.27	78	8.2	70	450	31	<2.2	<2.2	<2.2	<2.1	<2.6	4.30 J	<3.90 J	<2.8	<2.8	<4.0	<3.9	3.2	<2.7	<4.80 J	<34.2 N
Arsenic	mg/kg	9.9	46	~	48	19	19	2.7	<2.2	5.9	4.9	4.1	5.50 J	4.40	23.0	52.1	9.5	6.0	8.8	18.2	54.10	45.5
Barium	mg/kg	283	2000	~	~	59000	16000	57.6	26.9	213	131	98.1	102.00 J	126.00	178	90.0	63.3	40.1	55.1	86.5	368.00	487
Beryllium	mg/kg	10	40	1.2	9.6	140	16	0.63	0.47	0.99	0.80	0.84	0.59 J	0.46 J	<0.28	<0.28	0.81	<0.39	<0.24	<0.27	0.35 J	0.83 B
Cadmium	mg/kg	0.36	140	~	~	78	78	<0.55	<0.56	<0.55	<0.52	<0.65	<0.61 J	<0.64	1.5	<0.69	<1.0	<0.97	0.60	0.76	2.20	3.3
Calcium	mg/kg	~	~	81	370	~	~	1060	738	38500	21300	1120	583.00 J	7550.00 J	4710	1850	1280	1450	2940	2360	7780.00 J	14400
Chromium	mg/kg	0.4	1	~	10	~	~	19.2	5.9	27.8	19.3	16.3	14.30 J	19.10 J	29.8	13.7	24.2	10.2	71.5	57.3	74.40	74.8
Cobalt	mg/kg	0.14	230	34	270	590	1600	<5.5	<5.6	11.8	10.8	7.9	5.70 J	7.20 J	<7.0	<6.9	<10	<9.7	6.9	<6.6	5.30 J	12.4 B
Copper	mg/kg	5.4	100	~	~	45000	3100	18.2	3.3	9.8	8.1	39.9	188.00 J	94.20	568	233	12.1	19.1	222	300	622.00	464
Iron	mg/kg	~	~	47	218	~	~	16600	9210	26200	20300	17700	27600.00 J	17300.00 J	15300	7130	19800	9690	64000	33000	18300.00	NA
Lead	mg/kg	0.0537	1700	~	~	800	400	10.8	3.5	16.3	12.2	66.5	113.00 J	334.00 J	**23600**	**7330**	60.2	**950**	**7200**	**10400**	**19900.00**	**8490**
Magnesium	mg/kg	~	~	~	260	~	~	2370	<560	8790	7450	3270	398.00 J	4460.00	2710	1190	6150	2630	1850	1360	2990.00	11700
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	128	437	613	926	1280	57.50 J	449.00 J	115	60.0	232	47.9	338	147	101.00	357
Mercury	mg/kg	0.1	0.3	21	52	65	23	<0.034	<0.035	<0.036	<0.033	0.068	10.50 J	1.20 J	19.8	3.1	0.049	0.055	2.0	14.7	12.50	3.2
Nickel	mg/kg	13.6	280	~	~	23000	1600	16.1	9.9	29.1	26.5	19.6	33.10 J	24.60	34.8	18.6	25.5	10.3	103	83.2	58.50	46.0
Potassium	mg/kg	~	~	~	1	~	~	<1100	<1100	3650	2760	<1300	261.00 J	817.00 J	<1400	<1400	2850	<1900	<1200	<1300	649.00 J	NA
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	<2.2	<2.2	<2.2	<2.1	<2.6	1.20 J	0.50 J	4.8	<2.8	<4.0	<3.9	12.5	2.8	8.50	NA
Silver	mg/kg	1.04	560	~	~	5700	390	<0.55	<0.56	<0.55	<0.52	<0.65	<0.58 J	<0.61	1.9	<0.69	<1.0	<0.97	4.3	<0.66	3.10	NA
Sodium	mg/kg	~	~	~	~	~	~	<1100	<1100	<1100	<1000	<1300	217.00 J	448.00 J	1670	<1400	2040	4480	18600	3600	3600.00	13700
Thallium	mg/kg	1	~	~	57	~	~	<1.1	<1.1	<1.1	<1.0	<1.3	<1.10 J	<1.20 J	<35	<1.4	<2.0	<1.9	<6.0	<1.3	2.20 J	<5.7
Vanadium	mg/kg	2	280	150	410	1100	78	25.1	9.1	28.5	27.2	22.9	16.80 J	22.30	51.0	21.0	30.1	19.3	167	260	95.70	50.1
Zinc	mg/kg	6.62	160	~	~	110000	23000	36.4	20.7	67.7	52.0	56.7	50.10 J	66.70	181	73.6	63.2	23.9	94.9	104	251.00	679
Molybdenum	mg/kg	2	~	~	~	~	~	NA	NA	NA	NA	NA	6.70 J	2.70 J	NA	NA	NA	NA	NA	NA	8.60 J	5.3 B
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	5.20 J	NA	NA	NA	NA	NA	NA	4.90 J	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.76 J	2.9 N

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP	NJDEP	NJ ECO	NJ ECO	NJDEP	NJDEP	GMW-126	GMW-137	GMW-138	GMW-688		GMW-689		GMW-690		GMW-691		SB-10	SB-11		
Date		ECOLOGICAL	ECOLOGICAL	Saline	Saline	NRDCSRS	RDCSRS	1998-11-12	1998-11-13	1998-11-13	2016-10-10	2016-10-10	2016-10-10	2016-10-10	2016-10-07	2016-10-07	2016-10-11	2016-10-11	2015-09-18	2015-10-05	2015-10-05	2015-10-05
Start Depth		LSSL	USSL	Estuary	Estuary			0	4	4	2	14.5	14.5	2	11	19.5	2.5	14.5	4	9.5	11.5	20
End Depth				Sediment	Sediment			2	6	6	2.5	15	15	2.5	11.5	20	3	15	4.5	10	12	20.5
Grid Cell (Figures 1A through				ER-L	ER-M			D3	C1	B3	B2		B2		B2		B2		B3	B2		
Chemical	Units																					
Aluminum	mg/kg	50	~	~	9.3	~	78000	NA	NA	NA	11600	11400	11600	11500	19300	14200	8760	7730	7420	18300	20100	12600
Antimony	mg/kg	0.27	78	8.2	70	450	31	1.5 BN	3.8 BN	<15.9 N	8.4	<2.4	<2.4	<2.3	<6.2	<2.3	9.3	<2.2	<2.0	<2.8	<2.5	<2.1
Arsenic	mg/kg	9.9	46	~	48	19	19	67.5	299	85.9	584	<2.4	4.4	40.0	38.3	4.9	649	6.3	2.8	4.4	3.8	3.5
Barium	mg/kg	283	2000	~	~	59000	16000	465	728	1270	253	30.6	254	87.7	97.6	106	225	149	23.4	174	103	253
Beryllium	mg/kg	10	40	1.2	9.6	140	16	0.52 B	0.47 B	0.54 B	0.49	0.42	0.80	0.92	1.1	1.1	0.33	0.52	0.31	0.96	1.5	0.87
Cadmium	mg/kg	0.36	140	~	~	78	78	4.5	2.1 B	4.0	1.0	<0.60	<0.59	<0.57	2.4	<0.57	1.6	<1.1	<0.50	<0.70	<0.62	<0.53
Calcium	mg/kg	~	~	81	370	~	~	3060	3230	7020	4760	<600	1190	953	5150	1270	3140	1210	4410	1080	865	38700
Chromium	mg/kg	0.4	1	~	10	~	~	77.8	79.5	147	91.0	18.8	24.7	21.0	32.1	28.2	71.1	26.7	14.7	27.4	33.4	22.9
Cobalt	mg/kg	0.14	230	34	270	590	1600	8.8 B	7.0 B	9.9 B	<9.9	8.2	14.1	13.5	<16	13.8	<7.5	14.2	<5.0	11.2	12.9	11.5
Copper	mg/kg	5.4	100	~	~	45000	3100	509	359	760	355	18.3	14.8	44.4	105	21.7	352	7.8	5.9	12.2	15.8	12.6
Iron	mg/kg	~	~	47	218	~	~	NA	NA	NA	39400	19300	26400	24100	14000	30300	31200	26700	11000	25900	30100	21900
Lead	mg/kg	0.0537	1700	~	~	800	400	**12100**	**15500**	**21600**	**4480**	31.8	15.1	*531*	*724*	13.4	**7010**	18.5	9.0	99.5	83.2	10.7
Magnesium	mg/kg	~	~	~	260	~	~	5590	4700	5570	6440	5010	7320	5680	7440	8340	4980	5200	5650	6790	8970	9960
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	194	89.0	178	186	159	204	202	706	280	166	1160	65.9	497	213	851
Mercury	mg/kg	0.1	0.3	21	52	65	23	3.5	1.4	4.4	5.0	0.072	<0.034	0.33	0.097	<0.038	4.2	<0.037	0.041	0.062	0.63	<0.035
Nickel	mg/kg	13.6	280	~	~	23000	1600	45.0	37.3	83.8	42.2	18.9	28.0	44.1	28.3	29.1	31.4	31.0	7.8	25.6	33.1	27.6
Potassium	mg/kg	~	~	~	1	~	~	NA	NA	NA	2100	2250	3580	2470	3340	4230	1750	2110	3150	3650	5450	4020
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	NA	NA	NA	9.5	<2.4	<2.4	<2.3	<6.2	<2.3	7.8	<2.2	<2.0	<2.8	<2.5	<2.1
Silver	mg/kg	1.04	560	~	~	5700	390	NA	NA	NA	2.7	0.70	<0.59	0.67	<1.6	0.75	1.9	1.3	<0.50	0.72	<0.62	<0.53
Sodium	mg/kg	~	~	~	~	~	~	6080	11400	4080	3080	<1200	1710	<1100	6310	<1100	2640	1310	38900	2560	2110	1410
Thallium	mg/kg	1	~	~	57	~	~	<3.1	<6.1	<2.7	<2.0	<1.2	<1.2	<1.1	<3.1	<1.1	<1.5	<1.1	<1.0	<1.4	<1.2	<1.1
Vanadium	mg/kg	2	280	150	410	1100	78	40.9	48.3	150	36.5	24.5	27.6	27.2	50.6	34.3	26.8	29.5	20.4	31.8	43.4	30.3
Zinc	mg/kg	6.62	160	~	~	110000	23000	733	442	611	426	46.8	66.9	120	386	69.0	444	52.5	20.3	65.6	72.4	56.7
Molybdenum	mg/kg	2	~	~	~	~	~	6.9	5.5 B	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	0.95 N	1.7 N	4.0 N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	SB-12		SB-13		SB-14	SB-15	SB-16		SB-3			SB-4			SB-5	
Date								2015-10-08	2015-10-08	2015-10-08	2015-10-08	2015-09-25	2015-09-18	2015-10-09	2015-10-09	2015-10-05	2015-10-05	2015-10-05	2008-09-15	2015-11-18	2015-11-18	2015-10-07	2015-10-07
Start Depth								6	12	1	13	2.5	3.5	11	12.5	1	2.5	19	0	1.5	9.5	20.5	4
End Depth								6.5	12.5	1.5	13.5	3	4	11.5	13	1.5	3	19.5	0.5	2	10	21	4.5
Grid Cell (Figures 1A through								B3		B3		B3	C4	B2		B1			B1			B2	
Chemical	Units																						
Aluminum	mg/kg	50	~	~	9.3	~	78000	23100	13000	7480	22300	21400	18700	4900	16600	6310	7400	13000	11400	11100	13100	13600	7800
Antimony	mg/kg	0.27	78	8.2	70	450	31	<2.0	<2.8	<2.0	<2.6	<5.3	<7.8	<2.0	<2.5	<3.8	<3.5	<2.1	<2.3	15.1	<2.6	<2.1	6.4
Arsenic	mg/kg	9.9	46	~	48	19	19	9.6	3.3	37.2	5.1	10.4	12.9	49.1	5.5	4.4	13.9	6.1	11.3	919	9.1	4.0	283
Barium	mg/kg	283	2000	~	~	59000	16000	86.7	40.0	578	69.4	<53	<78	70.1	65.0	<38	<35	149	128	453	62.6	193	351
Beryllium	mg/kg	10	40	1.2	9.6	140	16	0.90	0.54	0.38	0.82	1.0	1.1	0.31	0.72	0.70	<0.35	1.1	1.4	0.62	0.41	0.94	0.37
Cadmium	mg/kg	0.36	140	~	~	78	78	<0.49	<0.71	1.6	<0.65	<1.3	<1.9	<0.50	<0.62	<0.95	<0.86	<0.53	0.61	3.8	<0.66	<0.53	2.3
Calcium	mg/kg	~	~	81	370	~	~	1270	<710	3630	<650	2790	2850	3190	<620	3490	3600	27900	5460	5340	<660	26300	13700
Chromium	mg/kg	0.4	1	~	10	~	~	27.7	19.5	75.6	29.1	35.8	33.2	18.3	25.4	15.0	15.7	25.2	28.7	126	16.7	23.4	70.7
Cobalt	mg/kg	0.14	230	34	270	590	1600	8.3	7.2	7.5	11.0	<13	<19	<5.0	13.7	<9.5	<8.6	13.0	10.2	<8.9	<6.6	11.7	6.5
Copper	mg/kg	5.4	100	~	~	45000	3100	51.7	7.9	337	12.7	10.3	20.1	68.1	18.4	10.7	13.9	9.2	85.2	585	12.1	14.1	668
Iron	mg/kg	~	~	47	218	~	~	23100	18300	22600	27200	36900	30100	9970	24700	8870	9400	24400	26500	38800	16500	23800	31700
Lead	mg/kg	0.0537	1700	~	~	800	400	147	17.4	**5880**	50.7	13.1	46.9	**3670**	70.8	52.9	240	14.3	251	**19700**	160	12.8	**15100**
Magnesium	mg/kg	~	~	~	260	~	~	4910	4670	3410	6890	8810	7330	3070	5630	3420	3270	9560	3840	6040	3110	10400	5120
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	149	117	142	181	261	224	99.8	166	54.7	73.5	684	274	229	90.8	656	197
Mercury	mg/kg	0.1	0.3	21	52	65	23	0.057	<0.032	4.9	0.18	<0.032	0.071	2.1	<0.036	0.080	0.13	<0.036	4.5	3.3	<0.033	<0.035	3.8
Nickel	mg/kg	13.6	280	~	~	23000	1600	23.9	17.3	94.2	25.8	27.5	27.1	27.0	22.7	<7.6	7.2	30.4	26.6	48.5	12.6	27.0	73.9
Potassium	mg/kg	~	~	~	1	~	~	2790	2820	1420	4180	5230	4480	1280	3230	<1900	2230	4750	1400	2120	1320	4530	1600
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	<2.0	<2.8	6.9	<2.6	<5.3	<7.8	3.0	<2.5	<3.8	<3.5	<2.1	3.6	9.5	<2.6	<2.1	7.7
Silver	mg/kg	1.04	560	~	~	5700	390	1.3	1.1	2.4	1.1	<1.3	<1.9	0.87	1.4	<0.95	<0.86	<0.53	<1.1	3.2	<0.66	1.0	17.3
Sodium	mg/kg	~	~	~	~	~	~	3480	3030	6280	2760	21500	22800	8510	1430	6410	5540	1290	<1100	3060	1620	1290	4330
Thallium	mg/kg	1	~	~	57	~	~	<0.99	<1.4	<1.0	<1.3	<2.6	<3.9	<1.0	<1.2	<1.9	<1.7	<1.1	<1.1	<1.8	<1.3	<1.1	<20
Vanadium	mg/kg	2	280	150	410	1100	78	40.3	26.9	185	45.4	49.7	44.3	47.4	39.0	15.3	18.8	33.2	40.5	34.3	29.4	32.4	64.6
Zinc	mg/kg	6.62	160	~	~	110000	23000	68.6	38.4	299	59.0	71.2	84.8	66.1	51.1	14.8	32.2	63.5	139	875	40.0	58.0	338
Molybdenum	mg/kg	2	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25	NA	NA	NA	NA

TABLE 1C
SOIL ANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	SB-6	SB-7		SB-8		SB-9	
Date								2015-09-25	2015-11-19	2015-11-19	2015-11-19	2015-11-19	2015-11-18	2015-11-18
Start Depth								4.5	5.5	10.5	6	10.5	1.5	12.5
End Depth								5	6	11	6.5	11	2	13
Grid Cell (Figures 1A through								B3	B1		B1		B2	
Chemical	Units													
Aluminum	mg/kg	50	~	~	9.3	~	78000	8830	16400	15400	11700	15200	10400	17200
Antimony	mg/kg	0.27	78	8.2	70	450	31	<11	8.5	<2.4	<2.0	<2.5	5.5	<2.5
Arsenic	mg/kg	9.9	46	~	48	19	19	<11	276	4.8	52.7	7.7	138	6.1
Barium	mg/kg	283	2000	~	~	59000	16000	<110	234	65.9	53.3	69.6	703	148
Beryllium	mg/kg	10	40	1.2	9.6	140	16	<1.1	0.72	0.40	0.78	0.54	0.54	0.83
Cadmium	mg/kg	0.36	140	~	~	78	78	<2.6	1.4	<0.59	<0.50	<0.62	1.8	<0.64
Calcium	mg/kg	~	~	81	370	~	~	5460	8740	<590	5100	<620	10700	<640
Chromium	mg/kg	0.4	1	~	10	~	~	30.5	87.6	19.5	25.5	19.1	105	23.8
Cobalt	mg/kg	0.14	230	34	270	590	1600	<26	<12	<5.9	5.0	<6.2	7.6	10.4
Copper	mg/kg	5.4	100	~	~	45000	3100	<13	511	10.4	49.2	10.9	841	9.5
Iron	mg/kg	~	~	47	218	~	~	9920	39900	16800	14400	24400	25400	23200
Lead	mg/kg	0.0537	1700	~	~	800	400	24.6	**8180**	14.5	**1200**	26.8	**42500**	38.5
Magnesium	mg/kg	~	~	~	260	~	~	9360	7910	3250	5840	2850	5900	4910
Manganese	mg/kg	220	4300	0.15	0.71	5900	11000	54.8	230	91.6	71.7	89.6	222	177
Mercury	mg/kg	0.1	0.3	21	52	65	23	<0.039	0.93	<0.037	0.47	<0.034	37.3	0.082
Nickel	mg/kg	13.6	280	~	~	23000	1600	<21	42.2	12.4	17.1	11.6	61.9	20.4
Potassium	mg/kg	~	~	~	1	~	~	<5300	3700	1630	2350	1420	2080	2200
Selenium	mg/kg	0.0276	4.1	1	3.7	5700	390	<11	5.8	<2.4	2.2	<2.5	9.6	<2.5
Silver	mg/kg	1.04	560	~	~	5700	390	<2.6	3.5	0.88	0.87	0.99	8.1	1.0
Sodium	mg/kg	~	~	~	~	~	~	50700	6550	1740	16600	2680	5670	2810
Thallium	mg/kg	1	~	~	57	~	~	<5.3	<2.5	<1.2	<1.0	<1.2	<2.9	<1.3
Vanadium	mg/kg	2	280	150	410	1100	78	<26	46.5	30.4	29.9	34.4	96.7	41.2
Zinc	mg/kg	6.62	160	~	~	110000	23000	27.1	393	37.6	65.1	33.7	444	54.5
Molybdenum	mg/kg	2	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
Palladium	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	NA	NA	NA
Cyanide	mg/kg	1.33	~	~	~	680	47	NA	NA	NA	NA	NA	NA	NA

Notes:

~	No standard exists for this compound in this classification.
mg/kg	Milligrams per kilogram
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
N	Presumptive evidence of a compound
B	Analyte detected in associated method blank
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
ESC	NJDEP Ecological Screening Criteria
NJDEP ECOLOGICAL LSSL	NJDEP Lower Ecological Soil Screening Level (March 2009)
NJDEP ECOLOGICAL USSL	NJDEP Upper Ecological Soil Screening Level (March 2009)
ER-L	NJDEP Saline Estuary Sediment Criteria (Effects Range – Low) (March 2009)
ER-M	NJDEP Saline Estuary Sediment Criteria (Effects Range – Medium) (March 2009)
NJDEP RDCSRS	NJDEP Residential Direct Contact Soil Remediation Standards (September 2017)
NJDEP NRDCSRS	NJDEP Non-Residential Direct Contact Soil Remediation Standards (September 2017)
Italics	Concentration exceeds the NJDEP RDCSRS
Bold	Concentration exceeds the NRDCSRS
Gray highlight	Concentration exceeds NJDEP Ecological Soil Screening Levels
Yellow highlight	Concentration exceeds NJDEP Saline Estuary Sediment Criteria

If more than one applicable SRS or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.

ESCs do not apply to soil borings SB-3, ASB-85, ASB-859 and GMW-690.

TABLE 1D
SOIL ANALYTICAL DATA
PESTICIDE COMPOUNDS AND
POLY-CHLORINATED BIPHENYLS (PCBs)

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 15, 2008

Location ID		NJDEP ECOLOGICAL LSSL	NJDEP ECOLOGICAL USSL	NJ ECO Saline Estuary Sediment ER-L	NJ ECO Saline Estuary Sediment ER-M	NJDEP NRDCSRS	NJDEP RDCSRS	ASB-208	ASB-217	ASB-218	ASB-85	ASB-86		GMW-123	GMW-126	GMW-137	GMW-138	SB-11	SB-4
Date								1999-04-19	1999-04-19	1999-04-19	1993-11-09	1993-11-09		1998-11-13	1998-11-12	1998-11-13	1998-11-13	1997-11-19	2008-09-15
Start Depth								0	0	0	4	2	4	2	0	4	4	0	0
End Depth								2	2	2	6	4	6	4	2	6	6	0	0.5
								B2	C1	D3	B1	A1		C3	D3	C1	B3	B2	B1
Chemical	**Units**																		
PESTICIDE COMPOUNDS																			
aldrin	mg/kg	0.00332	~	~	~	0.2	0.04	**61 P**	<130	**74**	<0.43	<0.01	NA	<28	<26	<30	<13	<0.01	0.0059
alpha-bhc	mg/kg	0.0994	~	~	~	0.5	0.1	NA	NA	NA	<0.43	<0.01 J	<0.51 J	NA	NA	NA	NA	<0.01	0.0019
beta-bhc	mg/kg	0.00398	~	~	~	2	0.4	NA	NA	NA	<0.43	<0.01 J	<0.51 J	NA	NA	NA	NA	<0.01	0.0032
delta-bhc	mg/kg	~	~	~	~	~	~	NA	NA	NA	NA	<0.01	<0.51	NA	NA	NA	NA	<0.005	<0.00029
gamma-BHC	mg/kg	0.005	~	~	~	2	0.4	NA	NA	NA	<0.22 J	<0.01 J	<0.51 J	NA	NA	NA	NA	<0.005	<0.00026
alpha-chlordane	mg/kg	0.224	~	~	~	1	0.2	NA	NA	NA	<0.22	<0.01	<0.51	NA	NA	NA	NA	<0.005	<0.00044
beta-chlordane	mg/kg	0.224	~	~	~	1	0.2	NA	NA	NA	<0.22	<0.01	<0.51	NA	NA	NA	NA	<0.005	<0.00048
dieldrin	mg/kg	0.00238	0.022	0.002	~	0.2	0.04	<110	<270	<120	<0.22	<0.03	<1.00	<57	<52	<60	<26	NA	<0.00032
4,4-DDD	mg/kg	0.758	~	0.002	0.02	13	3	**1900 D**	**34000 D**	<120	<0.22 J	<0.03	<1.00	<57	130	**6900 E**	**10000 E**	<0.005	<0.00026
4,4-DDE	mg/kg	0.596	~	0.0022	0.027	9	2	**290**	**2600**	<120	NA	<0.03	NA	<57	<52	**1500 E**	**2200 D**	<0.01	<0.00028
4,4-DDT	mg/kg	0.0035	0.093	0.001	0.007	8	2	<110	<270	<120	<0.22	<0.03	<1.00	<57	<52	<60	<26	<0.005	<0.00029
endrin	mg/kg	0.0101	~	0.003	~	340	23	NA	NA	NA	<0.43	<0.03	<1.00	NA	NA	NA	NA	<0.01	<0.00047
endosulfan sulfate	mg/kg	0.0358	~	~	~	6800	470	NA	NA	NA	<0.43	<0.03	<1.00	NA	NA	NA	NA	<0.01	<0.00030
endrin aldehyde	mg/kg	0.0105	~	~	~	~	~	NA	NA	NA	<0.43	<0.03	<1.00	NA	NA	NA	NA	<0.01	<0.00031
endrin ketone	mg/kg	~	~	~	~	~	~	NA	NA	NA	<0.43	<0.03	<1.00	NA	NA	NA	NA	<0.01	<0.00034
endosulfan I	mg/kg	~	~	~	~	6800	470	NA	NA	NA	<0.43	<0.01	<0.51	NA	NA	NA	NA	<0.01	<0.00028
endosulfan II	mg/kg	~	~	~	~	6800	470	NA	NA	NA	<0.22	<0.03	<1.00	NA	NA	NA	NA	<0.005	<0.00035
heptachlor	mg/kg	0.00598	~	~	0.0003	0.7	0.1	NA	NA	NA	<0.22	<0.01	<0.51	NA	NA	NA	NA	<0.005	<0.00038
heptachlor epoxide	mg/kg	0.152	~	0.005	~	0.3	0.07	NA	NA	NA	<0.22	<0.01	<0.51	NA	NA	NA	NA	<0.005	<0.00029
methoxychlor	mg/kg	0.0199	~	~	~	5700	390	NA	NA	NA	<2.20	<0.19	<5.10	NA	NA	NA	NA	<0.05	<0.00038
toxaphene	mg/kg	0.119	~	~	~	3	0.6	<3200	<8000	<3600	NA	NA	NA	<1700	<1600	<1800	<780	<0.5	<0.014
PCBS																			
aroclor-1016	mg/kg	~	~	0.007	~	1	0.2	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	NA
aroclor-1221	mg/kg	~	~	~	~	1	0.2	NA	NA	NA	NA	<0.76	NA	NA	NA	NA	NA	NA	NA
aroclor-1232	mg/kg	~	~	~	~	1	0.2	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	NA
aroclor-1242	mg/kg	~	~	~	~	1	0.2	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	NA
aroclor-1248	mg/kg	~	~	0.03	~	1	0.2	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	NA
aroclor-1254	mg/kg	~	~	0.06	~	1	0.2	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	NA
aroclor-1260	mg/kg	~	~	0.005	~	1	0.2	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	NA
aroclor-1262	mg/kg	~	~	~	~	1	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
aroclor-1268	mg/kg	~	~	~	~	1	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	mg/kg	0.000332	40	~	0.18	1	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

~	No standard exists for this compound in this classification.
mg/kg	Milligrams per kilogram
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
D	Concentration is based on a diluted sample analysis
E	Value exceeds calibration range
P	Quality control criteria not met. Greater than 40% relative percent difference (RPD) for detected concentrations between the two gas chromatograph columns
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
ESC	NJDEP Ecological Screening Criteria
NJDEP ECOLOGICAL LSSL	NJDEP Lower Ecological Soil Screening Level (March 2009)
NJDEP ECOLOGICAL USSL	NJDEP Upper Ecological Soil Screening Level (March 2009)
ER-L	NJDEP Saline Estuary Sediment Criteria (Effects Range – Low) (March 2009)
ER-M	NJDEP Saline Estuary Sediment Criteria (Effects Range – Medium) (March 2009)
NJDEP RDCSRS	NJDEP Residential Direct Contact Soil Remediation Standards (September 2017)
NJDEP NRDCSRS	NJDEP Non-Residential Direct Contact Soil Remediation Standards (September 2017)
Bold	Concentration exceeds the NRDCSRS
Gray highlight	Concentration exceeds NJDEP Ecological Soil Screening Levels
Yellow highlight	Concentration exceeds NJDEP Saline Estuary Sediment Criteria

If more than one applicable SRS or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.
ESCs do not apply to soil borings SB-3, ASB-85, ASB-859 and GMW-690.

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	AGRO-1	AGRO-2	AGRO-3	AGRO-4	AGRO-5	AGRO-6	AGRO-7	AGRO-8	AGRO-9	AGRO-10	AGRO-11	AGRO-12	ASB-121	ASB-122	ASB-162	ASB-193
Date					2016-11-02	2016-11-02	2016-11-02	2016-11-03	2016-11-02	2016-11-03	2016-11-03	2016-11-07	2016-11-07	2016-11-07	2016-11-09	2016-11-09	2005-04-15	2005-04-18	2005-04-15	1999-04-20
Start Depth					0	0	0	0	0	0	0	0	0	0	0	0	1.5	1.5	0.5	2
End Depth					1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	4
Grid Cell (Figures 1A through 1E)					B3	D3	C3	C3	C2	C2	C2	C1	C2	C2	D3	D3	B2	B2	C2	B1
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	330	1230	487	128	<0.79	110	218	<0.21	394	1270	<0.39	<0.34	NA	NA	NA	NA
C12-C16 Aromatics	mg/kg	~	~	~	1480	3100	1270	408	737	1100	2250	45.2	1270	3990	231	90.6	NA	NA	NA	NA
C16-C21 Aromatics	mg/kg	~	~	~	8090	11900	5480	1410	4990	4670	17900	516	3760	12300	3360	1400	NA	NA	NA	NA
C21-C36 Aromatics	mg/kg	~	~	~	13300	10500	6770	2130	4810	4940	16400	1220	3120	13300	3860	3080	NA	NA	NA	NA
C9-C12 Aliphatics	mg/kg	~	~	~	1080	2450	1110	547	229	1730	953	<0.36	1450	3490	94.4	87.1	NA	NA	NA	NA
C12-C16 Aliphatics	mg/kg	~	~	~	3890	6650	3350	1560	2380	6680	14600	372	3730	9550	2300	636	NA	NA	NA	NA
C16-C21 Aliphatics	mg/kg	~	~	~	8310	12000	6360	2470	5810	6960	39300	980	4620	12700	4100	2330	NA	NA	NA	NA
C21-C40 Aliphatics	mg/kg	~	~	~	25200	19300	12100	5470	8730	13700	56700	2380	6130	20300	5530	7220	NA	NA	NA	NA
Total Aliphatics	mg/kg	~	~	~	38500	40300	22900	10100	17100	29000	112000	3740	15900	46100	12000	10300	NA	NA	NA	NA
Total EPH	mg/kg	1,700	8,000	30,000	**61680**	**67130**	**36927**	14123	27686	**39890**	**148321**	5513.2	24474	**76900**	19475.4	14843.7	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	330	1230	487	128	<0.79	110	218	<0.21	394	1270	<0.39	<0.34	NA	NA	NA	NA
TPH-C12-C16 aromatics	mg/kg	~	~	~	1480	3100	1270	408	737	1100	2250	45.2	1270	3990	231	90.6	NA	NA	NA	NA
TPH-C16-C21 aromatics	mg/kg	~	~	~	8090	11900	5480	1410	4990	4670	17900	516	3760	12300	3360	1400	NA	NA	NA	NA
TPH-C21-C36 aromatics	mg/kg	~	~	~	13300	10500	6770	2130	4810	4940	16400	1220	3120	13300	3860	3080	NA	NA	NA	NA
Total TPH Aromatics	mg/kg	~	~	~	23200	26800	14000	4080	10500	10800	36800	1780	8540	30800	7450	4570	NA	NA	NA	NA
TPH-C9-C12 aliphatics	mg/kg	~	~	~	1080	2450	1110	547	229	1730	953	<0.36	1450	3490	94.4	87.1	NA	NA	NA	NA
TPH-C12-C16 aliphatics	mg/kg	~	~	~	3890	6650	3350	1560	2380	6680	14600	372	3730	9550	2300	636	NA	NA	NA	NA
TPH-C16-C21 aliphatics	mg/kg	~	~	~	8310	12000	6360	2470	5810	6960	39300	980	4620	12700	4100	2330	NA	NA	NA	NA
TPH-C21-C40 aliphatics	mg/kg	~	~	~	25200	19300	12100	5470	8730	13700	56700	2380	6130	20300	5530	7220	NA	NA	NA	NA
Total TPH Aliphatics	mg/kg	~	~	~	38500	40300	22900	10100	17100	29000	112000	3740	15900	46100	12000	10300	NA	NA	NA	NA
TPH Extractables, unspecified	mg/kg	~	~	~	61700	67100	36900	14100	27700	39900	148000	5520	24500	76900	19500	14800	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	243000	171000	113000	31500

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-208	ASB-217	ASB-218	90.7		ASB-413	ASB-414	ASB-795		ASB-796						
Date					2005-04-15	2005-04-18	2005-04-15	2003-12-23	2005-04-18	2003-12-23	2003-12-23	2013-05-31	2013-05-31	2013-11-12	2013-11-12	2013-11-12	2013-11-12	2013-11-12	2013-11-12	2013-11-12
Start Depth					1	1.5	1	0	0.5	0	0	0	0.5	0	1.5	4.5	5.5	6.5	7.5	8.5
End Depth					1.5	2	1.5	0.5	1	0.5	0.5	0.5	1	0.5	2	5	6	7	8	9
Grid Cell (Figures 1A through 1E)					B2	C1	D3	D2		D3	D2	C3		B1						
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	1410	NA	<1.0	677	360	349	77.5	<0.18	<0.18
C12-C16 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	6600	NA	356	2150	1430	1410	334	34.4	14.6
C16-C21 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	17800	NA	1990	5280	3860	3300	874	119	46.7
C21-C36 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	19500	NA	5360	14600	9230	6230	2010	394	136
C9-C12 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	3660	NA	203	3270	1270	1950	383	27.6	19.5
C12-C16 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	10900	NA	3030	9860	4320	7080	1510	134	58.6
C16-C21 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	11100	NA	5150	9170	4220	6010	1530	160	62.7
C21-C40 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	17100	NA	7830	11200	3180	4340	1170	184	65.4
Total Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	42800	NA	16200	33500	13000	19400	4580	506	206
Total EPH	mg/kg	1,700	8,000	30,000	NA	NA	NA	NA	NA	NA	NA	**88070**	NA	23919	**56207**	27870	**30669**	7888.5	1053	403.5
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	1410	NA	<1.0	677	360	349	77.5	<0.18	<0.18
TPH-C12-C16 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	6600	NA	356	2150	1430	1410	334	34.4	14.6
TPH-C16-C21 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	17800	NA	1990	5280	3860	3300	874	119	46.7
TPH-C21-C36 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	19500	NA	5360	14600	9230	6230	2010	394	136
Total TPH Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	45300	NA	7710	22700	14900	11300	3300	547	197
TPH-C9-C12 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	3660	NA	203	3270	1270	1950	383	27.6	19.5
TPH-C12-C16 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	10900	NA	3030	9860	4320	7080	1510	134	58.6
TPH-C16-C21 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	11100	NA	5150	9170	4220	6010	1530	160	62.7
TPH-C21-C40 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	17100	NA	7830	11200	3180	4340	1170	184	65.4
Total TPH Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	42800	NA	16200	33500	13000	19400	4580	506	206
TPH Extractables, unspecified	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	88100	NA	23900	56200	27900	30700	7880	1050	403
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	211000	40300	109000	132000	52700	293	3710	27500	38200 E	40300	153000	64200	50000	35400	617	219

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

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Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-797			ASB-798		ASB-802				ASB-803		ASB-803A	ASB-803B	ASB-804		
Date					2013-11-18	2013-11-18	2013-11-18	2013-12-09	2013-12-09	2013-11-26	2013-11-26	2013-11-26	2013-11-26	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15
Start Depth					0	2.5	5	0	3	0	1.5	5.5	0.5	0	5.5	0.5	0.5	0	2.5	4
End Depth					0.5	3	6	0.5	3.5	0.5	2	6	1	0.5	6	1	1	0.5	3	4.5
Grid Cell (Figures 1A through 1E)					B2			B2		C2				C2		C2	C2	D2		
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	151	1530	1420	59.9	1360	30.7	<2.9	<3.1	800	647	<3.7	993	1190	39.7	<2.8	<1.9
C12-C16 Aromatics	mg/kg	~	~	~	723	4200	4560	274	3510	253	874	<4.5	3820	2530	161	3620	4290	309	<3.9	<2.7
C16-C21 Aromatics	mg/kg	~	~	~	2800	9990	12900	2330	9760	3100	2560	<6.6	18500	9110	702	12100	14300	2110	<5.7	<3.9
C21-C36 Aromatics	mg/kg	~	~	~	2820	14500	24100	6140	11900	4230	4890	<10	19900	11100	708	14800	17400	2330	<9.2	<6.3
C9-C12 Aliphatics	mg/kg	~	~	~	1210	8670	10500	321	4270	105	1010	<2.9	4480	3020	242	5930	6620	115	<2.5	<1.7
C12-C16 Aliphatics	mg/kg	~	~	~	5870	18000	30200	1720	10200	2430	4800	<4.5	19000	10400	760	17400	20800	1020	<3.9	<2.7
C16-C21 Aliphatics	mg/kg	~	~	~	7750	17000	29200	4270	13700	5730	5500	<3.9	25500	15800	1530	25300	28800	2330	<3.4	<2.4
C21-C40 Aliphatics	mg/kg	~	~	~	14000	22200	33900	11800	23000	9610	7950	<12	38600	24300	2400	40000	46800	4420	<10	<6.9
Total Aliphatics	mg/kg	~	~	~	28800	65900	104000	18100	51200	17900	19300	<2.9	87500	53500	4930	88700	103000	7890	<2.5	<1.7
Total EPH	mg/kg	1,700	8,000	30,000	**35324**	**96090**	**146780**	26914.9	**77700**	25488.7	27584	0	**130600**	**76907**	6503	**120143**	**140200**	12673.7	0	0
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	151	1530	1420	59.9	1360	30.7	<2.9	<3.1	800	647	<3.7	993	1190	39.7	<2.8	<1.9
TPH-C12-C16 aromatics	mg/kg	~	~	~	723	4200	4560	274	3510	253	874	<4.5	3820	2530	161	3620	4290	309	<3.9	<2.7
TPH-C16-C21 aromatics	mg/kg	~	~	~	2800	9990	12900	2330	9760	3100	2560	<6.6	18500	9110	702	12100	14300	2110	<5.7	<3.9
TPH-C21-C36 aromatics	mg/kg	~	~	~	2820	14500	24100	6140	11900	4230	4890	<10	19900	11100	708	14800	17400	2330	<9.2	<6.3
Total TPH Aromatics	mg/kg	~	~	~	6500	30200	42900	8810	26500	7610	8320	<3.1	43000	23400	1570	31500	37200	4790	<2.8	<1.9
TPH-C9-C12 aliphatics	mg/kg	~	~	~	1210	8670	10500	321	4270	105	1010	<2.9	4480	3020	242	5930	6620	115	<2.5	<1.7
TPH-C12-C16 aliphatics	mg/kg	~	~	~	5870	18000	30200	1720	10200	2430	4800	<4.5	19000	10400	760	17400	20800	1020	<3.9	<2.7
TPH-C16-C21 aliphatics	mg/kg	~	~	~	7750	17000	29200	4270	13700	5730	5500	<3.9	25500	15800	1530	25300	28800	2330	<3.4	<2.4
TPH-C21-C40 aliphatics	mg/kg	~	~	~	14000	22200	33900	11800	23000	9610	7950	<12	38600	24300	2400	40000	46800	4420	<10	<6.9
Total TPH Aliphatics	mg/kg	~	~	~	28800	65900	104000	18100	51200	17900	19300	<2.9	87500	53500	4930	88700	103000	7890	<2.5	<1.7
TPH Extractables, unspecified	mg/kg	~	~	~	35300	96100	147000	26900	77700	25500	27600	<2.9	131000	76900	6510	120000	140000	12700	<2.5	<1.7
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	47200	20000	31100	16800	25400	5330	12700	898	11700	30100	4080	62400	84300	43700	147	116

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

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Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-805			ASB-806					ASB-807			ASB-808			ASB-809	
Date					2013-11-15	2013-11-15	2013-11-15	2013-11-26	2013-11-26	2013-11-26	2013-11-26	2013-11-26	2013-11-14	2013-11-14	2013-11-14	2013-11-11	2013-11-11	2013-11-11	2013-11-13	2013-11-13
Start Depth					0	3.5	4	0	1	2.5	3.5	4.5	0	3	5	0	3	4.5	0	4.5
End Depth					0.5	4	4.5	0.5	1.5	3	4	5	0.5	3.5	5.5	0.5	3.5	5	0.5	5
Grid Cell (Figures 1A through 1E)					C2			C3					D2			C3			D3	
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	<0.26	<2.5	<2.0	394	4350	<3.2	<3.3	<2.5	<0.21	<2.3	<0.30	<0.22	<1.4	<1.2	<0.90	<1.2
C12-C16 Aromatics	mg/kg	~	~	~	30.1	<3.5	<2.9	1950	11900	<4.5	<4.7	<3.6	33.5	<3.3	<0.43	110	<2.0	<1.7	193	<1.7
C16-C21 Aromatics	mg/kg	~	~	~	685	<5.2	<4.2	9670	33600	<6.6	<6.9	<5.3	490 E	<4.8	<0.63	855	120	<2.5	2720	<2.5
C21-C36 Aromatics	mg/kg	~	~	~	1760	431	<6.7	11700	29100	<11	<11	334	2140 E	324	33.2	1560	457	157	6170	<4.0
C9-C12 Aliphatics	mg/kg	~	~	~	19.5	<2.3	<1.9	2110	10500	<2.9	<3.0	<2.3	34.9	<2.1	<0.28	127	<1.3	<1.1	<0.83	<1.1
C12-C16 Aliphatics	mg/kg	~	~	~	318	<3.5	<2.9	7240	23300	<4.5	<4.7	156	267 E	<3.3	<0.43	1320	102	48.5	1100	<1.7
C16-C21 Aliphatics	mg/kg	~	~	~	1240	<3.1	<2.5	12100	25400	<4.0	<4.1	308	1050 E	<2.9	12.5	1720	203	87.3	2730	64.4
C21-C40 Aliphatics	mg/kg	~	~	~	3950	344	<7.4	21100	33200	<12	<12	516	3810 E	213	35.4	2700	591	250	5520	180
Total Aliphatics	mg/kg	~	~	~	5520	344	<1.9	42600	92300	<2.9	<3.0	980	5160 E	213	48	5860	896	385	9340	245
Total EPH	mg/kg	1,700	8,000	30,000	8002.6	775	0	**66264**	**171350**	0	0	1314	68.4	537	81.1	8392	1473	542.8	18433	244.4
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	<0.26	<2.5	<2.0	394	4350	<3.2	<3.3	<2.5	<0.21	<2.3	<0.30	<0.22	<1.4	<1.2	<0.90	<1.2
TPH-C12-C16 aromatics	mg/kg	~	~	~	30.1	<3.5	<2.9	1950	11900	<4.5	<4.7	<3.6	33.5	<3.3	<0.43	110	<2.0	<1.7	193	<1.7
TPH-C16-C21 aromatics	mg/kg	~	~	~	685	<5.2	<4.2	9670	33600	<6.6	<6.9	<5.3	490 E	<4.8	<0.63	855	120	<2.5	2720	<2.5
TPH-C21-C36 aromatics	mg/kg	~	~	~	1760	431	<6.7	11700	29100	<11	<11	334	2140 E	324	33.2	1560	457	157	6170	<4.0
Total TPH Aromatics	mg/kg	~	~	~	2480	431	<2.0	23700	78900	<3.2	<3.3	334	2660 E	324	33.2	2520	577	157	9080	<1.2
TPH-C9-C12 aliphatics	mg/kg	~	~	~	19.5	<2.3	<1.9	2110	10500	<2.9	<3.0	<2.3	34.9	<2.1	<0.28	127	<1.3	<1.1	<0.83	<1.1
TPH-C12-C16 aliphatics	mg/kg	~	~	~	318	<3.5	<2.9	7240	23300	<4.5	<4.7	156	267 E	<3.3	<0.43	1320	102	48.5	1100	<1.7
TPH-C16-C21 aliphatics	mg/kg	~	~	~	1240	<3.1	<2.5	12100	25400	<4.0	<4.1	308	1050 E	<2.9	12.5	1720	203	87.3	2730	64.4
TPH-C21-C40 aliphatics	mg/kg	~	~	~	3950	344	<7.4	21100	33200	<12	<12	516	3810 E	213	35.4	2700	591	250	5520	180
Total TPH Aliphatics	mg/kg	~	~	~	5520	344	<1.9	42600	92300	<2.9	<3.0	980	5160 E	213	48.0	5860	896	385	9340	245
TPH Extractables, unspecified	mg/kg	~	~	~	8000	775	<1.9	66300	171000	<2.9	<3.0	1310	7820 E	538	81.2	8380	1470	542	18400	245
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	17700	297	294	12500	60400	714	920	788	22100	1330	627	24700	1580	1690	21300	828

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

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Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-809A	ASB-809B	ASB-810			ASB-811			ASB-812		ASB-812A	ASB-812B	ASB-813			
Date					2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-26	2013-11-26	2013-11-26	2013-12-03	2013-12-03	2013-12-03	2013-12-03	2013-11-14	2013-11-14	2013-11-14	2013-11-14
Start Depth					1.5	1.5	0	3.5	4.5	0	1	5.5	0	1.5	0.5	0.5	0	1.5	4	4.5
End Depth					2	2	0.5	4	5	0.5	1.5	6	0.5	2	1	1	0.5	2	4.5	5
Grid Cell (Figures 1A through 1E)					D3	D3	D3			C2			B2		B2	B2	D2			
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	<1.9	<1.6	<0.67	<2.9	<1.0	<0.76	<2.6	<2.4	747	78.4	853	1090	16.1	<0.79	<0.94	<2.4
C12-C16 Aromatics	mg/kg	~	~	~	<2.7	81.3	172	<4.0	<1.5	301	<3.7	<3.5	2860	247	3180	4060	86.9	88.7	51.7	<3.3
C16-C21 Aromatics	mg/kg	~	~	~	625	934	1090	<5.9	<2.2	4390	658	<5.1	11300	773	8390	11000	904	648	391	<4.9
C21-C36 Aromatics	mg/kg	~	~	~	1150	1640	1530	<9.5	<3.5	9670	2510	<8.1	19500	1220	11000	14500	2560	1020	646	<7.8
C9-C12 Aliphatics	mg/kg	~	~	~	<1.7	<1.4	195	<2.6	<0.95	131	<2.4	<2.2	1740	261	3050	5140	39.6	77.6	43	<2.2
C12-C16 Aliphatics	mg/kg	~	~	~	429	638	1600	<4.0	<1.5	2620	332	<3.5	4660	631	7060	12500	368	819	424	101
C16-C21 Aliphatics	mg/kg	~	~	~	1060	1510	1660	<3.6	<1.3	5820	849	<3.0	6550	905	8060	15400	1310	2160	1200	237
C21-C40 Aliphatics	mg/kg	~	~	~	2270	3090	2550	<10	<3.8	14400	1820	<8.9	12800	1480	11500	23700	4120	4090	2450	488
Total Aliphatics	mg/kg	~	~	~	3760	5240	6000	<2.6	<0.95	23000	3000	<2.2	25700	3270	29700	56700	5840	7150	4120	826
Total EPH	mg/kg	1,700	8,000	30,000	5534	7893.3	8797	0	0	**37332**	6169	0	**60157**	5595.4	**53093**	**87390**	9404.6	8903.3	5205.7	826
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	<1.9	<1.6	<0.67	<2.9	<1.0	<0.76	<2.6	<2.4	747	78.4	853	1090	16.1	<0.79	<0.94	<2.4
TPH-C12-C16 aromatics	mg/kg	~	~	~	<2.7	81.3	172	<4.0	<1.5	301	<3.7	<3.5	2860	247	3180	4060	86.9	88.7	51.7	<3.3
TPH-C16-C21 aromatics	mg/kg	~	~	~	625	934	1090	<5.9	<2.2	4390	658	<5.1	11300	773	8390	11000	904	648	391	<4.9
TPH-C21-C36 aromatics	mg/kg	~	~	~	1150	1640	1530	<9.5	<3.5	9670	2510	<8.1	19500	1220	11000	14500	2560	1020	646	<7.8
Total TPH Aromatics	mg/kg	~	~	~	1780	2660	2790	<2.9	<1.0	14400	3170	<2.4	34400	2310	23500	30600	3560	1760	1090	<2.4
TPH-C9-C12 aliphatics	mg/kg	~	~	~	<1.7	<1.4	195	<2.6	<0.95	131	<2.4	<2.2	1740	261	3050	5140	39.6	77.6	43.0	<2.2
TPH-C12-C16 aliphatics	mg/kg	~	~	~	429	638	1600	<4.0	<1.5	2620	332	<3.5	4660	631	7060	12500	368	819	424	101
TPH-C16-C21 aliphatics	mg/kg	~	~	~	1060	1510	1660	<3.6	<1.3	5820	849	<3.0	6550	905	8060	15400	1310	2160	1200	237
TPH-C21-C40 aliphatics	mg/kg	~	~	~	2270	3090	2550	<10	<3.8	14400	1820	<8.9	12800	1480	11500	23700	4120	4090	2450	488
Total TPH Aliphatics	mg/kg	~	~	~	3760	5240	6000	<2.6	<0.95	23000	3000	<2.2	25700	3270	29700	56700	5840	7150	4120	826
TPH Extractables, unspecified	mg/kg	~	~	~	5530	7900	8790	<2.6	<0.95	37300	6170	<2.2	60100	5590	53200	87400	9400	8910	5210	826
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	3320	3550	15200	1190	370	13900	7360	3690	39100	7920	111000	55000	4690	6820	10300	1240

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-814				ASB-815			ASB-815A	ASB-815B	ASB-816				ASB-819	
Date					2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-12-09	2013-12-09	2013-12-09	2013-12-09	2013-12-09	2013-12-03	2013-12-03	2013-12-03	2013-12-03	2013-12-09	2013-12-09
Start Depth					0	0.5	3.5	5	0	1.5	5.5	2.5	2.5	0	4.5	3.5	5.5	0	3
End Depth					0.5	1	3.5	6	0.5	2	6	3	3	0.5	5	4	6	0.5	3.5
Grid Cell (Figures 1A through 1E)					C3				B2			B2	B2	B2				C2	
Chemical	Units																		
EXTRACTABLE PETROLEUM HYDROCARBON																			
C10-C12 Aromatics	mg/kg	~	~	~	<0.22	621	<2.6	<3.0	237	545	<3.8	<2.9	<3.0	34.6	1300	1230	283	<1.6	73.3
C12-C16 Aromatics	mg/kg	~	~	~	52.3	2990	<3.7	<4.2	932	1590	<5.4	634	582	230	3940	3860	899	372	247
C16-C21 Aromatics	mg/kg	~	~	~	543	8870	320	<6.2	4390	4750	<7.9	2100	2060	2670	8790	9210	2750	3370	802
C21-C36 Aromatics	mg/kg	~	~	~	1810	8470	804	259	6030	8060	<13	3930	3450	10000	13400	13100	6120	9520	1090
C9-C12 Aliphatics	mg/kg	~	~	~	107	6020	<2.4	<2.7	749	2740	<3.5	531	542	96.3	5730	5970	693	274	314
C12-C16 Aliphatics	mg/kg	~	~	~	404	15000	281	<4.2	4510	7650	<5.4	3120	3200	1240	10600	12300	2020	2480	984
C16-C21 Aliphatics	mg/kg	~	~	~	1050	14200	595	<3.7	6360	9590	<4.8	4600	4450	4050	12200	15100	3870	5920	1400
C21-C40 Aliphatics	mg/kg	~	~	~	3090	16800	1050	233	10800	13800	<14	6030	5930	12600	22600	29300	8340	19100	2260
Total Aliphatics	mg/kg	~	~	~	4660	52000	1920	233	22400	33700	<3.5	14300	14100	18000	51100	62700	14900	27800	4960
Total EPH	mg/kg	1,700	8,000	30,000	7056.3	**72971**	3050	492	**34008**	**48725**	0	20945	20214	**30920.9**	**78560**	**90070**	24975	**41036**	7170.3
TOTAL PETROLEUM HYDROCARBON																			
TPH-C10-C12 aromatics	mg/kg	~	~	~	<0.22	621	<2.6	<3.0	237	545	<3.8	<2.9	<3.0	34.6	1300	1230	283	<1.6	73.3
TPH-C12-C16 aromatics	mg/kg	~	~	~	52.3	2990	<3.7	<4.2	932	1590	<5.4	634	582	230	3940	3860	899	372	247
TPH-C16-C21 aromatics	mg/kg	~	~	~	543	8870	320	<6.2	4390	4750	<7.9	2100	2060	2670	8790	9210	2750	3370	802
TPH-C21-C36 aromatics	mg/kg	~	~	~	1810	8470	804	259	6030	8060	<13	3930	3450	10000	13400	13100	6120	9520	1090
Total TPH Aromatics	mg/kg	~	~	~	2410	20900	1120	259	11600	14900	<3.8	6670	6090	12900	27400	27400	10000	13300	2220
TPH-C9-C12 aliphatics	mg/kg	~	~	~	107	6020	<2.4	<2.7	749	2740	<3.5	531	542	96.3	5730	5970	693	274	314
TPH-C12-C16 aliphatics	mg/kg	~	~	~	404	15000	281	<4.2	4510	7650	<5.4	3120	3200	1240	10600	12300	2020	2480	984
TPH-C16-C21 aliphatics	mg/kg	~	~	~	1050	14200	595	<3.7	6360	9590	<4.8	4600	4450	4050	12200	15100	3870	5920	1400
TPH-C21-C40 aliphatics	mg/kg	~	~	~	3090	16800	1050	233	10800	13800	<14	6030	5930	12600	22600	29300	8340	19100	2260
Total TPH Aliphatics	mg/kg	~	~	~	4660	52000	1920	233	22400	33700	<3.5	14300	14100	18000	51100	62700	14900	27800	4960
TPH Extractables, unspecified	mg/kg	~	~	~	7060	72900	3050	493	34000	48700	<3.5	20900	20200	30900	78500	90100	25000	41100	7170
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	10400	27100	1160	729	21600	87500	968	13800	17100	22100	49600	64600	20100	8920	52500

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-821			90.7		ASB-823				ASB-824			ASB-825		
Date					2013-11-14	2013-11-14	2013-11-14	2013-11-18	2013-11-18	2013-12-09	2013-12-09	2013-12-09	2013-12-09	2013-11-14	2013-11-14	2013-11-14	2013-11-18	2013-11-18	2013-11-18
Start Depth					0	3	5.5	0	3.5	0	1.5	2.5	3	0	4	5	0	2	5.5
End Depth					0.5	3.5	6	0.5	4	0.5	2	3	3.5	0.5	4.5	5.5	0.5	2.5	6
Grid Cell (Figures 1A through 1E)					D2			B1		B2				D2			B1		
Chemical	Units																		
EXTRACTABLE PETROLEUM HYDROCARBON																			
C10-C12 Aromatics	mg/kg	~	~	~	<0.57	<2.5	<0.32	<0.17	60.5	<1.5	1910	219	211	<1.2	<2.8	<1.5	<0.17	1460	1670
C12-C16 Aromatics	mg/kg	~	~	~	31.2	<3.5	<0.45	<0.24	261	217	5100	792	754	363	<4.0	<2.1	11.2	3120	3390
C16-C21 Aromatics	mg/kg	~	~	~	389	<5.1	<0.67	22.8	721	1990	14300	2640	2650	3010	<5.9	80.4	72.3	6830	6540
C21-C36 Aromatics	mg/kg	~	~	~	2300	285	27.5	<0.56	1470	4130	21300	5570	5140	5320	720	199	223	5820	6640
C9-C12 Aliphatics	mg/kg	~	~	~	30.4	<2.3	<0.29	<0.15	248	166	6380	873	840	402	<2.6	<1.3	14.8	4880	5700
C12-C16 Aliphatics	mg/kg	~	~	~	277	142	16.9	15.4	929	1220	16400	4620	4470	1780	<4.0	71.6	39.7	7940	9390
C16-C21 Aliphatics	mg/kg	~	~	~	1260	321	44.5	<0.21	801	3290	19400	6410	5960	4790	<3.5	231	87.9	7520	8240
C21-C40 Aliphatics	mg/kg	~	~	~	4870	731	122	367	506	8970	25600	8890	7840	9910	1200	558	298	10100	10100
Total Aliphatics	mg/kg	~	~	~	6440	1190	184	382	2480	13700	67800	20800	19100	16900	1200	861	440	30400	33400
Total EPH	mg/kg	1,700	8,000	30,000	9157.6	1479	210.9	405.2	4996.5	19983	**110390**	**30014**	27865	25575	1920	1140	746.9	**47670**	**51670**
TOTAL PETROLEUM HYDROCARBON																			
TPH-C10-C12 aromatics	mg/kg	~	~	~	<0.57	<2.5	<0.32	<0.17	60.5	<1.5	1910	219	211	<1.2	<2.8	<1.5	<0.17	1460	1670
TPH-C12-C16 aromatics	mg/kg	~	~	~	31.2	<3.5	<0.45	<0.24	261	217	5100	792	754	363	<4.0	<2.1	11.2	3120	3390
TPH-C16-C21 aromatics	mg/kg	~	~	~	389	<5.1	<0.67	22.8	721	1990	14300	2640	2650	3010	<5.9	80.4	72.3	6830	6540
TPH-C21-C36 aromatics	mg/kg	~	~	~	2300	285	27.5	<0.56	1470	4130	21300	5570	5140	5320	720	199	223	5820	6640
Total TPH Aromatics	mg/kg	~	~	~	2720	285	27.5	22.8	2510	6340	42600	9220	8750	8700	720	279	306	17200	18200
TPH-C9-C12 aliphatics	mg/kg	~	~	~	30.4	<2.3	<0.29	<0.15	248	166	6380	873	840	402	<2.6	<1.3	14.8	4880	5700
TPH-C12-C16 aliphatics	mg/kg	~	~	~	277	142	16.9	15.4	929	1220	16400	4620	4470	1780	<4.0	71.6	39.7	7940	9390
TPH-C16-C21 aliphatics	mg/kg	~	~	~	1260	321	44.5	<0.21	801	3290	19400	6410	5960	4790	<3.5	231	87.9	7520	8240
TPH-C21-C40 aliphatics	mg/kg	~	~	~	4870	731	122	367	506	8970	25600	8890	7840	9910	1200	558	298	10100	10100
Total TPH Aliphatics	mg/kg	~	~	~	6440	1190	184	382	2480	13700	67800	20800	19100	16900	1200	861	440	30400	33400
TPH Extractables, unspecified	mg/kg	~	~	~	9160	1480	211	405	4990	20000	110000	30000	27900	25600	1920	1140	746	47600	51600
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	6330	1330	56.3	345	2820	9770	25600	7140	13000	23900	8210	3190	824	82200	54400

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-85		ASB-858			ASB-859		ASB-86		ASB-860			ASB-861			ASB-87
Date					1993-11-09		2016-10-06	2016-10-06	2016-10-06	2016-10-06	2016-10-06	1993-11-09		2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	1994-02-15
Start Depth					0	4	7	11	17	17.5	9.5	2	4	3	6.5	9	11.5	5.5	2.5	2
End Depth					2	6	7.5	11.5	17.5	18	10	4	6	3.5	6.5	9.5	12	6	3	4
Grid Cell (Figures 1A through 1E)					B1		A1			A1		A1		B2			B2			B2
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	NA	NA	14.7	<0.064	<0.064	<0.064	<0.083	NA	NA	4850	721	71.7	438	2810	2800	NA
C12-C16 Aromatics	mg/kg	~	~	~	NA	NA	137	80.7	<0.15	<0.15	<0.19	NA	NA	8520	1950	269	1170	7300	7840	NA
C16-C21 Aromatics	mg/kg	~	~	~	NA	NA	144	113	<0.27	<0.27	29	NA	NA	14800	5210	707	2760	16600	17100	NA
C21-C36 Aromatics	mg/kg	~	~	~	NA	NA	<0.40	<0.37	<0.37	<0.37	31.3	NA	NA	12600	8380	834	3270	17800	14700	NA
C9-C12 Aliphatics	mg/kg	~	~	~	NA	NA	51.8	27.6	<0.11	<0.11	<0.14	NA	NA	13700	2630	315	1230	5520	6120	NA
C12-C16 Aliphatics	mg/kg	~	~	~	NA	NA	404	334	<0.10	<0.10	24.1	NA	NA	17400	5850	1100	2660	11400	13300	NA
C16-C21 Aliphatics	mg/kg	~	~	~	NA	NA	121	115	<2.0	<2.0	26.4	NA	NA	13200	5730	1050	2930	14400	17500	NA
C21-C40 Aliphatics	mg/kg	~	~	~	NA	NA	<0.72	<0.67	<0.67	<0.68	27.8	NA	NA	16700	6720	918	5800	30700	33300	NA
Total Aliphatics	mg/kg	~	~	~	NA	NA	576	477	<0.10	<0.10	78.3	NA	NA	61000	20900	3380	12600	62000	70300	NA
Total EPH	mg/kg	1,700	8,000	30,000	NA	NA	872.5	670.3	0	0	138.6	0	0	**101770**	**37191**	5264.7	20258	**106530**	**112660**	NA
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	NA	NA	14.7	<0.064	<0.064	<0.064	<0.083	NA	NA	4850	721	71.7	438	2810	2800	NA
TPH-C12-C16 aromatics	mg/kg	~	~	~	NA	NA	137	80.7	<0.15	<0.15	<0.19	NA	NA	8520	1950	269	1170	7300	7840	NA
TPH-C16-C21 aromatics	mg/kg	~	~	~	NA	NA	144	113	<0.27	<0.27	29.0	NA	NA	14800	5210	707	2760	16600	17100	NA
TPH-C21-C36 aromatics	mg/kg	~	~	~	NA	NA	<0.40	<0.37	<0.37	<0.37	31.3	NA	NA	12600	8380	834	3270	17800	14700	NA
Total TPH Aromatics	mg/kg	~	~	~	NA	NA	296	193	<0.064	<0.064	60.4	NA	NA	40700	16300	1880	7640	44500	42400	NA
TPH-C9-C12 aliphatics	mg/kg	~	~	~	NA	NA	51.8	27.6	<0.11	<0.11	<0.14	NA	NA	13700	2630	315	1230	5520	6120	NA
TPH-C12-C16 aliphatics	mg/kg	~	~	~	NA	NA	404	334	<0.10	<0.10	24.1	NA	NA	17400	5850	1100	2660	11400	13300	NA
TPH-C16-C21 aliphatics	mg/kg	~	~	~	NA	NA	121	115	<2.0	<2.0	26.4	NA	NA	13200	5730	1050	2930	14400	17500	NA
TPH-C21-C40 aliphatics	mg/kg	~	~	~	NA	NA	<0.72	<0.67	<0.67	<0.68	27.8	NA	NA	16700	6720	918	5800	30700	33300	NA
Total TPH Aliphatics	mg/kg	~	~	~	NA	NA	576	477	<0.10	<0.10	78.3	NA	NA	61000	20900	3380	12600	62000	70300	NA
TPH Extractables, unspecified	mg/kg	~	~	~	NA	NA	872	670	<0.064	<0.064	139	NA	NA	102000	37200	5260	20300	107000	113000	NA
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	2000.00	100000.00	NA	NA	NA	NA	NA	1500.00	63000.00	NA	NA	NA	NA	NA	NA	237000.00

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	ASB-88		ASB-89		GMW-123		GMW-126		GMW-137	GMW-138	GMW-688		GMW-689		GMW-690	
Date					1994-02-22	2005-04-18	1994-02-22	2005-04-15	1998-11-13	2005-04-18	1998-11-12	2005-04-15	1998-11-13	1998-11-13	2016-10-10	2016-10-10	2016-10-10	2016-10-10	2016-10-07	2016-10-07
Start Depth					0	0.5	0	1.5	2	1	0	0	4	4	2	14.5	14.5	2	11	19.5
End Depth					2	1	2	2	4	1.5	2	0.5	6	6	2.5	15	15	2.5	11.5	20
Grid Cell (Figures 1A through 1E)					D2		C3		C3		D3		C1	B3	B2		B2		B2	
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3060	<0.072	<0.072	344	323	<0.069
C12-C16 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8100	<0.17	<0.17	936	1140	<0.16
C16-C21 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19400	<0.30	<0.30	1850	2900	<0.29
C21-C36 Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35500	<0.42	<0.42	2590	3760	<0.40
C9-C12 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16800	<0.12	<0.13	1580	1200	<0.12
C12-C16 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30600	<0.11	<0.12	3570	3730	<0.11
C16-C21 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26900	<2.2	<2.2	2590	3210	<2.1
C21-C40 Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27700	<0.75	<0.76	2780	2780	<0.73
Total Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	102000	<0.11	<0.12	10500	10900	<0.11
Total EPH	mg/kg	1,700	8,000	30,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**168060**	0	0	16240	19043	0
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3060	<0.072	<0.072	344	323	<0.069
TPH-C12-C16 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8100	<0.17	<0.17	936	1140	<0.16
TPH-C16-C21 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19400	<0.30	<0.30	1850	2900	<0.29
TPH-C21-C36 aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35500	<0.42	<0.42	2590	3760	<0.40
Total TPH Aromatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	66100	<0.072	<0.072	5710	8120	<0.069
TPH-C9-C12 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16800	<0.12	<0.13	1580	1200	<0.12
TPH-C12-C16 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30600	<0.11	<0.12	3570	3730	<0.11
TPH-C16-C21 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26900	<2.2	<2.2	2590	3210	<2.1
TPH-C21-C40 aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27700	<0.75	<0.76	2780	2780	<0.73
Total TPH Aliphatics	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	102000	<0.11	<0.12	10500	10900	<0.11
TPH Extractables, unspecified	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	168000	<0.072	<0.072	16200	19000	<0.069
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	1800.00	38000	28000.00	39000	50000	126000	191000	69900	338000	185000	NA	NA	NA	NA	NA	NA

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	90.7		HSB-229								HSB-230	HSB-231					
Date					2016-10-11	2016-10-11	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-14	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13
Start Depth					2.5	14.5	0	1.5	3	5.5	6.5	7.5	8.5	9.5	0	0	1	3.5	4.5	5.5	6.5
End Depth					3	15	0.5	2	3.5	6	7	8	9	10	0.5	0.5	1.5	4	5	6	7
Grid Cell (Figures 1A through 1E)					B2		C2								D2	D2					
Chemical	Units																				
EXTRACTABLE PETROLEUM HYDROCARBON																					
C10-C12 Aromatics	mg/kg	~	~	~	6190	<0.068	29	75.2	226	<2.0	<1.7	<1.7	<1.4	<1.3	48.9	80.3	<2.8	<1.2	<1.1	<1.4	<0.95
C12-C16 Aromatics	mg/kg	~	~	~	10100	<0.16	148	369	1090	<2.9	<2.4	<2.3	<2.0	107	447	697	158	<1.7	301	<1.9	<1.3
C16-C21 Aromatics	mg/kg	~	~	~	17100	<0.29	1320	1310	3790	458	117	99.8	219	396	4770	6110	1010	106	2090	<2.9	<2.0
C21-C36 Aromatics	mg/kg	~	~	~	16900	<0.39	3320	1780	2990	<6.8	<5.7	<5.5	<4.7	137	5720	6460	1270	274	2130	<4.6	<3.2
C9-C12 Aliphatics	mg/kg	~	~	~	12000	<0.12	108	260	917	108	<1.6	<1.5	109	153	301	193	<2.5	<1.1	69.9	<1.3	<0.87
C12-C16 Aliphatics	mg/kg	~	~	~	18300	<0.11	494	1160	3430	397	<2.4	90	345	641	4730	3210	655	46.4	1440	<1.9	<1.3
C16-C21 Aliphatics	mg/kg	~	~	~	13300	<2.1	1820	1990	5780	780	275	164	618	1210	18800	11300	2090	188	4020	83.5	119
C21-C40 Aliphatics	mg/kg	~	~	~	14700	<0.71	5250	2670	7230	554	389	188	818	1410	27800	19200	3450	550	5870	195	247
Total Aliphatics	mg/kg	~	~	~	58300	<0.11	7670	6070	17400	1840	664	442	1890	3420	51600	34000	6190	784	11400	278	365
Total EPH	mg/kg	1,700	8,000	30,000	**108590**	0	12489	9614.2	25453	2297	781	541.8	2109	4054	**62616.9**	**47250.3**	8633	1164.4	15920.9	278.5	366
TOTAL PETROLEUM HYDROCARBON																					
TPH-C10-C12 aromatics	mg/kg	~	~	~	6190	<0.068	29	75.2	226	<2.0	<1.7	<1.7	<1.4	<1.3	48.9	80.3	<2.8	<1.2	<1.1	<1.4	<0.95
TPH-C12-C16 aromatics	mg/kg	~	~	~	10100	<0.16	148	369	1090	<2.9	<2.4	<2.3	<2.0	107	447	697	158	<1.7	301	<1.9	<1.3
TPH-C16-C21 aromatics	mg/kg	~	~	~	17100	<0.29	1320	1310	3790	458	117	99.8	219	396	4770	6110	1010	106	2090	<2.9	<2.0
TPH-C21-C36 aromatics	mg/kg	~	~	~	16900	<0.39	3320	1780	2990	<6.8	<5.7	<5.5	<4.7	137	5720	6460	1270	274	2130	<4.6	<3.2
Total TPH Aromatics	mg/kg	~	~	~	50300	<0.068	4810	3530	8100	458	117	99.8	219	640	11000	13400	2440	381	4510	<1.4	<0.95
TPH-C9-C12 aliphatics	mg/kg	~	~	~	12000	<0.12	108	260	917	108	<1.6	<1.5	109	153	301	193	<2.5	<1.1	69.9	<1.3	<0.87
TPH-C12-C16 aliphatics	mg/kg	~	~	~	18300	<0.11	494	1160	3430	397	<2.4	90	345	641	4730	3210	655	46.4	1440	<1.9	<1.3
TPH-C16-C21 aliphatics	mg/kg	~	~	~	13300	<2.1	1820	1990	5780	780	275	164	618	1210	18800	11300	2090	188	4020	83.5	119
TPH-C21-C40 aliphatics	mg/kg	~	~	~	14700	<0.71	5250	2670	7230	554	389	188	818	1410	27800	19200	3450	550	5870	195	247
Total TPH Aliphatics	mg/kg	~	~	~	58300	<0.11	7670	6070	17400	1840	664	442	1890	3420	51600	34000	6190	784	11400	278	365
TPH Extractables, unspecified	mg/kg	~	~	~	109000	<0.068	12500	9600	25500	2300	781	542	2110	4060	62600	47400	8630	1160	15900	278	365
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	NA	NA	39200	86200	64800	4620	696	1950	843	1200	26400	62700	5970	1680	1790	693	790

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	SB-10		SB-11				SB-12			SB-13			SB-14	SB-15	SB-16	
Date					2009-04-29	2015-09-18	2009-04-29	2015-10-05	2015-10-05	2015-10-05	2009-04-29	2015-10-08	2015-10-08	2009-04-29	2015-10-08	2015-10-08	2015-09-25	2015-09-18	2015-10-09	2015-10-09
Start Depth					2.5	4	2.5	9.5	11.5	20	2.5	6	12	2.5	1	13	2.5	3.5	11	12.5
End Depth					3	4.5	3	10	12	20.5	3	6.5	12.5	3	1.5	13.5	3	4	11.5	13
Grid Cell (Figures 1A through 1E)					B3		B2				B3			B3			B3	C4	B2	
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	NA	<2.2	NA	2630	<1.4	<1.2	NA	<3.9	<2.4	NA	443	<2.2	<1.5	<1.4	1070	<0.43
C12-C16 Aromatics	mg/kg	~	~	~	NA	<2.0	NA	4220	<1.3	<1.1	NA	198	<2.2	NA	1560	<2.0	<1.4	<1.3	4130	29.8
C16-C21 Aromatics	mg/kg	~	~	~	NA	<4.0	NA	6720	<2.5	<2.3	NA	2100	<4.5	NA	6700	88.3	<2.8	<2.5	11200	135
C21-C36 Aromatics	mg/kg	~	~	~	NA	114	NA	4570	<3.0	<2.7	NA	2550	<5.4	NA	9960	<4.8	82.1	82.1	10600	372
C9-C12 Aliphatics	mg/kg	~	~	~	NA	<1.8	NA	7700	<1.1	<1.0	NA	<3.2	<2.0	NA	1480	<1.8	<1.2	<1.1	3150	13.9
C12-C16 Aliphatics	mg/kg	~	~	~	NA	<1.4	NA	11100	<0.87	<0.78	NA	1010	<1.5	NA	4330	<1.4	<0.95	<0.88	8430	48.4
C16-C21 Aliphatics	mg/kg	~	~	~	NA	<2.7	NA	9120	<1.7	<1.5	NA	3860	<3.0	NA	8420	<2.7	<1.9	<1.7	9820	114
C21-C40 Aliphatics	mg/kg	~	~	~	NA	<8.3	NA	10100	70.1	<4.7	NA	6590	<9.2	NA	19700	424	<5.6	<5.2	16200	459
Total Aliphatics	mg/kg	~	~	~	NA	<1.4	NA	38000	70.1	<0.78	NA	11500	<1.5	NA	33900	424	<0.95	<0.88	37600	635
Total EPH	mg/kg	1,700	8,000	30,000	0	114	0	**56160**	70.1	0	NA	16308	0	0	**52593**	512.3	82.1	82.1	**64600**	1172.1
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	NA	<2.2	NA	2630	<1.4	<1.2	NA	<3.9	<2.4	NA	443	<2.2	<1.5	<1.4	1070	<0.43
TPH-C12-C16 aromatics	mg/kg	~	~	~	NA	<2.0	NA	4220	<1.3	<1.1	NA	198	<2.2	NA	1560	<2.0	<1.4	<1.3	4130	29.8
TPH-C16-C21 aromatics	mg/kg	~	~	~	NA	<4.0	NA	6720	<2.5	<2.3	NA	2100	<4.5	NA	6700	88.3	<2.8	<2.5	11200	135
TPH-C21-C36 aromatics	mg/kg	~	~	~	NA	114	NA	4570	<3.0	<2.7	NA	2550	<5.4	NA	9960	<4.8	82.1	82.1	10600	372
Total TPH Aromatics	mg/kg	~	~	~	NA	114	NA	18100	<1.3	<1.1	NA	4850	<2.2	NA	18700	88.3	82.1	82.1	27100	537
TPH-C9-C12 aliphatics	mg/kg	~	~	~	NA	<1.8	NA	7700	<1.1	<1.0	NA	<3.2	<2.0	NA	1480	<1.8	<1.2	<1.1	3150	13.9
TPH-C12-C16 aliphatics	mg/kg	~	~	~	NA	<1.4	NA	11100	<0.87	<0.78	NA	1010	<1.5	NA	4330	<1.4	<0.95	<0.88	8430	48.4
TPH-C16-C21 aliphatics	mg/kg	~	~	~	NA	<2.7	NA	9120	<1.7	<1.5	NA	3860	<3.0	NA	8420	<2.7	<1.9	<1.7	9820	114
TPH-C21-C40 aliphatics	mg/kg	~	~	~	NA	<8.3	NA	10100	70.1	<4.7	NA	6590	<9.2	NA	19700	424	<5.6	<5.2	16200	459
Total TPH Aliphatics	mg/kg	~	~	~	NA	<1.4	NA	38000	70.1	<0.78	NA	11500	<1.5	NA	33900	424	<0.95	<0.88	37600	635
TPH Extractables, unspecified	mg/kg	~	~	~	NA	114	NA	56100	70.1	<17	NA	16300	<34	NA	52600	512	82.1	82.1	64600	1170
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	SB-3			SB-4			SB-5		SB-6		SB-7			SB-8		
Date					2015-10-05	2015-10-05	2015-10-05	2008-09-15	2015-11-18	2015-11-18	2015-10-07	2015-10-07	2009-04-29	2015-09-25	2009-04-29	2015-11-19	2015-11-19	2009-04-29	2015-11-19	2015-11-19
Start Depth					1	2.5	19	0	1.5	9.5	20.5	4	2.5	4.5	2.5	5.5	10.5	2.5	6	10.5
End Depth					1.5	3	19.5	0.5	2	10	21	4.5	3	5	3	6	11	3	6.5	11
Grid Cell (Figures 1A through 1E)					B1			B1			B2		B3		B1			B1		
Chemical	Units																			
EXTRACTABLE PETROLEUM HYDROCARBON																				
C10-C12 Aromatics	mg/kg	~	~	~	1240	2230	<1.2	NA	1820	<1.1	<1.2	2080	NA	<5.4	NA	2220	<1.4	NA	2600	<1.1
C12-C16 Aromatics	mg/kg	~	~	~	3130	5710	<1.1	NA	5060	<1.0	<1.1	5230	NA	<4.9	NA	7470	<1.3	NA	9970	<1.0
C16-C21 Aromatics	mg/kg	~	~	~	8820	14300	<2.3	NA	10900	76.4	<2.2	14100	NA	<9.9	NA	16800	64.3	NA	25000	118
C21-C36 Aromatics	mg/kg	~	~	~	8810	26700	<2.7	NA	24700	158	<2.6	19100	NA	263	NA	37500	247	NA	58500	334
C9-C12 Aliphatics	mg/kg	~	~	~	4570	12600	<1.0	NA	11300	<0.92	<0.97	7770	NA	<4.4	NA	10500	<1.1	NA	14400	<0.94
C12-C16 Aliphatics	mg/kg	~	~	~	13500	25900	<0.78	NA	19600	60.8	<0.75	20000	NA	<3.4	NA	26000	<0.89	NA	44700	139
C16-C21 Aliphatics	mg/kg	~	~	~	14300	24200	<1.5	NA	14000	90.7	<1.5	25200	NA	<6.7	NA	20600	<1.7	NA	38000	173
C21-C40 Aliphatics	mg/kg	~	~	~	16000	24700	<4.7	NA	15300	125	<4.5	29600	NA	<20	NA	15700	<5.3	NA	31800	196
Total Aliphatics	mg/kg	~	~	~	48400	87500	<0.78	NA	60100	277	<0.75	82600	NA	<3.4	NA	72900	<0.89	NA	129000	508
Total EPH	mg/kg	1,700	8,000	30,000	**70370**	**136340**	0	NA	**102680**	510.9	0	**123080**	NA	263	NA	**136790**	311.3	NA	**224970**	960
TOTAL PETROLEUM HYDROCARBON																				
TPH-C10-C12 aromatics	mg/kg	~	~	~	1240	2230	<1.2	NA	1820	<1.1	<1.2	2080	NA	<5.4	NA	2220	<1.4	NA	2600	<1.1
TPH-C12-C16 aromatics	mg/kg	~	~	~	3130	5710	<1.1	NA	5060	<1.0	<1.1	5230	NA	<4.9	NA	7470	<1.3	NA	9970	<1.0
TPH-C16-C21 aromatics	mg/kg	~	~	~	8820	14300	<2.3	NA	10900	76.4	<2.2	14100	NA	<9.9	NA	16800	64.3	NA	25000	118
TPH-C21-C36 aromatics	mg/kg	~	~	~	8810	26700	<2.7	NA	24700	158	<2.6	19100	NA	263	NA	37500	247	NA	58500	334
Total TPH Aromatics	mg/kg	~	~	~	22000	48900	<1.1	NA	42400	235	<1.1	40500	NA	263	NA	64000	312	NA	96000	452
TPH-C9-C12 aliphatics	mg/kg	~	~	~	4570	12600	<1.0	NA	11300	<0.92	<0.97	7770	NA	<4.4	NA	10500	<1.1	NA	14400	<0.94
TPH-C12-C16 aliphatics	mg/kg	~	~	~	13500	25900	<0.78	NA	19600	60.8	<0.75	20000	NA	<3.4	NA	26000	<0.89	NA	44700	139
TPH-C16-C21 aliphatics	mg/kg	~	~	~	14300	24200	<1.5	NA	14000	90.7	<1.5	25200	NA	<6.7	NA	20600	<1.7	NA	38000	173
TPH-C21-C40 aliphatics	mg/kg	~	~	~	16000	24700	<4.7	NA	15300	125	<4.5	29600	NA	<20	NA	15700	<5.3	NA	31800	196
Total TPH Aliphatics	mg/kg	~	~	~	48400	87500	<0.78	NA	60100	277	<0.75	82600	NA	<3.4	NA	72900	<0.89	NA	129000	508
TPH Extractables, unspecified	mg/kg	~	~	~	70400	136000	<17	NA	103000	511	<17	123000	NA	263	NA	137000	312	NA	225000	961
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	NA	NA	NA	3900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1E
SOIL ANALYTICAL DATA
TOTAL AND EXTRACTABLE PETROLEUM HYDROCARBON

Bayway Refinery Complex - IAOC A18

November 9, 1993 through September 21, 2018

Location ID		NJDEP EPH ECOLOGICAL SCREENING CRITERIA	NJDEP Category 2 EPH Product Determination Criterion	NJDEP EPH Ceiling Limit Concentration	SB-9		
Date					2009-04-29	2015-11-18	2015-11-18
Start Depth					2.5	1.5	12.5
End Depth					3	2	13
Grid Cell (Figures 1A through 1E)					B2		
Chemical	Units						
EXTRACTABLE PETROLEUM HYDROCARBON							
C10-C12 Aromatics	mg/kg	~	~	~	NA	3230	<1.4
C12-C16 Aromatics	mg/kg	~	~	~	NA	9900	<1.3
C16-C21 Aromatics	mg/kg	~	~	~	NA	22600	<2.6
C21-C36 Aromatics	mg/kg	~	~	~	NA	18400	<3.1
C9-C12 Aliphatics	mg/kg	~	~	~	NA	10000	<1.1
C12-C16 Aliphatics	mg/kg	~	~	~	NA	33800	<0.88
C16-C21 Aliphatics	mg/kg	~	~	~	NA	41900	<1.7
C21-C40 Aliphatics	mg/kg	~	~	~	NA	53300	<5.2
Total Aliphatics	mg/kg	~	~	~	NA	139000	<0.88
Total EPH	mg/kg	1,700	8,000	30,000	NA	**193130**	0
TOTAL PETROLEUM HYDROCARBON							
TPH-C10-C12 aromatics	mg/kg	~	~	~	NA	3230	<1.4
TPH-C12-C16 aromatics	mg/kg	~	~	~	NA	9900	<1.3
TPH-C16-C21 aromatics	mg/kg	~	~	~	NA	22600	<2.6
TPH-C21-C36 aromatics	mg/kg	~	~	~	NA	18400	<3.1
Total TPH Aromatics	mg/kg	~	~	~	NA	54100	<1.3
TPH-C9-C12 aliphatics	mg/kg	~	~	~	NA	10000	<1.1
TPH-C12-C16 aliphatics	mg/kg	~	~	~	NA	33800	<0.88
TPH-C16-C21 aliphatics	mg/kg	~	~	~	NA	41900	<1.7
TPH-C21-C40 aliphatics	mg/kg	~	~	~	NA	53300	<5.2
Total TPH Aliphatics	mg/kg	~	~	~	NA	139000	<0.88
TPH Extractables, unspecified	mg/kg	~	~	~	NA	193000	<19
TOTAL PETROLEUM HYDROCARBONS	mg/kg	~	~	~	NA	NA	NA

Notes:

~	No standard exists for this compound in this classification.
EPH	Extractable Petroleum Hydrocarbon
TPH	Total Petroleum Hydrocarbon
mg/kg	Milligrams per kilogram
<5.0	Not detected at or above the method detection limit, method detection limit included.
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
Bold	Concentration exceeds the Maximum Allowable Concentration for Capping (30,000 mg/kg)
Yellow highlight	Concentration exceeds NJDEP Category 2 EPH Product Determination Criteria for crude oil (8,000 mg/kg)

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		AGRO-1	AGRO-2	AGRO-3	AGRO-4	AGRO-5	AGRO-6	AGRO-7	AGRO-8	AGRO-9	AGRO-10	AGRO-11	AGRO-12	ASB-121	ASB-122	ASB-162	ASB-193	ASB-208	
Date		2016-11-02	2016-11-02	2016-11-02	2016-11-03	2016-11-02	2016-11-03	2016-11-03	2016-11-07	2016-11-07	2016-11-07	2016-11-09	2016-11-09	2005-04-15	2005-04-18	2005-04-15	1999-04-20	1999-04-19	2005-04-15
Start Depth		0	0	0	0	0	0	0	0	0	0	0	0	1.5	1.5	0.5	2	0	1
End Depth		1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	4	2	1.5
Grid Cell (Figures 1A through 1E)		B3	D3	C3	C3	C2	C2	C2	C1	C2	C2	D3	D3	B2	B2	C2	B1	B2	
Chemical	Units																		
Chloride	mg/kg	8220	15900	7840	12300	7590	12500	7340	11500	6580	6150	15700	11700	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.6	7.6	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	62.8	63.7	58.0	54.6	57.8	61.5	69.8	57.7	60.5	82.4	45.6	54.5	58.7	73.8	49.8	NA	84.2	73.0

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		ASB-217		ASB-218		ASB-412		ASB-413	ASB-414	ASB-795		ASB-796						
Date		1999-04-19	2005-04-18	1999-04-19	2005-04-15	2003-12-23	2005-04-18	2003-12-23	2003-12-23	2013-05-31	2013-05-31	2013-11-12	2013-11-12	2013-11-12	2013-11-12	2013-11-12	2013-11-12	2013-11-12
Start Depth		0	1.5	0	1	0	0.5	0	0	0	0.5	0	1.5	4.5	5.5	6.5	7.5	8.5
End Depth		2	2	2	1.5	0.5	1	0.5	0.5	0.5	1	0.5	2	5	6	7	8	9
Grid Cell (Figures 1A through 1E)		C1		D3		D2		D3	D2	C3		B1						
Chemical	Units																	
Chloride	mg/kg	NA	NA	NA	NA	7330	NA	6360	<3300	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	7.0	NA	7.5	NA	7.88	NA	7.37	7.42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	444000	NA	80200	166000	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	<54	NA	<30	<33	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	0.62	NA	0.074 B	0.071 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	<53.0	NA	<30.0	<33.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	343	NA	175	204	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	68.1	21.4	84.3	77.0	36.8	30.5	67.2	59.4	77.8	52.9	77.5	60.8	40.7	27.8	20.7	77.0	80.1

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		ASB-797		ASB-798		ASB-802				ASB-803		ASB-803A	ASB-803B	ASB-804			ASB-805		
Date		2013-11-18	2013-11-18	2013-12-09	2013-12-09	2013-11-26	2013-11-26	2013-11-26	2013-11-26	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-11-15
Start Depth		0	5	0	3	0	1.5	5.5	0.5	0	5.5	0.5	0.5	0	2.5	4	0	3.5	4
End Depth		0.5	6	0.5	3.5	0.5	2	6	1	0.5	6	1	1	0.5	3	4.5	0.5	4	4.5
Grid Cell (Figures 1A through 1E)		B2		B2		C2				C2		C2	C2	D2			C2		
Chemical	Units																		
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	78.9	43.5	64.7	54.0	61.1	16.5	14.4	55.9	74.2	12.4	48.4	43.2	78.2	17.4	35.3	53.5	18.5	21.2

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		ASB-806				ASB-807			ASB-808			ASB-809		ASB-809A	ASB-809B	ASB-810		
Date		2013-11-26	2013-11-26	2013-11-26	2013-11-26	2013-11-14	2013-11-14	2013-11-14	2013-11-11	2013-11-11	2013-11-11	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13
Start Depth		0	2.5	3.5	4.5	0	3	5	0	3	4.5	0	4.5	1.5	1.5	0	3.5	4.5
End Depth		0.5	3	4	5	0.5	3.5	5.5	0.5	3.5	5	0.5	5	2	2	0.5	4	5
Grid Cell (Figures 1A through 1E)		C3				D2			C3			D3		D3	D3	D3		
Chemical	Units																	
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	73.0	14.5	14.2	17.2	73.1	20.4	48.6	69.6	34.8	39.4	52.2	36.1	25.0	26.8	63.6	16.5	45.2

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		ASB-811			ASB-812		ASB-813				ASB-814				ASB-815			ASB-815A	ASB-815B
Date		2013-11-26	2013-11-26	2013-11-26	2013-12-03	2013-12-03	2013-11-14	2013-11-14	2013-11-14	2013-11-14	2013-11-15	2013-11-15	2013-11-15	2013-11-15	2013-12-09	2013-12-09	2013-12-09	2013-12-09	2013-12-09
Start Depth		0	1	5.5	0	1.5	0	1.5	4	4.5	0	0.5	3.5	5	0	1.5	5.5	2.5	2.5
End Depth		0.5	1.5	6	0.5	2	0.5	2	4.5	5	0.5	1	3.5	6	0.5	2	6	3	3
Grid Cell (Figures 1A through 1E)			C2		B2		D2				C3					B2		B2	B2
Chemical	Units																		
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	57.7	17.6	19.7	78.7	78.6	73.5	18.9	16.5	20.4	72.2	68.1	15.7	15.5	59.2	64.1	11.9	14.3	14.5

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		ASB-816		ASB-819		ASB-821			Notes:		ASB-823				ASB-824			ASB-825
Date		2013-12-03	2013-12-03	2013-12-09	2013-12-09	2013-11-14	2013-11-14	2013-11-14	2013-11-18	2013-11-18	2013-12-09	2013-12-09	2013-12-09	2013-12-09	2013-11-14	2013-11-14	2013-11-14	2013-11-18
Start Depth		0	5.5	0	3	0	3	5.5	0	3.5	0	1.5	2.5	3	0	4	5	0
End Depth		0.5	6	0.5	3.5	0.5	3.5	6	0.5	4	0.5	2	3	3.5	0.5	4.5	5.5	0.5
Grid Cell (Figures 1A through 1E)		B2		C2		D2			B1		B2				D2			B1
Chemical	Units																	
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	69.7	20.2	54.6	21.1	65.0	18.8	48.1	87.8	84.0	67.7	70.8	13.4	12.6	65.0	17.0	31.4	92.1

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		ASB-858			ASB-859		ASB-860			ASB-861			ASB-88	ASB-89	GMW-123		GMW-126		GMW-137	GMW-138	GMW-688	
Date		2016-10-06	2016-10-06	2016-10-06	2016-10-06	2016-10-06	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2016-10-05	2005-04-18	2005-04-15	1998-11-13	2005-04-18	1998-11-12	2005-04-15	1998-11-13	1998-11-13	2016-10-10	2016-10-10
Start Depth		7	11	17	17.5	9.5	3	6.5	9	11.5	5.5	2.5	0.5	1.5	2	1	0	0	4	4	2	14.5
End Depth		7.5	11.5	17.5	18	10	3.5	6.5	9.5	12	6	3	1	2	4	1.5	2	0.5	6	6	2.5	15
Grid Cell (Figures 1A through 1E)		A1			A1		B2			B2			D2	C3	C3		D3		C1	B3	B2	
Chemical	Units																					
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9	NA	2.4	NA	4.4	6.5	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	89.3	89.0	89.1	95.5	74.3	67.7	70.2	50.0	53.9	81.4	74.7	19.1	23.3	35.1	50.0	63.6	81.9	32.7	75.4	51.7	83.0

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		GMW-689		GMW-690		GMW-691		HSB-229						HSB-231						SB-10	
Date		2016-10-10	2016-10-10	2016-10-07	2016-10-07	2016-10-11	2016-10-11	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-25	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2013-11-13	2009-04-29	2015-09-18
Start Depth		14.5	2	11	19.5	2.5	14.5	0	5.5	6.5	7.5	8.5	9.5	0	1	3.5	4.5	5.5	6.5	2.5	4
End Depth		15	2.5	11.5	20	3	15	0.5	6	7	8	9	10	0.5	1.5	4	6	6	7	3	4.5
Grid Cell (Figures 1A through 1E)		B2		B2		B2		C2						D2						B3	
Chemical	Units																				
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
percent solids	%	85.0	83.7	30.7	85.4	67.6	90.2	68.4	31.9	42.6	42.6	53.7	51.0	68.7	17.0	38.9	41.9	34.2	49.6	88.9	16.0

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		SB-11						SB-12			SB-13			SB-14		SB-15	SB-16		SB-3			SB-4		
Date		1996-11-25	1997-11-19	2009-04-29	2015-10-05	2015-10-05	2015-10-05	2009-04-29	2015-10-08	2015-10-08	2009-04-29	2015-10-08	2015-10-08	2015-09-25	2015-09-25	2015-09-18	2015-10-09	2015-10-09	2015-10-05	2015-10-05	2015-10-05	2008-09-15	2015-11-18	2015-11-18
Start Depth			0	2.5	9.5	11.5	20	2.5	6	12	2.5	1	13	2.5	14.5	3.5	11	12.5	1	2.5	19	0	1.5	9.5
End Depth			0	3	10	12	20.5	3	6.5	12.5	3	1.5	13.5	3	15	4	11.5	13	1.5	3	19.5	0.5	2	10
Grid Cell (Figures 1A through 1E)		B2						B3			B3			B3		C4	B2		B1			B1		
Chemical	Units																							
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	8.1	7.8	NA	7.81	8.12	8.72	NA	6.95	7.67	NA	7.49	7.88	7.54	NA	NA	6.67	7.91	7.52	7.72	9.16	NA	7.39	7.81
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	NA	NA	NA	2640	1810	1290	NA	3220	2540	NA	8970	4530	6530	NA	NA	3590	2280	1270	2200	1030	NA	4130	1870
percent solids	%	NA	NA	92.8	71.8	83.1	92.3	88.3	47.4	71.3	88.1	53.4	75.0	25.2	74.3	24.9	38.8	80.2	50.2	55.6	91.0	92.5	54.5	74.7

TABLE 1F
SOIL ANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

November 25, 1996 through November 9, 2016

Location ID		SB-5		SB-6			SB-7			SB-8			SB-9		
Date		2015-10-07	2015-10-07	2009-04-29	2015-09-25	2015-09-25	2009-04-29	2015-11-19	2015-11-19	2009-04-29	2015-11-19	2015-11-19	2009-04-29	2015-11-18	2015-11-18
Start Depth		20.5	4	2.5	4.5	14	2.5	5.5	10.5	2.5	6	10.5	2.5	1.5	12.5
End Depth		21	4.5	3	5	14.5	3	6	11	3	6.5	11	3	2	13
Grid Cell (Figures 1A through 1E)		B2		B3			B1			B1			B2		
Chemical	Units														
Chloride	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	pH units	9.10	7.45	NA	7.32	NA	NA	8.12	8.09	NA	8.34	8.03	NA	8.03	7.92
Total organic carbon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrogen, nitrate+nitrite	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phosphorus	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
specific conductivity	umhos/cm	1330	6620	NA	6720	NA	NA	4840	2810	NA	7010	3530	NA	5620	3600
percent solids	%	89.5	63.9	89.9	12.5	78.0	84.3	40.1	80.5	86.5	20.7	77.0	88.2	67.7	76.4

Notes:

<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
mg/kg	Milligrams per kilogram
NA	Not analyzed

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	AWP-600	AWP-601	AWP-602	AWP-603	AWP-604	EB-2S																	
Date						2019-05-08	2019-05-09	2019-05-09	2019-05-09	2019-05-08	1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						B3	C3	C3	C3	B3	B1																	
Chemical	Units																											
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<2.20	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<0.22
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<2.90	<2.90	<2.90	<2.90	<2.90	<2.90	<2.90	<0.39
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<0.28
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<0.21
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.50	<2.40	<2.50	<2.50	<2.50	<2.50	<2.50	<0.20
1,2,3-trichlorobenzene	µg/L	~	~	~	~	<0.4	<0.4	<0.4	<0.4	<0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.50
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.50
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.69
1,2-dibromoethane	µg/L	~	0.03	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	0.66 J
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.10	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<0.39
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.40	<2.20	<2.40	<2.40	<2.40	<4.60	<4.60	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<0.33
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<0.19
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<0.21
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	<0.3	0.4 J	<0.3	<0.3	0.4 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.9
2-Hexanone	µg/L	~	~	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.5
4-methyl-2-pentanone	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2
Acetone	µg/L	32435	6000.00	~	~	<0.7	8 J	<0.7	0.9 J	2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5.0
Benzene	µg/L	1535	1.00	~	~	<0.2	<0.2	<0.2	<0.2	0.6 J	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	1.20 J	<4.00	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<0.14
bromochloromethane	µg/L	~	~	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.46
Bromodichloromethane	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<0.55
Bromoform	µg/L	~	4.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<0.34
Bromomethane	µg/L	~	10.00	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<0.46
Carbon disulfide	µg/L	~	700.00	~	~	0.3 J	1 J	<0.2	0.7 J	1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.33
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<1.80	<1.80	<1.80	<1.80	<1.80	<1.80	<1.80	<0.54
Chlorobenzene	µg/L	~	50.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	3.1
Chloroethane	µg/L	~	~	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<0.44
Chloroform	µg/L	~	70.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<0.23
Chloromethane	µg/L	~	30.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<3.40	<3.40	<3.40	<3.40	<3.40	<3.40	<3.40	<0.96
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<0.19
cyclohexane	µg/L	~	~	~	~	<0.2	<0.2	<0.2	<0.2	2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.73
Dibromochloromethane	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<0.23
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.70
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.4	<0.4	<0.4	<0.4	0.6 J	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	<2.40	<2.40	<2.40	<2.40	<2.40	<2.40	<2.40	<0.20
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	<0.2	<0.2	<0.2	<0.2	0.5 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.23 J
methyl acetate	µg/L	~	~	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.5
methyl cyclohexane	µg/L	~	~	~	~	<0.2	<0.2	<0.2	<0.2	1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.78
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	<0.2	<0.2	<0.2	<0.2	0.4 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.7
Methylene chloride	µg/L	~	3.00	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	1.10 JB	<3.00	2.60 JB	3.80 B	2.50 JB	1.70 JB	<3.00	1.30 J	<3.00	<3.00	6.30	<2.70	<2.70	<2.70	<2.70	2.90 B	<2.70	<1.0
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.27
tert-Butyl alcohol	µg/L	~	100.00	~	~	<12	NA	NA	NA	40 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<0.23
Toluene	µg/L	~	600.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<0.23
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.36
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<0.26
Trichloroethene	µg/L	1751	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<0.26
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<0.58
Vinyl chloride	µg/L	~	1.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<0.33
m/p-xylene	µg/L	~	~	~	~	<1	<1	<1	<1	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.42
o-xylene	µg/L	~	~	~	~	<0.4	<0.4	<0.4	<0.4	0.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21
xylenes, total	µg/L	~	1000.00	~	~	<1	<1	<1	<1	<1	NA	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	1.00 J	<5.00	<4.90	<4.90	<4.90	<4.90	<4.90	<7.40	<7.40	<0.21
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.2 J
Total VOC TICs	µg/L	~	500.00	~	~	0	190 J	0	170 J	110 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	188 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-3S																		
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	1999-06-23	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)															B1									
Chemical	Units																							
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<10.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<2.20	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<10	<0.22
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<18.00	<7.00	<7.00	<7.00	9.40	<7.00	<7.00	<7.00	<7.00	<7.00	<2.90	<2.90	<2.90	<2.90	<2.90	<2.90	<2.90	<1	<0.39
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<13.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<1	<0.28
1,1-Dichloroethane	µg/L	~	50.00	~	~	5.50 J	7.10	6.90	11.00	4.00 J	11.00	10.00	6.60	1.70 J	<5.00	<2.10	<2.10	<2.10	<2.10	7.00	8.60	13.00	<10	<0.21
1,1-Dichloroethene	µg/L	~	1.00	~	~	<7.50	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.50	<2.40	<2.50	<2.50	<2.50	<2.50	<2.50	<1	<0.20
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.50
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<9	<0.50
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.69
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<20	<0.22
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	5.60	6.80	11.00	9.10	5.70	18.00	23.00	9.00	2.60	13.00	1.30 J	<3.50	<3.50	3.40 J	<3.50	12.00	24.00	8 J	<0.23
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<7.50	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.10	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<1	<0.39
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	<5.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.40	<2.20	<2.40	<2.40	<2.40	<4.60	<4.60	<10	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<15.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1	<0.33
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<10	<0.19
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<10	<0.21
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<1.9
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<1.5
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<1.2
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<5.0
Benzene	µg/L	1535	1.00	~	~	12.00	10.00	5.00 J	22.00	12.00	5.40	12.00	20.00	6.40	2.40 J	1.00 J	<2.30	<2.30	<2.30	7.90	24.00	57.00	10	<0.14
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.46
Bromodichloromethane	µg/L	~	1.00	~	~	<5.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<1	<0.55
Bromoform	µg/L	~	4.00	~	~	<13.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<1	<0.34
Bromomethane	µg/L	~	10.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<10	<0.46
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.33
Carbon tetrachloride	µg/L	~	1.00	~	~	<7.50	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<1.80	<1.80	<1.80	<1.80	<1.80	<1.80	<1.80	<1	<0.54
Chlorobenzene	µg/L	~	50.00	~	~	<15.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	2 J	<0.17
Chloroethane	µg/L	~	~	~	~	6.00 J	<10.00	10.00	18.00	<10.00	14.00	11.00	8.80 J	1.70 J	5.60 J	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	10.00	<10	<0.44
Chloroform	µg/L	~	70.00	~	~	<5.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<1	<0.23
Chloromethane	µg/L	~	30.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<3.40	<3.40	<3.40	<3.40	<3.40	<3.40	<3.40	<10	<0.96
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<13.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<0.6	<0.19
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.73
Dibromochloromethane	µg/L	~	1.00	~	~	<7.50	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<10	<0.23
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.70
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	51 JN	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<18.00	<7.00	<7.00	<7.00	<7.00	<7.00	<7.00	1.50 J	<7.00	<7.00	<2.40	<2.40	<2.40	<2.40	<2.40	1.20 J	2.90	<10	<0.20
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<20	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.5
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.78
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	17 J	<0.34
Methylene chloride	µg/L	~	3.00	~	~	16.00 B	<3.00	3.20 B	6.40 B	3.20 B	<3.00	<3.00	1.70 J	<3.00	<3.00	6.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<1	<1.0
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<20	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.27
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<10.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1	<0.23
Toluene	µg/L	~	600.00	~	~	<15.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<2.10	<2.10	<2.10	<2.10	1.10 J	<2.10	<2.10	<10	<0.23
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.36
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<13.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<1.2	<0.26
Trichloroethene	µg/L	1751	1.00	~	~	<5.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<1	<0.26
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<5.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	NA	<0.58
Vinyl chloride	µg/L	~	1.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70	<1	<0.33
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.42
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21
xylenes, total	µg/L	~	1000.00	~	~	NA	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	2.40 J	<5.00	<5.00	1.00 J	<4.90	<4.90	<4.90	11.50 J	1.70 J	6.10 J	2 J	<0.21
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
Total VOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	341	0

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-4S																
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13
Grid Cell (Figures 2A, 2B and 2C)														B1								
Chemical	Units																					
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<20.00	<10.00	<10.00	<10.00	<20.00	<4.00	<4.00	<20.00	<4.00	<20.00	<5.20	<2.10	<2.10	<2.10	<4.20	<2.10	<2.10
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<35.00	<18.00	<18.00	<18.00	<35.00	<7.00	<7.00	<35.00	<7.00	<35.00	<7.20	<2.90	<2.90	<2.90	<5.80	<2.90	<2.90
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<25.00	<13.00	<13.00	<13.00	<25.00	<5.00	<5.00	<25.00	<5.00	<25.00	<7.50	<3.00	<3.00	<3.00	<6.00	<3.00	<3.00
1,1-Dichloroethane	µg/L	~	50.00	~	~	<25.00	<13.00	<13.00	<13.00	<25.00	<5.00	<5.00	<25.00	<5.00	<25.00	<5.20	<2.10	<2.10	<2.10	<4.20	<2.10	<2.10
1,1-Dichloroethene	µg/L	~	1.00	~	~	<15.00	<7.50	<7.50	<7.50	<15.00	<3.00	<3.00	<15.00	<3.00	<15.00	<6.20	<2.40	<2.50	<2.50	<5.00	<2.50	<2.50
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<9.50	<4.80	<4.80	<4.80	<9.50	<1.90	<1.90	<9.50	<1.90	<9.50	<8.80	<3.50	<3.50	<3.50	<7.00	<3.50	<3.50
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<15.00	<7.50	<7.50	<7.50	<15.00	<3.00	<3.00	<15.00	<3.00	<15.00	<5.50	<2.20	<2.20	<2.20	<4.40	<2.20	<2.20
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	<10.00	<5.00	<5.00	<5.00	<10.00	<2.00	<2.00	<10.00	<2.00	<10.00	<6.00	<2.20	<2.40	<2.40	<4.80	<4.60	<4.60
1,2-Dichloropropane	µg/L	843	1.00	~	~	<30.00	<15.00	<15.00	<15.00	<30.00	<6.00	<6.00	<30.00	<6.00	<30.00	<4.80	<1.90	<1.90	<1.90	<3.80	<1.90	<1.90
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<25.00	<5.00	<25.00	<7.50	<3.00	<3.00	<3.00	<6.00	<3.00	<3.00
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<25.00	<5.00	<25.00	<8.80	<3.50	<3.50	<3.50	<7.00	<3.50	<3.50
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	4.90 J	194.00	125.00	229.00	170.00	82.00	58.00	120.00	79.00	78.00	60.00	81.00	84.00	44.00	34.00	92.00	76.00
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<10.00	<5.00	<5.00	<5.00	<10.00	<2.00	<2.00	<10.00	<2.00	<10.00	<5.80	<2.30	<2.30	<2.30	<4.60	<2.30	<2.30
Bromoform	µg/L	~	4.00	~	~	<25.00	<13.00	<13.00	<13.00	<25.00	<5.00	<5.00	<25.00	<5.00	<25.00	<7.80	<3.10	<3.10	<3.10	<6.20	<3.10	<3.10
Bromomethane	µg/L	~	10.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<50.00	<10.00	<50.00	<7.50	<3.00	<3.00	<3.00	<6.00	<3.00	<3.00
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<15.00	<7.50	<7.50	<7.50	<15.00	<3.00	<3.00	<15.00	<3.00	<15.00	<4.50	<1.80	<1.80	<1.80	<3.60	<1.80	<1.80
Chlorobenzene	µg/L	~	50.00	~	~	<30.00	<15.00	<15.00	<15.00	<30.00	<6.00	<6.00	<30.00	<6.00	<30.00	<6.20	<2.50	<2.50	<2.50	<5.00	<2.50	<2.50
Chloroethane	µg/L	~	~	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<50.00	<10.00	<50.00	<7.80	<3.10	<3.10	<3.10	<6.20	<3.10	<3.10
Chloroform	µg/L	~	70.00	~	~	<10.00	<5.00	<5.00	<5.00	<10.00	<2.00	<2.00	<10.00	<2.00	<10.00	<5.50	<2.20	<2.20	<2.20	<4.40	<2.20	<2.20
Chloromethane	µg/L	~	30.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<50.00	<10.00	<50.00	<8.50	<3.40	<3.40	<3.40	<6.80	<3.40	<3.40
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<25.00	<13.00	<13.00	<13.00	<25.00	<5.00	<5.00	<25.00	<5.00	<25.00	<5.50	<2.20	<2.20	<2.20	<4.40	<2.20	<2.20
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<15.00	<7.50	<7.50	<7.50	<15.00	<3.00	<3.00	<15.00	<3.00	<15.00	<7.00	<2.80	<2.80	<2.80	<5.60	<2.80	<2.80
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	33.00 J	42.00	23.00	32.00	<35.00	30.00	22.00	21.00 J	14.00	21.00 J	23.00	17.00	12.00	22.00	17.00	18.00	14.00
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	39.00 B	<7.50	9.70 B	24.00 B	36.00 B	<3.00	<3.00	8.00 J	<3.00	<15.00	19.00	<2.70	<2.70	<2.70	<5.40	<2.70	<2.70
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<20.00	<10.00	<10.00	<10.00	<20.00	<4.00	<4.00	<20.00	<4.00	<20.00	<5.00	<2.00	<2.00	<2.00	<4.00	<2.00	<2.00
Toluene	µg/L	~	600.00	~	~	31.00 J	12.00 J	6.90 J	11.00 J	5.60 J	4.90 J	3.10 J	4.90 J	3.10 J	<30.00	2.50 J	4.60	4.20	1.90 J	3.20 J	6.20 J	4.30
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<25.00	<13.00	<13.00	<13.00	<25.00	<5.00	<5.00	<25.00	<5.00	<25.00	<5.50	<2.20	<2.20	<2.20	<4.40	<2.20	<2.20
Trichloroethene	µg/L	1751	1.00	~	~	<10.00	<5.00	<5.00	<5.00	<10.00	<2.00	<2.00	<10.00	<2.00	<10.00	<5.20	<2.10	<2.10	<2.10	<4.20	<2.10	<2.10
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<10.00	<5.00	<5.00	<5.00	<10.00	<2.00	<2.00	<10.00	<2.00	<10.00	<7.00	<2.80	<2.80	<2.80	<5.60	<2.80	<2.80
Vinyl chloride	µg/L	~	1.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<50.00	<10.00	<50.00	<6.80	<2.70	<2.70	<2.70	<5.40	<2.70	<2.70
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	NA	46.00	26.00	34.00	16.00 J	13.00	7.50 J	57.00	7.70	23.80 J	13.00	7.70	<4.90	15.20	6.40 J	12.60 J	12.00
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-123													GMW-126												
Date						1998-12-02	1999-07-07	2002-12-18	2013-10-31	2013-12-10	2014-09-16	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-07	1998-12-02	1999-07-07	2002-12-18	2013-10-31	2013-12-10	2014-09-17	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-09
Grid Cell (Figures 2A, 2B and 2C)						C3													D3												
Chemical	Units																														
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<10	<10	NA	<1.2	<0.50	<0.32	<0.25	<0.25	<0.22	<0.22	<0.25	<0.3	<2	<10	<10	NA	<1.2	<0.50	<0.64	<0.25	<0.25	<0.22	<0.22	<0.25	<15	<3
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<1.0	<1	NA	<0.98	<0.39	<0.39	<0.21	<0.21	<0.39	<0.39	<0.17	<0.2	<1	<1	<1	NA	<0.98	<0.39	<0.79	<0.21	<0.21	<0.39	<0.39	<0.17	<10	<2
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	<3.8	<1.5	<0.45	<0.52	<0.52	<1.2	<1.2	<1.2	<0.2	<1	NA	NA	NA	<3.8	<1.5	<0.89	<0.52	<0.52	<1.2	<1.2	<1.2	<10	<2
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<3.0	<1	NA	<1.1	<0.42	<0.28	<0.21	<0.21	<0.28	<0.28	<0.24	<0.2	<1	<3	<1	NA	<1.1	<0.42	<0.55	<0.21	<0.21	<0.28	<0.28	<0.24	<10	<2
1,1-Dichloroethane	µg/L	~	50.00	~	~	2 J	<10	NA	<1.3	<0.52	<0.35	<0.17	<0.17	<0.21	<0.21	<0.21	<0.2	<1	<10	<10	NA	<1.3	<0.52	<0.70	<0.17	<0.17	<0.21	<0.21	<0.21	<10	<2
1,1-Dichloroethene	µg/L	~	1.00	~	~	<2.0	<1	NA	<1.7	<0.69	<0.50	<0.51	<0.51	<0.20	<0.20	<0.47	<0.2	<1	<2	<1	NA	<1.7	<0.69	<0.99	<0.51	<0.51	<0.20	<0.20	<0.47	<10	<2
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	<1.2	<0.49	<0.26	<0.23	<0.23	<0.20	<0.50	<0.50	<0.4	<2	NA	NA	NA	<1.2	<0.49	<0.53	<0.23	<0.23	<0.20	<0.50	<0.50	<20	<4
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	<9.0	<9	NA	<1.1	<0.43	<0.22	<0.21	<0.21	<0.25	<0.50	<0.50	<0.3	<2	<9	<9	NA	<1.1	<0.43	<0.45	<0.21	<0.21	<0.25	<0.50	<0.50	<15	<3
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	<6.3	<2.5	<1.2	<0.99	<0.99	<0.69	<0.69	<0.69	<0.3	<2	NA	NA	NA	<6.3	<2.5	<2.3	<0.99	<0.99	<0.69	<0.69	<0.69	<15	<3
1,2-dibromoethane	µg/L	~	0.03	~	~	<20	<20	NA	<0.80	<0.32	<0.23	<0.23	<0.23	<0.22	<0.22	<0.21	<0.2	<1	<20	<20	NA	<0.80	<0.32	<0.45	<0.23	<0.23	<0.22	<0.22	<0.21	<10	<2
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	NA	<1.0	<0.41	<0.16	<0.19	<0.19	<0.23	<0.23	<0.50	<0.2	<1	<10	<10	NA	<1.0	<0.41	<0.32	<0.19	<0.19	<0.23	<0.23	<0.50	<10	<2
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<2.0	<1	NA	<1.1	<0.44	<0.30	<0.18	<0.18	<0.39	<0.39	<0.20	<0.3	<2	<2	<1	NA	<1.1	<0.44	<0.60	<0.18	<0.18	<0.39	<0.39	<0.20	<15	<3
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	<10	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<1.0	<1	NA	<1.4	<0.56	<0.43	<0.39	<0.39	<0.33	<0.33	<0.24	<0.2	<1	<1	<1	NA	<1.4	<0.56	<0.87	<0.39	<0.39	<0.33	<0.33	<0.24	<10	<2
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	NA	<1.6	<0.63	<0.26	<0.23	<0.23	<0.19	<0.19	<0.50	<0.2	<1	<10	<10	NA	<1.6	<0.63	<0.51	<0.23	<0.23	<0.19	<0.19	<0.50	<10	<2
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<10	<10	NA	<1.5	<0.60	<0.24	<0.27	<0.27	<0.21	<0.21	<0.50	<0.2	<1	<10	<10	NA	<1.5	<0.60	<0.47	<0.27	<0.27	<0.21	<0.21	<0.50	<10	<2
1-Butanol	µg/L	~	~	~	~	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	<10	<10	NA	<16	<6.4	<2.5	<5.6	<5.6	<1.9	<1.9	<4.8	<0.3	<2	<10	<10	NA	<16	<6.4	<5.0	<5.6	<5.6	<1.9	<1.9	<4.8	<15	<3
2-Hexanone	µg/L	~	~	~	~	<10	<10	NA	<8.5	<3.4	<1.7	<1.7	<1.7	<1.5	<1.5	<3.3	<0.3	<2	<10	<10	NA	<8.5	<3.4	<3.5	<1.7	<1.7	<1.5	<1.5	<3.3	<15	<3
4-methyl-2-pentanone	µg/L	~	~	~	~	<10	<10	NA	<7.4	<3.0	<1.1	<1.0	<1.0	<1.2	<1.2	<3.0	<0.5	<3	<10	<10	NA	<7.4	<3.0	<2.1	<1.0	<1.0	<1.2	<1.2	<3.0	<25	<5
Acetone	µg/L	32435	6000.00	~	~	<10	<10	NA	<17	<6.7	<2.6	<3.3	<3.3	<5.0	<5.0	<5.0	<0.7	<4	<10	<10	NA	<17	<6.7	<5.3	<3.3	<3.3	<5.0	<5.0	<5.0	<35	<7
Benzene	µg/L	1535	1.00	~	~	13	6	<10	<1.4	<0.56	<0.21	<0.24	<0.24	0.16 J	<0.14	<0.17	0.2 J	<1	6	3	<10	<1.4	1.1 J	<0.42	0.61	1.5	0.72	1.3	0.73	<10	<2
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	<2.1	<0.83	<0.49	<0.37	<0.37	<0.46	<0.46	<0.38	<0.2	<1	NA	NA	NA	<2.1	<0.83	<0.97	<0.37	<0.37	<0.46	<0.46	<0.38	<10	<2
Bromodichloromethane	µg/L	~	1.00	~	~	<1.0	<1	NA	<1.1	<0.42	<0.28	<0.23	<0.23	<0.55	<0.55	<0.22	<0.2	<1	<1.3	<1	NA	<1.1	<0.42	<0.56	<0.23	<0.23	<0.55	<0.55	<0.22	<10	<2
Bromoform	µg/L	~	4.00	~	~	<4.0	<1	NA	<1.5	<0.60	<0.31	<0.23	<0.23	<0.34	<0.34	<0.42	<0.2	<5	<4	<1	NA	<1.5	<0.60	<0.62	<0.23	<0.23	<0.34	<0.34	<0.42	<10	<10
Bromomethane	µg/L	~	10.00	~	~	<10	<10	NA	<2.8	<1.1	<0.39	<0.42	<0.42	<0.46	<0.46	<1.4	<0.3	<2	<10	<10	NA	<2.8	<1.1	<0.77	<0.42	<0.42	<0.46	<0.46	<1.4	<15	<3
Carbon disulfide	µg/L	~	700.00	~	~	<10	<10	NA	3.5 J	<0.36	0.60 J	0.78 J	0.82 J	99.6	<0.33	0.76 J	0.8 J	1 J	3 J	<10	NA	2.7 J	2.8 J	1.7 J	2.5	0.69 J	32.2	0.90 J	1.6 J	<10	5 J
Carbon tetrachloride	µg/L	~	1.00	~	~	<2.0	<1	NA	<1.1	<0.45	<0.24	<0.22	<0.22	<0.54	<0.54	<0.34	<0.2	<1	<2	<1	NA	<1.1	<0.45	<0.47	<0.22	<0.22	<0.54	<0.54	<0.34	<10	<2
Chlorobenzene	µg/L	~	50.00	~	~	<10	<10	NA	<1.7	<0.69	<0.27	<0.19	<0.19	<0.17	<0.17	<0.24	<0.2	<1	<10	<10	NA	<1.7	<0.69	<0.54	<0.19	<0.19	<0.17	<0.17	<0.24	<10	<2
Chloroethane	µg/L	~	~	~	~	<10	<10	NA	<1.9	<0.78	<0.56	<0.34	<0.34	<0.44	<0.44	<0.59	<0.2	<1	<10	<10	NA	<1.9	<0.78	<1.1	<0.34	<0.34	<0.44	<0.44	<0.59	<10	<2
Chloroform	µg/L	~	70.00	~	~	<6.0	<1	NA	<1.2	<0.49	<0.20	<0.19	<0.19	<0.23	<0.23	<0.29	<0.2	<1	<6	<1	NA	<1.2	<0.49	<0.41	<0.19	<0.19	<0.23	<0.23	<0.29	15 J	<2
Chloromethane	µg/L	~	30.00	~	~	<10	<10	NA	<1.8	<0.73	<0.33	<0.41	<0.41	<0.96	<0.96	<0.53	<0.2	<1	<10	<10	NA	<1.8	<0.73	<0.66	<0.41	<0.41	<0.96	<0.96	<0.53	<10	<2
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	NA	NA	NA	<1.2	<0.48	<0.33	<0.27	<0.27	<0.31	<0.31	<0.50	<0.2	<1	NA	NA	NA	<1.2	<0.48	<0.65	<0.27	<0.27	<0.31	<0.31	<0.50	<10	<2
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<1.0	<0.6	NA	<0.76	<0.30	<0.28	<0.21	<0.21	<0.19	<0.19	<0.25	<0.2	<1	<0.86	<0.6	NA	<0.76	<0.30	<0.57	<0.21	<0.21	<0.19	<0.19	<0.25	<10	<2
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	<0.90	<0.36	<0.37	0.49 J	<0.28	<0.73	<0.73	<0.63	0.6 J	<5	20 JN	NA	NA	<0.90	0.79 J	<0.74	1.8 J	8.2	2.0 J	9.4	3.8 J	<10	<10
Dibromochloromethane	µg/L	~	1.00	~	~	<10	<10	NA	<0.96	<0.38	<0.25	<0.15	<0.15	<0.23	<0.23	<0.16	<0.2	<1	<10	<10	NA	<0.96	<0.38	<0.50	<0.15	<0.15	<0.23	<0.23	<0.16	<10	<2
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	NA	NA	NA	<3.2	<1.3	<0.73	<0.90	<0.90	<0.70	<0.70	<1.9	<0.2	<1	NA	NA	NA	<3.2	<1.3	<1.5	<0.90	<0.90	<0.70	<0.70	<1.9	<10	<2
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	2 J	<10	<10	<1.0	<0.42	<0.40	<0.27	0.29 J	<0.20	<0.20	<0.22	<0.4	<2	15	2 J	<10	<1.0	1.8 J	<0.79	0.38 J	3.4	0.53 J	6.2	2.2	<20	<4
Hexane	µg/L	~	~	~	~	<20	25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<20	<20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	<1.1	<0.45	<0.26	<0.23	<0.23	0.28 J	<0.16	<0.25	<0.2	<1	NA	NA	NA	<1.1	0.64 J	<0.51	0.24 J	1.7	0.25 J	2.6	1.4	<10	<2
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	<7.5	<3.0	<3.1	<1.9	<1.9	<1.5	<1.5	<3.1	<0.2	<1	NA	NA	NA	<7.5	<3.0	<6.2	<1.9	<1.9	<1.5	<1.5	<3.1	<10	<2
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	<0.77	<0.31	<0.22	<0.22	<0.22	<0.78	<0.78	<1.8	0.4 J	<3	NA	NA	NA	<0.77	<0.31	<0.43	<0.22	1.2 J	<0.78	1.1 J	<1.8	<10	<5
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	<20	<20	NA	<1.4	<0.57	<0.26	<0.24	<0.24	<0.34	<0.34	<0.25	<0.2	<1	4 J	<20	NA	<1.4	<0.57	0.73 J	0.63 J	<0.24	0.69 J	0.52 J	0.51 J	<10	<2
Methylene chloride	µg/L	~	3.00	~	~	<3.0	<1	NA	<4.3	<1.7	<0.81	<0.73	<0.73	<1.0	<1.0	<1.0	<0.3	<2	<3	<1	NA	<4.3	<1.7	<1.6	6.4	1.7 J	<1.0	<1.0	<1.0	<15	<3
n-Propylbenzene	µg/L	~	~	~	~	<20	10 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 J	2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	<10	<10	NA	<1.5	<0.60	<0.26	<0.27	<0.27	<0.27	<0.27	<0.24	<0.2	<1	<10	<10	NA	<1.5	<0.60	<0.51	<0.27	<0.27	<0.27	<0.27	<0.24	<10	<2
tert-Butyl alcohol	µg/L	~	100.00	~	~	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<1.0	<1	NA	<1.3	<0.50	<0.35	<0.40	<0.40	<0.23	<0.23	<0.50	<0.2	<1	<1	<1	NA	<1.3	<0.50	<0.70	<0.40	<0.40	<0.23	<0.23	<0.50	<10	<2
Toluene	µg/L	~	600.00	~	~	<10	2 J	<10	<2.2	<0.89	<0.22	<0.16	0.47 J	<0.23	<0.23	<0.25	<0.2	<1	23	2 J	2 J	<2.2	4.3	<0.44	1.3	5.9	1.5	8.2	3.2	<10	3 J
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	NA	NA	NA	<1.9	<0.76	<0.51	<0.65	<0.65	<0.36	<0.36	<0.40	<0.2	<1	NA	NA	NA	<1.9	<0.76	<1.0	<0.65	<0.65	<0.36	<0.36	<0.40	<10	<2
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<1.0	<1.2	NA	<1.0	<0.41	<0.32	<0.19	<0.19	<0.26	<0.26	<0.22	<0.2	<1	<0.77	<1.2	NA	<1.0	<0.41	<0.63	<0.19	<0.19	<0.26	<0.26	<0.22	<10	<2
Trichloroethene	µg/L	1751	1.00	~	~	<1.0	<1	NA	<2.5	<1.0	<0.25	<0.22	<0.22	<0.26	<0.26	<0.27	<0.2	<1	<1.5	<1	NA	<2.5	<1.0	<0.50	<0.22	<0.22	<0.26	<0.26	<0.27	<10	<2
Trichlorofluoromethane	µg/L	~	2000.00	~	~	NA	NA	NA	<1.7	<0.67	<0.28	<0.43	<0.43	<0.58	<0.58	<0.60	<0.2	<1	NA	NA	NA	<1.7	<0.67	<0.56	<0.43	<0.43	<0.58	<0.58	<0.60	<10	<2
Vinyl chloride	µg/L	~	1.00	~	~	<5.0	<1	NA	<2.1	<0.83	<0.17	<0.15	<0.15	<0.33	<0.33	<0.62	<0.2	<1	<5	<1	NA	<2.1	<0.83	<0.35	<0.15	<0.15	<0.33	<0.33	<0.62	<10	<2
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	<2.0	<0.80	<0.45	<0.38	0.85 J	<0.42	<0.42	<0.43	<1	<5	NA	NA	NA	<2.0	1.3 J	<0.90	<0.38	2.5	<0.42	3.6	0.81 J	<50	<10
o-xylene	µg/L	~	~	~	~	NA	NA	NA	<0.97	<0.39	<0.20	<0.17	0.42 J	<0.21	<0.21	<0.22	<0.4	<2	NA	NA	NA	<0.97	3.4	<0.40	0.54 J	6.7	0.68 J	9.3	2.8	<20	<4
xylenes, total	µg/L	~	1000.00	~	~	<10	26	<10	<0.97	<0.39	<0.20	<0.17	1.3	<0.21	<0.21	<0.22	<1	<7	51	9 J	1 J	<0.97	4.8	<0.40	0.74 J	9.2	0.68 J	12.9	3.6	<50	<14
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	0	0	0	0	0	0	0	0	0 J	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0 J	NA
Total VOC TICs	µg/L	~	500.00	~	~	140	464	55.0	0	210 J	102.2 J	38 J	0	28.7 J	5.3 J	330 J	5300 J	83 J	NA	NA	53.0	0	490 J	328 J	560 J	113.2 J	781.4 J	789 J	617 J	880 J	340 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-137													GMW-138												
Date						1998-12-01	1999-07-02	2002-12-18	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-02	2016-08-26	2016-12-09	2017-08-11	2018-09-19	2019-08-29	1998-12-02	1999-07-02	2002-12-18	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-03	2016-08-25	2017-01-17	2017-08-11	2018-09-19	2019-08-08
Grid Cell (Figures 2A, 2B and 2C)						C1													B3												
Chemical	Units																														
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<10	<10	NA	<6.2	<0.25	<0.64	<0.25	<0.25	<0.22	<0.22	<0.25	<3	<0.3	<10	<10	NA	<2.5	<0.25	<0.64	<0.25	<0.25	<1.1	<0.22	<0.25	<3	<2
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<1	<1	NA	<4.9	<0.20	<0.79	<0.21	<0.21	<0.39	<0.39	<0.17	<2	<0.2	<1	<1	NA	<2.0	<0.20	<0.79	<0.21	<0.21	<2.0	<0.39	<0.17	<2	<1
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	<19	<0.77	<0.89	<0.52	<0.52	<1.2	<1.2	<1.2	<2	<0.2	NA	NA	NA	<7.7	<0.77	<0.89	<0.52	<0.52	<5.8	<1.2	<1.2	<2	<1
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<3	<1	NA	<5.3	<0.21	<0.55	<0.21	<0.21	<0.28	<0.28	<0.24	<2	<0.2	<3	<1	NA	<2.1	<0.21	<0.55	<0.21	<0.21	<1.4	<0.28	<0.24	<2	<1
1,1-Dichloroethane	µg/L	~	50.00	~	~	<10	<10	NA	<6.5	<0.26	<0.70	<0.17	<0.17	<0.21	<0.21	<0.21	<2	<0.2	<10	<10	NA	<2.6	<0.26	<0.70	<0.17	<0.17	<1.0	<0.21	<0.21	<2	<1
1,1-Dichloroethene	µg/L	~	1.00	~	~	<2	<1	NA	<8.6	<0.34	<0.99	<0.51	<0.51	<0.20	<0.20	<0.47	<2	<0.2	<2	<1	NA	<3.4	<0.34	<0.99	<0.51	<0.51	<1.0	<0.20	<0.47	<2	<1
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	<6.1	<0.24	<0.53	<0.23	<0.23	<0.20	<0.50	<0.50	<4	<0.4	NA	NA	NA	<2.4	<0.24	<0.53	<0.23	<0.23	<1.0	<0.50	<0.50	<4	<2
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	<9	<9	NA	<5.4	<0.22	<0.45	<0.21	<0.21	<0.25	<0.50	<0.50	<3	<0.3	<9	<9	NA	<2.2	<0.22	<0.45	<0.21	<0.21	<1.2	<0.50	<0.50	<3	<2
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	<32	<1.3	<2.3	<0.99	<0.99	<0.69	<0.69	<0.69	<3	<0.3	NA	NA	NA	<13	<1.3	<2.3	<0.99	<0.99	<3.4	<0.69	<0.69	<3	<2
1,2-dibromoethane	µg/L	~	0.03	~	~	<20	<20	NA	<4.0	<0.16	<0.45	<0.23	<0.23	<0.22	<0.22	<0.21	<2	<0.2	<20	<20	NA	<1.6	<0.16	<0.45	<0.23	<0.23	<1.1	<0.22	<0.21	<2	<1
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	NA	<5.1	<0.20	<0.32	<0.19	<0.19	<0.23	<0.23	<0.50	<2	<0.2	<10	<10	NA	<2.0	<0.20	<0.32	<0.19	<0.19	<1.2	<0.23	<0.50	<2	<1
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<2	<1	NA	<5.5	<0.22	<0.60	<0.18	<0.18	<0.39	<0.39	<0.20	<3	<0.3	<2	<1	NA	<2.2	<0.22	<0.60	<0.18	<0.18	<2.0	<0.39	<0.20	<3	<2
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	<10	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<1	<1	NA	<7.0	<0.28	<0.87	<0.39	<0.39	<0.33	<0.33	<0.24	<2	<0.2	<1	<1	NA	<2.8	<0.28	<0.87	<0.39	<0.39	<1.6	<0.33	<0.24	<2	<1
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	NA	<7.9	<0.31	<0.51	<0.23	<0.23	<0.19	<0.19	<0.50	<2	<0.2	<10	<10	NA	<3.1	<0.31	<0.51	<0.23	<0.23	<0.97	<0.19	<0.50	<2	<1
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<10	<10	NA	<7.5	<0.30	<0.47	<0.27	<0.27	<0.21	<0.21	<0.50	<2	<0.2	<10	<10	NA	<3.0	<0.30	<0.47	<0.27	<0.27	<1.1	<0.21	<0.50	<2	<1
1-Butanol	µg/L	~	~	~	~	<500	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<500	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	<500	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<500	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	<10	<10	NA	<80	<3.2	<5.0	<5.6	<5.6	<1.9	<1.9	<4.8	<3	<0.3	<10	<10	NA	<32	<3.2	<5.0	<5.6	<5.6	<9.5	<1.9	<4.8	<3	<2
2-Hexanone	µg/L	~	~	~	~	<10	<10	NA	<43	<1.7	<3.5	<1.7	<1.7	<1.5	<1.5	<3.3	<3	<0.3	<10	<10	NA	<17	<1.7	<3.5	<1.7	<1.7	<7.6	<1.5	<3.3	<3	<2
4-methyl-2-pentanone	µg/L	~	~	~	~	<10	<10	NA	<37	<1.5	<2.1	<1.0	<1.0	<1.2	<1.2	<3.0	<5	<0.5	<10	<10	NA	<15	<1.5	<2.1	<1.0	<1.0	<6.0	<1.2	<3.0	<5	<3
Acetone	µg/L	32435	6000.00	~	~	<10	<10	NA	<84	<3.3	<5.3	<3.3	<3.3	<5.0	<5.0	<5.0	<7	1 J	<10	<10	NA	<33	<3.3	<5.3	<3.3	<3.3	<25	<5.0	<5.0	8 J	<4
Benzene	µg/L	1535	1.00	~	~	3	3	4 J	<7.0	0.70 J	1.0	0.26 J	0.41 J	0.75	0.43 J	0.90	<2	0.6 J	4	<1	<10	<2.8	0.30 J	<0.42	0.91	0.62	<0.70	0.77	0.22 J	<2	<1
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	<10	<0.42	<0.97	<0.37	<0.37	<0.46	<0.46	<0.38	<2	<0.2	NA	NA	NA	<4.2	<0.42	<0.97	<0.37	<0.37	<2.3	<0.46	<0.38	<2	<1
Bromodichloromethane	µg/L	~	1.00	~	~	<1.3	<1	NA	<5.3	<0.21	<0.56	<0.23	<0.23	<0.55	<0.55	<0.22	<2	<0.2	<1.3	<1	NA	<2.1	<0.21	<0.56	<0.23	<0.23	<2.8	<0.55	<0.22	<2	<1
Bromoform	µg/L	~	4.00	~	~	<4	<1	NA	<7.5	<0.30	<0.62	<0.23	<0.23	<0.34	<0.34	<0.42	<2	<1	<4	<1	NA	<3.0	<0.30	<0.62	<0.23	<0.23	<1.7	<0.34	<0.42	<2	<5
Bromomethane	µg/L	~	10.00	~	~	<10	<10	NA	<14	<0.56	<0.77	<0.42	<0.42	<0.46	<0.46	<1.4	<3	<0.3	<10	<10	NA	<5.6	<0.56	<0.77	<0.42	<0.42	<2.3	<0.46	<1.4	<3	<2
Carbon disulfide	µg/L	~	700.00	~	~	8 J	<10	NA	<4.6	1.3 J	<0.99	0.43 J	0.44 J	44.8	0.66 J	0.78 J	<2	1 J	<10	<10	NA	11.3 J	1.7 J	2.0 J	1.7 J	0.75 J	3.2 J	1.3 J	1.7 J	<2	1 J
Carbon tetrachloride	µg/L	~	1.00	~	~	<2	<1	NA	<5.7	<0.23	<0.47	<0.22	<0.22	<0.54	<0.54	<0.34	<2	<0.2	<2	<1	NA	<2.3	<0.23	<0.47	<0.22	<0.22	<2.7	<0.54	<0.34	<2	<1
Chlorobenzene	µg/L	~	50.00	~	~	<10	<10	NA	<8.7	<0.35	<0.54	<0.19	<0.19	<0.17	<0.17	<0.24	<2	<0.2	<10	<10	NA	<3.5	<0.35	<0.54	<0.19	<0.19	<0.87	<0.17	<0.24	<2	<1
Chloroethane	µg/L	~	~	~	~	<10	<10	NA	<9.7	<0.39	<1.1	<0.34	<0.34	<0.44	<0.44	<0.59	<2	<0.2	<10	<10	NA	<3.9	<0.39	<1.1	<0.34	<0.34	<2.2	<0.44	<0.59	<2	<1
Chloroform	µg/L	~	70.00	~	~	<6	<1	NA	<6.1	<0.25	<0.41	<0.19	<0.19	<0.23	<0.23	<0.29	<2	<0.2	<6	<1	NA	<2.5	<0.25	<0.41	<0.19	<0.19	<1.1	<0.23	<0.29	<2	<1
Chloromethane	µg/L	~	30.00	~	~	<10	<10	NA	<9.1	<0.36	<0.66	<0.41	<0.41	<0.96	<0.96	<0.53	<2	<0.2	<10	<10	NA	<3.6	<0.36	<0.66	<0.41	<0.41	<4.8	<0.96	<0.53	<2	<1
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	NA	NA	NA	<6.0	<0.24	<0.65	<0.27	<0.27	<0.31	<0.31	<0.50	<2	<0.2	NA	NA	NA	<2.4	<0.24	<0.65	<0.27	<0.27	<1.5	<0.31	<0.50	<2	<1
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.86	<0.6	NA	<3.8	<0.15	<0.57	<0.21	<0.21	<0.19	<0.19	<0.25	<2	<0.2	<0.86	<0.6	NA	<1.5	<0.15	<0.57	<0.21	<0.21	<0.93	<0.19	<0.25	<2	<1
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	<4.5	<0.18	<0.74	<0.28	<0.28	<0.73	<0.73	<0.63	<2	<1	NA	NA	NA	<1.8	<0.18	<0.74	<0.28	<0.28	<3.6	<0.73	<0.63	<2	<5
Dibromochloromethane	µg/L	~	1.00	~	~	<10	<10	NA	<4.8	<0.19	<0.50	<0.15	<0.15	<0.23	<0.23	<0.16	<2	<0.2	<10	<10	NA	<1.9	<0.19	<0.50	<0.15	<0.15	<1.1	<0.23	<0.16	<2	<1
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	NA	NA	NA	<16	<0.63	<1.5	<0.90	<0.90	<0.70	<0.70	<1.9	<2	<0.2	NA	NA	NA	<6.3	<0.63	<1.5	<0.90	<0.90	<3.5	<0.70	<1.9	<2	<1
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	36 JN	24 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	1 J	<10	1 J	<5.2	<0.21	<0.79	<0.27	<0.27	<0.20	<0.20	<0.22	<4	<0.4	7 J	<10	<10	<2.1	<0.21	<0.79	<0.27	<0.27	<0.98	0.23 J	<0.22	<4	<2
Hexane	µg/L	~	~	~	~	<20	<20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<20	<20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	<5.6	<0.22	<0.51	<0.23	<0.23	<0.16	<0.16	<0.25	<2	<0.2	NA	NA	NA	<2.2	<0.22	<0.51	<0.23	<0.23	<0.79	<0.16	<0.25	<2	<1
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	<38	<1.5	<6.2	<1.9	<1.9	<1.5	<1.5	<3.1	<2	<0.2	NA	NA	NA	<15	<1.5	<6.2	<1.9	<1.9	<7.7	<1.5	<3.1	<2	<1
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	<3.9	<0.15	<0.43	<0.22	<0.22	<0.78	<0.78	<1.8	<2	<0.5	NA	NA	NA	<1.5	<0.15	<0.43	<0.22	<0.22	<3.9	<0.78	<1.8	<2	<3
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	<20	<20	NA	<7.1	0.34 J	<0.53	<0.24	<0.24	<0.34	<0.34	<0.25	<2	<0.2	3 J	<20	NA	<2.9	1.6	0.88 J	1.2	1.2	1.8 J	0.64 J	1.2	<2	<1
Methylene chloride	µg/L	~	3.00	~	~	<3	<1	NA	<22	<0.86	<1.6	<0.73	<0.73	<1.0	<1.0	<1.0	<3	0.4 J	<3	<1	NA	<8.6	<0.86	<1.6	<0.73	<0.73	<5.0	<1.0	<1.0	<3	<2
n-Propylbenzene	µg/L	~	~	~	~	<20	<20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 J	<20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	<10	<10	NA	<7.6	<0.30	<0.51	<0.27	<0.27	<0.27	<0.27	<0.24	<2	<0.2	<10	<10	NA	<3.0	<0.30	<0.51	<0.27	<0.27	<1.4	<0.27	<0.24	<2	<1
tert-Butyl alcohol	µg/L	~	100.00	~	~	<500	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<500	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<1	<1	NA	<6.3	<0.25	<0.70	<0.40	<0.40	<0.23	<0.23	<0.50	<2	<0.2	<1	<1	NA	<2.5	<0.25	<0.70	<0.40	<0.40	<1.2	<0.23	<0.50	<2	<1
Toluene	µg/L	~	600.00	~	~	5 J	4 J	13	<11	<0.44	<0.44	<0.16	<0.16	<0.23	<0.23	<0.25	<2	<0.2	7 J	<10	<10	<4.4	<0.44	<0.44	<0.16	<0.16	<1.1	<0.23	<0.25	<2	<1
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	NA	NA	NA	<9.5	<0.38	<1.0	<0.65	<0.65	<0.36	<0.36	<0.40	<2	<0.2	NA	NA	NA	<3.8	<0.38	<1.0	<0.65	<0.65	<1.8	<0.36	<0.40	<2	<1
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.77	<1.2	NA	<5.2	<0.21	<0.63	<0.19	<0.19	<0.26	<0.26	<0.22	<2	<0.2	<0.77	<1.2	NA	<2.1	<0.21	<0.63	<0.19	<0.19	<1.3	<0.26	<0.22	<2	<1
Trichloroethene	µg/L	1751	1.00	~	~	<1.5	<1	NA	<13	<0.50	<0.50	<0.22	<0.22	<0.26	<0.26	<0.27	<2	<0.2	<1.5	<1	NA	<5.0	<0.50	<0.50	<0.22	<0.22	<1.3	<0.26	<0.27	<2	<1
Trichlorofluoromethane	µg/L	~	2000.00	~	~	NA	NA	NA	<8.4	<0.33	<0.56	<0.43	<0.43	<0.58	<0.58	<0.60	<2	<0.2	NA	NA	NA	<3.3	<0.33	<0.56	<0.43	<0.43	<2.9	<0.58	<0.60	<2	<1
Vinyl chloride	µg/L	~	1.00	~	~	<5	<1	NA	<10	<0.41	<0.35	<0.15	<0.15	<0.33	<0.33	<0.62	<2	<0.2	<5	<1	NA	<4.1	<0.41	<0.35	<0.15	<0.15	<1.6	<0.33	<0.62	<2	<1
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	<10	<0.40	<0.90	<0.38	<0.38	<0.42	<0.42	<0.43	<10	<1	NA	NA	NA	<4.0	<0.40	<0.90	<0.38	<0.38	<2.1	<0.42	<0.43	<10	<5
o-xylene	µg/L	~	~	~	~	NA	NA	NA	<4.8	<0.19	<0.40	<0.17	<0.17	<0.21	<0.21	<0.22	<4	<0.4	NA	NA	NA	<1.9	<0.19	<0.40	0.56 J	0.43 J	<1.0	0.74 J	0.29 J	<4	<2
xylenes, total	µg/L	~	1000.00	~	~	6 J	4 J	7 J	<4.8	<0.19	<0.40	<0.17	<0.17	<0.21	<0.21	<0.22	<10	<1	24	<10	<10	<1.9	<0.19	<0.40	0.84 J	0.43 J	<1.0	0.74 J	0.29 J	<10	<7
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	0	0	0	0	0	0	0	0	0 J	NA	NA	NA	NA	0	16 J	0	0	13 J	0	19 J	6.8 J	0 J	NA
Total VOC TICs	µg/L	~	500.00	~	~	440	81	136	0	0	0	400 J	6.2 J	745.1 J	22.9 J	170.5 J	0 J	650 J	84.8	<0	51.0	0	18 J	10 J	580 J	610.6 J	0	793.5 J	182.5 J	170 J	0

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		GMW-650	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-211R	GMW-212				GMW-213			GMW-229		GMW-647				GMW-648			GMW-649		
Date						2017-01-20	2002-12-18	2013-12-12	2016-02-04	2016-12-06	2002-12-18	2013-12-12	2016-12-06	2017-01-18	2018-05-22	2013-07-12	2013-08-01	2016-02-04	2016-12-08	2013-08-01	2016-02-04	2016-12-09	2013-12-12	2016-02-17	2016-12-06
Grid Cell (Figures 2A, 2B and 2C)						B2	C1				C2			B2		C3				D3			D2		
Chemical	Units																								
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<2.2	NA	<0.25	<0.50	<0.43	NA	<0.25	<1.1	<1.1	<0.5	NA	<0.24	<0.25	<0.22	NA	<0.25	<0.22	<0.25	<0.25	<1.1
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<3.9	NA	<0.20	<0.41	<0.79	NA	<0.20	<2.0	<2.0	<0.5	<0.21	<0.21	<0.21	<0.39	<0.21	<0.21	<0.39	<0.20	<0.21	<2.0
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	<12	NA	<0.77	<1.0	<2.3	NA	<0.77	<5.8	<5.8	<2	NA	<0.53	<0.52	<1.2	NA	<0.52	<1.2	<0.77	<0.52	<5.8
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<2.8	NA	<0.21	<0.43	<0.55	NA	<0.21	<1.4	<1.4	<0.5	NA	<0.29	<0.21	<0.28	NA	<0.21	<0.28	<0.21	<0.21	<1.4
1,1-Dichloroethane	µg/L	~	50.00	~	~	<2.1	NA	<0.26	<0.34	<0.41	NA	<0.26	<1.0	<1.0	<0.5	NA	<0.11	<0.17	<0.21	NA	<0.17	<0.21	<0.26	<0.17	<1.0
1,1-Dichloroethene	µg/L	~	1.00	~	~	<2.0	NA	<0.34	<1.0	<0.41	NA	<0.34	<1.0	<1.0	<0.5	NA	<0.19	<0.51	<0.20	NA	<0.51	<0.20	<0.34	<0.51	<1.0
1,2,3-trichlorobenzene	µg/L	~	~	~	~	<5.0	NA	<0.24	<0.45	<1.0	NA	<0.24	<2.5	<2.5	<1	NA	<0.28	<0.23	<0.50	NA	<0.23	<0.50	<0.24	<0.23	<2.5
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	<5.0	NA	<0.22	<0.42	<1.0	NA	<0.22	<2.5	<2.5	<1	NA	<0.20	<0.21	<0.50	NA	<0.21	<0.50	<0.22	<0.21	<2.5
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	<6.9	NA	<1.3	<2.0	<1.4	NA	<1.3	<3.4	<3.4	<2	NA	<0.54	<0.99	<0.69	NA	<0.99	<0.69	<1.3	<0.99	<3.4
1,2-dibromoethane	µg/L	~	0.03	~	~	<2.2	NA	<0.16	<0.46	<0.44	NA	<0.16	<1.1	<1.1	<0.5	NA	<0.20	<0.23	<0.22	NA	<0.23	<0.22	<0.16	<0.23	<1.1
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<2.3	NA	<0.20	<0.37	<0.47	NA	<0.20	<1.2	<1.2	<1	NA	<0.22	<0.19	<0.23	NA	<0.19	<0.23	<0.20	<0.19	<1.2
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<3.9	NA	<0.22	<0.36	<0.79	NA	<0.22	<2.0	<2.0	<0.5	NA	<0.26	<0.18	<0.39	NA	<0.18	<0.39	<0.22	<0.18	<2.0
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<3.3	NA	<0.28	<0.79	<0.65	NA	<0.28	<1.6	<1.6	<0.5	NA	<0.48	<0.39	<0.33	NA	<0.39	<0.33	<0.28	<0.39	<1.6
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<1.9	NA	<0.31	<0.45	<0.39	NA	<0.31	<0.97	<0.97	<1	NA	<0.22	<0.23	<0.19	NA	<0.23	<0.19	<0.31	<0.23	<0.97
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<2.1	NA	<0.30	<0.55	<0.43	NA	<0.30	<1.1	<1.1	<1	NA	<0.30	<0.27	<0.21	NA	<0.27	<0.21	<0.30	<0.27	<1.1
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	55.6 J	NA	4.7 J	<11	<3.8	NA	<3.2	<9.5	<9.5	<3	NA	<2.4	<5.6	<1.9	NA	<5.6	<1.9	<3.2	<5.6	<9.5
2-Hexanone	µg/L	~	~	~	~	<15	NA	<1.7	<3.5	<3.0	NA	<1.7	<7.6	<7.6	<3	NA	<1.1	<1.7	<1.5	NA	<1.7	<1.5	<1.7	<1.7	<7.6
4-methyl-2-pentanone	µg/L	~	~	~	~	21.9 J	NA	<1.5	<2.0	<2.4	NA	<1.5	<6.0	<6.0	<3	NA	<0.83	<1.0	<1.2	NA	<1.0	<1.2	<1.5	<1.0	<6.0
Acetone	µg/L	32435	6000.00	~	~	185	NA	21.2	8.0 J	24.1	NA	<3.3	<25	<25	13 J	NA	9.6 J	<3.3	<5.0	NA	5.7 J	<5.0	19.3	<3.3	<25
Benzene	µg/L	1535	1.00	~	~	261	59	45.8	32.2	32.8	7 J	3.2	1.5 J	15.9	3	0.36 J	<0.24	<0.24	<0.14	<0.24	<0.24	<0.14	2.9	1.6	2.8
bromochloromethane	µg/L	~	~	~	~	<4.6	NA	<0.42	<0.74	<0.93	NA	<0.42	<2.3	<2.3	<1	NA	<0.30	<0.37	<0.46	NA	<0.37	<0.46	<0.42	<0.37	<2.3
Bromodichloromethane	µg/L	~	1.00	~	~	<5.5	NA	<0.21	<0.45	<1.1	NA	<0.21	<2.8	<2.8	<0.5	NA	<0.21	<0.23	<0.55	NA	<0.23	<0.55	<0.21	<0.23	<2.8
Bromoform	µg/L	~	4.00	~	~	<3.4	NA	<0.30	<0.47	<0.68	NA	<0.30	<1.7	<1.7	<0.5	NA	<0.21	<0.23	<0.34	NA	<0.23	<0.34	<0.30	<0.23	<1.7
Bromomethane	µg/L	~	10.00	~	~	<4.6	NA	<0.56	<0.85	<0.93	NA	<0.56	<2.3	<2.3	<0.5	NA	<0.22	<0.42	<0.46	NA	<0.42	<0.46	<0.56	<0.42	<2.3
Carbon disulfide	µg/L	~	700.00	~	~	<3.3	NA	<0.18	<0.51	<0.66	NA	35.7	3.5 J	<1.7	<1	NA	4.8	2.9	4.2	NA	2.7	<0.33	1.8 J	0.81 J	<1.7
Carbon tetrachloride	µg/L	~	1.00	~	~	<5.4	NA	<0.23	<0.44	<1.1	NA	<0.23	<2.7	<2.7	<0.5	NA	<0.22	<0.22	<0.54	NA	<0.22	<0.54	<0.23	<0.22	<2.7
Chlorobenzene	µg/L	~	50.00	~	~	<1.7	NA	<0.35	<0.37	<0.35	NA	<0.35	<0.87	<0.87	<0.5	NA	<0.23	<0.19	<0.17	NA	<0.19	<0.17	0.82 J	<0.19	<0.87
Chloroethane	µg/L	~	~	~	~	<4.4	NA	<0.39	<0.68	<0.89	NA	<0.39	<2.2	<2.2	<0.5	NA	<0.26	<0.34	<0.44	NA	<0.34	<0.44	<0.39	<0.34	<2.2
Chloroform	µg/L	~	70.00	~	~	<2.3	NA	<0.25	<0.37	<0.45	NA	<0.25	<1.1	<1.1	<0.5	NA	<0.20	<0.19	<0.23	NA	<0.19	<0.23	<0.25	<0.19	<1.1
Chloromethane	µg/L	~	30.00	~	~	<9.6	NA	<0.36	<0.81	<1.9	NA	<0.36	<4.8	<4.8	<0.5	NA	<0.21	<0.41	<0.96	NA	<0.41	<0.96	<0.36	<0.41	<4.8
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<3.1	NA	<0.24	<0.55	<0.62	NA	<0.24	<1.5	<1.5	<0.5	NA	<0.19	<0.27	<0.31	NA	<0.27	<0.31	<0.24	<0.27	<1.5
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<1.9	NA	<0.15	<0.41	<0.37	NA	<0.15	<0.93	<0.93	<0.5	NA	<0.21	<0.21	<0.19	NA	<0.21	<0.19	<0.15	<0.21	<0.93
cyclohexane	µg/L	~	~	~	~	72.7	NA	48.2	30.7	26.9	NA	14.5	5.7 J	18.8 J	20	NA	<0.35	<0.28	<0.73	NA	<0.28	<0.73	1.4 J	0.52 J	<3.6
Dibromochloromethane	µg/L	~	1.00	~	~	<2.3	NA	<0.19	<0.31	<0.45	NA	<0.19	<1.1	<1.1	<0.5	NA	<0.14	<0.15	<0.23	NA	<0.15	<0.23	<0.19	<0.15	<1.1
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<7.0	NA	<0.63	<1.8	<1.4	NA	<0.63	<3.5	<3.5	<0.5	NA	<0.27	<0.90	<0.70	NA	<0.90	<0.70	<0.63	<0.90	<3.5
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	0.38	NA	NA	NA	<0.090	NA	NA	NA	NA	0.31	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	141	30	63.6	34.7	32.2	8 J	0.89 J	<0.98	8.7	5	NA	<0.23	<0.27	<0.20	NA	<0.27	<0.20	2.7	0.34 J	<0.98
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	23.0	NA	9.4	6.3	5.5	NA	2.9	<0.79	2.9 J	2 J	NA	<0.45	<0.23	<0.16	NA	<0.23	<0.16	0.40 J	<0.23	<0.79
methyl acetate	µg/L	~	~	~	~	<15	NA	<1.5	<3.8	<3.1	NA	<1.5	<7.7	<7.7	<1	NA	<1.2	<1.9	<1.5	NA	<1.9	<1.5	<1.5	<1.9	<7.7
methyl cyclohexane	µg/L	~	~	~	~	129	NA	40.4	26.2	20.1	NA	16.6	5.1 J	17.1 J	23	NA	<0.26	<0.22	<0.78	NA	<0.22	<0.78	1.4 J	0.70 J	<3.9
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	<3.4	NA	<0.29	<0.47	<0.68	NA	<0.29	<1.7	<1.7	<0.5	NA	0.56 J	0.67 J	0.83 J	NA	<0.24	<0.34	0.51 J	<0.24	<1.7
Methylene chloride	µg/L	~	3.00	~	~	<10	NA	<0.86	<1.5	<2.0	NA	<0.86	<5.0	<5.0	<0.5	<0.70	<0.70	<0.73	<1.0	<0.70	<0.73	<1.0	<0.86	<0.73	<5.0
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	<2.7	NA	<0.30	<0.54	<0.54	NA	<0.30	<1.4	<1.4	<1	NA	<0.21	<0.27	<0.27	NA	<0.27	<0.27	<0.30	<0.27	<1.4
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<2.3	NA	<0.25	<0.80	<0.47	NA	<0.25	<1.2	<1.2	<0.5	<0.28	<0.28	<0.40	<0.23	<0.28	<0.40	<0.23	<0.25	<0.40	<1.2
Toluene	µg/L	~	600.00	~	~	237	93	21.1	7.5	6.4	22	4.8	<1.1	6.2	2	0.54 J	<0.23	<0.16	<0.23	<0.23	<0.16	<0.23	3.3	<0.16	<1.1
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<3.6	NA	<0.38	<1.3	<0.71	NA	<0.38	<1.8	<1.8	<0.5	NA	<0.21	<0.65	<0.36	NA	<0.65	<0.36	<0.38	<0.65	<1.8
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<2.6	NA	<0.21	<0.37	<0.52	NA	<0.21	<1.3	<1.3	<0.5	NA	<0.19	<0.19	<0.26	NA	<0.19	<0.26	<0.21	<0.19	<1.3
Trichloroethene	µg/L	1751	1.00	~	~	<2.6	NA	<0.50	<0.45	<0.51	NA	<0.50	<1.3	<1.3	<0.5	NA	<0.22	<0.22	<0.26	NA	<0.22	<0.26	<0.50	<0.22	<1.3
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<5.8	NA	<0.33	<0.86	<1.2	NA	<0.33	<2.9	<2.9	<0.5	NA	<0.27	<0.43	<0.58	NA	<0.43	<0.58	<0.33	<0.43	<2.9
Vinyl chloride	µg/L	~	1.00	~	~	<3.3	NA	<0.41	<0.29	<0.65	NA	<0.41	<1.6	<1.6	<0.5	NA	<0.21	<0.15	<0.33	NA	<0.15	<0.33	<0.41	<0.15	<1.6
m/p-xylene	µg/L	~	~	~	~	274	NA	50.3	23.8	20.3	NA	5.9	2.2 J	20.7	9	NA	<0.42	<0.38	<0.42	NA	<0.38	<0.42	3.9	<0.38	<2.1
o-xylene	µg/L	~	~	~	~	215	NA	68.6	37.8	31.8	NA	16.6	3.6 J	31.9	17	NA	<0.24	<0.17	<0.21	NA	<0.17	<0.21	4.6	<0.17	<1.0
xylenes, total	µg/L	~	1000.00	~	~	489	100	119	61.6	52.1	37	22.5	5.8	52.6	26	NA	<0.24	<0.17	<0.21	NA	<0.17	<0.21	8.6	<0.17	<1.0
Total VOC Alkanes	µg/L	~	100.00	~	~	170 J	NA	19 J	37 J	12 J	NA	0	0	27 J	51 J	NA	0	0	0	NA	0	0	0	0	0
Total VOC TICs	µg/L	~	500.00	~	~	2430 J	545	313 J	318 J	215 J	335	0	180 J	425 J	380 J	NA	14150 J	45.9 J	962.9 J	NA	0	0	151.6 J	22 J	150 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-650	GMW-686		GMW-687		GMW-688	GMW-689	GMW-690	GMW-691	GMW-692	GMW-748	GMW-749	GMW-750
Date						2016-12-05	2016-02-05	2016-12-05	2016-02-05	2016-12-08	2017-01-20	2017-01-17	2016-12-12	2017-01-19	2016-12-14	2019-05-09	2019-05-09	2019-05-09
Grid Cell (Figures 2A, 2B and 2C)						B1	C2		C3		B2	B2	B2	B2	B2	B1	B2	C2
Chemical	Units																	
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<2.2	<0.25	<1.1	<0.25	<0.22	<1.1	<0.22	<0.22	<2.2	<0.86	<0.3	<3	<3
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<3.9	<0.21	<2.0	<0.21	<0.39	<2.0	<0.39	<0.39	<3.9	<1.6	<0.2	<2	<2
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	<12	<0.52	<5.8	<0.52	<1.2	<5.8	<1.2	<1.2	<12	<4.6	<0.2	<2	<2
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<2.8	<0.21	<1.4	<0.21	<0.28	<1.4	<0.28	<0.28	<2.8	<1.1	<0.2	<2	<2
1,1-Dichloroethane	µg/L	~	50.00	~	~	<2.1	<0.17	<1.0	<0.17	<0.21	<1.0	<0.21	<0.21	<2.1	<0.82	<0.2	<2	<2
1,1-Dichloroethene	µg/L	~	1.00	~	~	<2.0	<0.51	<1.0	<0.51	<0.20	<1.0	<0.20	<0.20	<2.0	<0.82	<0.2	<2	<2
1,2,3-trichlorobenzene	µg/L	~	~	~	~	<5.0	<0.23	<2.5	<0.23	<0.50	<2.5	<0.50	<0.50	<5.0	<2.0	<0.4	<4	<4
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	<5.0	<0.21	<2.5	<0.21	<0.50	<2.5	<0.50	<0.50	<5.0	<2.0	<0.3	<3	<3
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	<6.9	<0.99	<3.4	<0.99	<0.69	<3.4	<0.69	<0.69	<6.9	<2.7	<0.3	<3	<3
1,2-dibromoethane	µg/L	~	0.03	~	~	<2.2	<0.23	<1.1	<0.23	<0.22	<1.1	<0.22	<0.22	<2.2	<0.89	<0.2	<2	<2
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<2.3	<0.19	<1.2	<0.19	<0.23	<1.2	<0.23	<0.23	<2.3	<0.93	<0.2	<2	<2
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<3.9	<0.18	<2.0	<0.18	<0.39	<2.0	<0.39	<0.39	<3.9	<1.6	<0.3	<3	<3
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<3.3	<0.39	<1.6	<0.39	<0.33	<1.6	<0.33	<0.33	<3.3	<1.3	<0.2	<2	<2
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<1.9	<0.23	<0.97	<0.23	<0.19	<0.97	<0.19	<0.19	<1.9	<0.77	<0.2	<2	<2
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<2.1	<0.27	<1.1	<0.27	<0.21	<1.1	<0.21	<0.21	<2.1	<0.85	<0.2	<2	<2
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	<19	<5.6	<9.5	<5.6	<1.9	24.8 J	4.2 J	<1.9	32.7 J	<7.6	0.7 J	<3	26 J
2-Hexanone	µg/L	~	~	~	~	<15	<1.7	<7.6	<1.7	<1.5	<7.6	<1.5	<1.5	<15	<6.0	<0.3	<3	<3
4-methyl-2-pentanone	µg/L	~	~	~	~	<12	<1.0	<6.0	<1.0	<1.2	<6.0	1.5 J	<1.2	<12	<4.8	<0.5	<5	<5
Acetone	µg/L	32435	6000.00	~	~	<50	5.6 J	<25	<3.3	<5.0	79.0	15.8	<5.0	<50	23.7 J	3 J	<7	140 J
Benzene	µg/L	1535	1.00	~	~	31.3	90.9	97.4	8.6	17.6	109	135	1.0	192	214	<0.2	19	3 J
bromochloromethane	µg/L	~	~	~	~	<4.6	<0.37	<2.3	<0.37	<0.46	<2.3	<0.46	<0.46	<4.6	<1.9	<0.2	<2	<2
Bromodichloromethane	µg/L	~	1.00	~	~	<5.5	<0.23	<2.8	<0.23	<0.55	<2.8	<0.55	<0.55	<5.5	<2.2	<0.2	<2	<2
Bromoform	µg/L	~	4.00	~	~	<3.4	<0.23	<1.7	<0.23	<0.34	<1.7	<0.34	<0.34	<3.4	<1.4	<0.2	<2	<2
Bromomethane	µg/L	~	10.00	~	~	<4.6	<0.42	<2.3	<0.42	<0.46	<2.3	<0.46	<0.46	<4.6	<1.9	<0.3	<3	<3
Carbon disulfide	µg/L	~	700.00	~	~	<3.3	7.6	3.6 J	8.1	1.6 J	<1.7	<0.33	<0.33	<3.3	<1.3	<0.2	<2	<2
Carbon tetrachloride	µg/L	~	1.00	~	~	<5.4	<0.22	<2.7	<0.22	<0.54	<2.7	<0.54	<0.54	<5.4	<2.2	<0.2	<2	<2
Chlorobenzene	µg/L	~	50.00	~	~	<1.7	<0.19	<0.87	<0.19	<0.17	<0.87	<0.17	<0.17	<1.7	<0.70	<0.2	<2	<2
Chloroethane	µg/L	~	~	~	~	<4.4	<0.34	<2.2	<0.34	<0.44	<2.2	<0.44	<0.44	<4.4	<1.8	<0.2	<2	<2
Chloroform	µg/L	~	70.00	~	~	<2.3	<0.19	<1.1	<0.19	<0.23	<1.1	<0.23	<0.23	<2.3	<0.91	<0.2	<2	<2
Chloromethane	µg/L	~	30.00	~	~	<9.6	<0.41	<4.8	<0.41	<0.96	<4.8	<0.96	<0.96	<9.6	<3.9	<0.2	<2	<2
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<3.1	<0.27	<1.5	<0.27	<0.31	<1.5	<0.31	<0.31	<3.1	<1.2	<0.2	<2	<2
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<1.9	<0.21	<0.93	<0.21	<0.19	<0.93	<0.19	<0.19	<1.9	<0.74	<0.2	<2	<2
cyclohexane	µg/L	~	~	~	~	303	52.1	32.5	5.0	7.5	65.7	31.0	13.3	58.0	149	23	10 J	<2
Dibromochloromethane	µg/L	~	1.00	~	~	<2.3	<0.15	<1.1	<0.15	<0.23	<1.1	<0.23	<0.23	<2.3	<0.91	<0.2	<2	<2
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<7.0	<0.90	<3.5	<0.90	<0.70	<3.5	<0.70	<0.70	<7.0	<2.8	<0.2	<2	<2
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	195	71.0	52.0	3.5	5.8	104	38.2	5.6	116	249	<0.4	18	<4
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	91.2	9.9	8.1	1.4	1.5	19.5	7.3	9.7	18.9	32.8	<0.2	2 J	<2
methyl acetate	µg/L	~	~	~	~	<15	<1.9	<7.7	<1.9	<1.5	<7.7	<1.5	<1.5	<15	<6.2	<0.2	<2	<2
methyl cyclohexane	µg/L	~	~	~	~	1490	45.8	31.3	2.6 J	1.9 J	80.0	24.6	19.4	73.0	143	31	6 J	<2
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	<3.4	<0.24	<1.7	1.4	<0.34	<1.7	<0.34	<0.34	<3.4	<1.4	<0.2	<2	<2
Methylene chloride	µg/L	~	3.00	~	~	<10	<0.73	<5.0	<0.73	<1.0	<5.0	<1.0	<1.0	<10	<4.0	<0.3	<3	<3
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	<2.7	<0.27	<1.4	<0.27	<0.27	<1.4	<0.27	<0.27	<2.7	<1.1	<0.2	<2	<2
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<2.3	<0.40	<1.2	<0.40	<0.23	<1.2	<0.23	<0.23	<2.3	<0.93	<0.2	<2	<2
Toluene	µg/L	~	600.00	~	~	103	175	67.1	2.1	3.2	156	87.5	1.2	290	512	0.2 J	37	3 J
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<3.6	<0.65	<1.8	<0.65	<0.36	<1.8	<0.36	<0.36	<3.6	<1.4	<0.2	<2	<2
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<2.6	<0.19	<1.3	<0.19	<0.26	<1.3	<0.26	<0.26	<2.6	<1.0	<0.2	<2	<2
Trichloroethene	µg/L	1751	1.00	~	~	<2.6	<0.22	<1.3	<0.22	<0.26	<1.3	<0.26	<0.26	<2.6	<1.0	<0.2	<2	<2
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<5.8	<0.43	<2.9	<0.43	<0.58	<2.9	<0.58	<0.58	<5.8	<2.3	<0.2	<2	<2
Vinyl chloride	µg/L	~	1.00	~	~	<3.3	<0.15	<1.6	<0.15	<0.33	<1.6	<0.33	<0.33	<3.3	<1.3	<0.2	<2	<2
m/p-xylene	µg/L	~	~	~	~	664	169	96.2	2.5	4.0	294	74.7	12.6	325	602	6	47 J	<10
o-xylene	µg/L	~	~	~	~	289	84.3	60.6	4.1	7.6	163	39.2	10.0	172	322	1	29	<4
xylenes, total	µg/L	~	1000.00	~	~	953	253	157	6.6	11.6	457	114	22.6	497	924	8	76	<10
Total VOC Alkanes	µg/L	~	100.00	~	~	15830 J	38 J	0	0	0	0	220 J	0	0	550 J	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	6480 J	1064 J	351 J	93.8 J	166.5 J	1540 J	464 J	396 J	1633 J	1363 J	180 J	55 J	0

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<2.10	<2.10	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.16	<0.16	<0.16	<0.16	<0.16	<0.34	<0.34	<0.78	<0.78	<0.78
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<2.90	<2.90	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.38	<0.38	<0.38	<0.38	<0.38	<0.26	<0.26	<0.28	<0.28	<0.28
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<3.00	<3.00	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.4	<0.4	<0.40	<0.40	<0.40	<0.45	<0.45	<0.59	<0.59	<0.59
1,1-Dichloroethane	µg/L	~	50.00	~	~	<2.10	<2.10	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.28	<0.28	<0.28	<0.28	<0.28	<0.32	<0.32	<0.55	<0.55	<0.55
1,1-Dichloroethene	µg/L	~	1.00	~	~	<2.50	<2.50	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.36	<0.36	<0.36	<0.36	<0.36	<0.66	<0.66	<0.69	<0.69	<0.69
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<3.50	<3.50	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.61	<0.61	<0.61	<0.61	<0.61	<0.52	<0.52	<0.58	<0.58	<0.58
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<2.20	<2.20	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.13	<0.13	<0.13	<0.13	<0.13	<0.26	<0.26	<0.75	<0.75	<0.75
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<1.90	<1.90	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.3	<0.3	<0.30	<0.30	<0.30	<0.25	<0.25	<0.29	<0.29	<0.29
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<3.00	<3.00	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.49	<0.49	<0.49	<0.49	<0.49	<0.29	<0.29	<0.66	<0.66	<0.66
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<3.50	<3.50	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.23	<0.23	<0.23	<0.23	<0.23	<0.54	<0.54	<0.70	<0.70	<0.70
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<2.30	<2.30	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.25	<0.25	<0.25	<0.25	<0.25	<0.27	<0.27	<0.27	<0.27	<0.27
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<2.30	<2.30	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.26	<0.26	<0.26	<0.26	<0.26	<0.14	<0.14	<0.19	<0.19	<0.19
Bromoform	µg/L	~	4.00	~	~	<3.10	<3.10	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.11	<0.11	<0.11	<0.11	<0.11	<0.25	<0.25	<0.53	<0.53	<0.53
Bromomethane	µg/L	~	10.00	~	~	<3.00	<3.00	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.19	<0.19	<0.19	<0.19	<0.19	<0.56	<0.56	<0.72	<0.72	<0.72
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<1.80	<1.80	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.1	<0.1	<0.10	<0.10	<0.10	<0.33	<0.33	<0.67	<0.67	<0.67
Chlorobenzene	µg/L	~	50.00	~	~	<2.50	<2.50	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.21	<0.21	<0.21	<0.21	<0.21	<0.27	<0.27	<0.31	<0.31	<0.31
Chloroethane	µg/L	~	~	~	~	<3.10	<3.10	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.51	<0.51	<0.51	<0.51	<0.51	<0.82	<0.82	<0.86	<0.86	<0.86
Chloroform	µg/L	~	70.00	~	~	<2.20	<2.20	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.26	<0.26	<0.26	<0.26	<0.26	<0.36	<0.36	<0.60	<0.60	<0.60
Chloromethane	µg/L	~	30.00	~	~	<3.40	<3.40	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.88	<0.88	<0.88	<0.88	<0.88	<0.60	<0.60	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<2.40	<2.40	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.39	<0.39	<0.39	<0.39	<0.39	<0.33	<0.33	<0.89	<0.89	<0.89
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<2.20	<2.20	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.22	<0.22	<0.22	<0.22	<0.22	<0.16	<0.16	<0.55	<0.55	<0.55
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<2.80	<2.80	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.18	<0.18	<0.18	<0.18	<0.18	<0.26	<0.26	<0.28	<0.28	<0.28
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	NA	NA	NA	<5	<5	<5	<5	<5	<5	<5	<5	<0.51	<0.51	<0.51	<0.51	<0.51	<0.53	<0.53	<1.1	<1.1	<1.1
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	120 JN	NA	75 JN	46 JN	75 JN	86 JN	46 JN	53 JN	33 JN	36 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<2.40	<2.40	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.39	<0.39	<0.39	<0.39	<0.39	<0.23	<0.23	<0.60	<0.60	<0.60
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	6.6 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<2.70	<2.70	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.4	<0.4	<0.40	<0.40	<0.40	<0.30	<0.30	<0.39	<0.39	<0.39
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<2.00	<2.00	<0.23	<0.23	18.2	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.21	<0.21	<0.21	<0.21	<0.21	<0.37	<0.37	<0.91	<0.91	<0.91
Toluene	µg/L	~	600.00	~	~	<2.10	<2.10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.14	<0.14	<0.14	<0.14	<0.14	<0.33	<0.33	<0.62	<0.62	<0.62
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<2.20	<2.20	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.44	<0.44	<0.44	<0.44	<0.44	<0.40	<0.40	<0.89	<0.89	<0.89
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<2.20	<2.20	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.2	<0.2	<0.20	<0.20	<0.20	<0.31	<0.31	<0.60	<0.60	<0.60
Trichloroethene	µg/L	1751	1.00	~	~	<2.10	<2.10	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.18	<0.18	<0.18	<0.18	<0.18	<0.27	<0.27	<0.30	<0.30	<0.30
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<2.80	<2.80	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<1.3	<1.3	<1.3
Vinyl chloride	µg/L	~	1.00	~	~	<2.70	<2.70	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<1.6	<1.6	<1.6	<1.6	<1.6	<0.54	<0.54	<1.3	<1.3	<1.3
m/p-xylene	µg/L	~	~	~	~	<4.90	<4.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	<2.50	<2.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	NA	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.53	<0.53	<0.53	<0.53	<0.53	<0.29	<0.29	<1.2	<1.2	<1.2
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	<0	<0	149	45.1	104.5	85.1	103.6	117.8	75.4	70.8	41	54.7	45.9	110	50.1	47.1	135	67.3	68.2	92.7	93.7

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-01-21	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14
Grid Cell (Figures 2A, 2B and 2C)						GMW-650																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.78	<0.78	<0.78	<0.10	<0.10	<0.10	<0.53	<0.53	<0.53	<0.53	<0.53	<0.14	<0.14	NA	<0.14	<0.14	<0.087	<0.087	<0.087	<0.24	<0.24
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.28	<0.28	<0.28	<0.12	<0.12	<0.12	<0.090	<0.090	<0.090	<0.090	<0.090	<0.13	<0.13	NA	<0.13	<0.13	<0.24	<0.24	<0.24	<0.26	<0.26
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.59	<0.59	<0.59	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.34	<0.34	NA	<0.34	<0.34	<0.18	<0.18	<0.18	<0.61	<0.61
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.55	<0.55	<0.55	<0.11	<0.11	<0.11	<0.31	<0.31	<0.31	<0.31	<0.31	<0.12	<0.12	NA	<0.12	<0.12	<0.14	<0.14	<0.14	<0.70	<0.70
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.69	<0.69	<0.69	<0.17	<0.17	<0.17	<0.43	<0.43	<0.43	<0.43	<0.43	<0.35	<0.35	NA	<0.35	<0.35	<0.49	<0.49	<0.49	<0.58	<0.58
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.58	<0.58	<0.58	<0.33	<0.33	<0.33	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	NA	<0.15	<0.15	<0.15	<0.15	<0.15	<0.30	<0.30
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.75	<0.75	<0.75	<0.41	<0.41	<0.41	<0.22	<0.22	<0.22	<0.22	<0.22	<0.17	<0.17	NA	<0.17	<0.17	<0.31	<0.31	<0.31	<0.48	<0.48
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.29	<0.29	<0.29	<0.13	<0.13	<0.13	<0.16	<0.16	<0.16	<0.16	<0.16	<0.17	<0.17	NA	<0.17	<0.17	<0.18	<0.18	<0.18	<0.40	<0.40
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.66	<0.67	<0.67	<0.24	<0.24	<0.24	<0.26	<0.26	<0.26	<0.26	<0.26	<0.30	<0.30	NA	<0.30	<0.30	<0.17	<0.17	<0.17	<0.23	<0.23
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.70	<0.70	<0.70	<0.17	<0.17	<0.17	<0.41	<0.41	<0.41	<0.41	<0.41	<0.27	<0.27	NA	<0.27	<0.27	<0.26	<0.26	<0.26	<0.69	<0.69
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<0.27	<0.27	<0.27	<0.23	<0.23	<0.23	<0.19	<0.19	<0.19	<0.19	<0.19	<0.33	<0.33	<0.37	<0.33	<0.33	<0.11	<0.11	<0.11	<0.18	<0.18
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.65	<0.65	<0.65	<0.65	<0.65	<0.14	<0.14	NA	<0.14	<0.14	<0.13	<0.13	<0.13	<0.14	<0.14
Bromoform	µg/L	~	4.00	~	~	<0.53	<0.53	<0.53	<0.14	<0.14	<0.14	<0.75	<0.75	<0.75	<0.75	<0.75	<0.26	<0.26	NA	<0.26	<0.26	<0.32	<0.32	<0.32	<0.27	<0.27
Bromomethane	µg/L	~	10.00	~	~	<0.72	<0.72	<0.72	<0.20	<0.20	<0.20	<0.54	<0.54	<0.54	<0.54	<0.54	<0.27	<0.27	NA	<0.27	<0.27	<0.23	<0.23	<0.23	<0.75	<0.75
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.67	<0.67	<0.67	<0.095	<0.095	<0.095	<0.58	<0.58	<0.58	<0.58	<0.58	<0.18	<0.18	NA	<0.18	<0.18	<0.10	<0.10	<0.10	<0.30	<0.30
Chlorobenzene	µg/L	~	50.00	~	~	<0.31	<0.31	<0.31	<0.16	<0.16	<0.16	<0.24	<0.24	<0.24	<0.24	<0.24	<0.11	<0.11	NA	<0.11	<0.11	<0.14	<0.14	<0.14	<0.13	<0.13
Chloroethane	µg/L	~	~	~	~	<0.86	<0.87	<0.87	<0.23	<0.23	<0.23	<0.64	<0.64	<0.64	<0.64	<0.64	<0.99	<0.99	NA	<0.99	<0.99	<0.30	<0.30	<0.30	<0.33	<0.33
Chloroform	µg/L	~	70.00	~	~	<0.60	<0.60	<0.60	<0.13	<0.13	<0.13	<0.22	<0.22	<0.22	<0.22	<0.22	<0.13	<0.13	NA	<0.13	<0.13	<0.14	<0.14	<0.14	<0.19	<0.19
Chloromethane	µg/L	~	30.00	~	~	<1.0	<1.0	<1.0	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.25	<0.25	NA	<0.25	<0.25	<0.14	<0.14	<0.14	<0.42	<0.42
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.89	<0.89	<0.89	<0.16	<0.16	<0.16	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	NA	<0.15	<0.15	<0.17	<0.17	<0.17	<0.56	<0.56
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.55	<0.55	<0.55	<0.12	<0.12	<0.12	<0.31	<0.31	<0.31	<0.31	<0.31	<0.17	<0.17	NA	<0.17	<0.17	<0.17	<0.17	<0.17	<0.22	<0.22
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<0.28	<0.28	<0.28	<0.11	<0.11	<0.11	<0.20	<0.20	<0.20	<0.20	<0.20	<0.14	<0.14	NA	<0.14	<0.14	<0.16	<0.16	<0.16	<0.18	<0.18
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<1.1	<1.1	<1.1	<1.0	<1.0	<1.0	<1.2	<1.2	<1.2	<1.2	<1.2	<0.71	<0.71	NA	<0.71	<0.71	<0.33	<0.33	<0.33	<0.76	<0.76
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.60	<0.60	<0.60	<0.12	<0.12	<0.12	<0.65	<0.65	<0.65	<0.65	<0.65	<0.22	<0.22	<0.44	<0.22	<0.22	<0.38	<0.38	<0.38	<0.23	<0.23
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.0	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<0.39	<0.39	<0.39	<0.14	<0.47	<0.47	<0.64	<0.64	<0.64	<0.64	<0.64	<0.13	<0.13	NA	<0.13	<0.13	<0.22	<0.22	<0.22	<0.19	<0.19
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.91	<0.91	<0.91	<0.14	<0.14	<0.14	<0.18	<0.18	<0.18	<0.18	<0.18	<0.26	<0.26	NA	<0.26	<0.26	<0.17	<0.17	<0.17	<0.28	<0.28
Toluene	µg/L	~	600.00	~	~	<0.62	<0.62	<0.62	<0.15	<0.15	<0.15	<0.24	<0.24	<0.24	<0.24	<0.24	<0.11	<0.11	<0.41	<0.11	<0.11	<0.14	<0.14	<0.14	<0.31	<0.31
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.89	<0.89	<0.89	<0.11	<0.11	<0.11	<0.53	<0.53	<0.53	<0.53	<0.53	<0.28	<0.28	NA	<0.28	<0.28	<0.28	<0.28	<0.28	<0.38	<0.38
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.60	<0.60	<0.60	<0.12	<0.12	<0.12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.24	<0.24	NA	<0.24	<0.24	<0.15	<0.15	<0.15	<0.16	<0.16
Trichloroethene	µg/L	1751	1.00	~	~	<0.30	<0.30	<0.30	<0.15	<0.15	<0.15	<0.19	<0.19	<0.19	<0.19	<0.19	<0.20	<0.20	NA	<0.20	<0.20	<0.15	<0.15	<0.15	<0.20	<0.20
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<1.3	<1.3	<1.3	<0.11	<0.11	<0.11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.41	<0.41	NA	<0.41	<0.41	<0.16	<0.16	<0.16	<1.2	<1.2
Vinyl chloride	µg/L	~	1.00	~	~	<1.3	<1.3	<1.3	<0.14	<0.14	<0.14	<0.67	<0.67	<0.67	<0.67	<0.67	<0.27	<0.27	NA	<0.27	<0.27	<0.13	<0.13	<0.13	<0.35	<0.35
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	<1.2	<1.2	<1.2	<0.11	<0.11	<0.11	<0.056	<0.55	<0.55	<0.55	<0.55	<0.26	<0.26	<0.34	<0.26	<0.26	<0.18	<0.18	<0.18	<0.25	<0.25
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	78.1	168	1280	128	87.3	97.9	92.0	75.4 J	115 J	60 J	73.1 J	169.7 J	54.1 J	NA	37.3 J	31.7 J	89 J	98.2 J	49.6 J	112.9 J	77 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2006-10-10	2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.11	<0.11	<0.11	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.16	<0.16
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.10	<0.10	<0.10	<0.13	<0.13	<0.13	<0.13	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.15	<0.15	<0.15	<0.46	<0.46	<0.46	<0.46	<0.21	<0.21	<0.21	<0.21	<0.21	<0.23	<0.23
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.10	<0.10	<0.10	<0.26	<0.26	<0.26	<0.26	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.17	<0.17	<0.17	<0.38	<0.38	<0.38	<0.38	<0.24	<0.24	<0.24	<0.24	<0.24	<0.30	<0.30
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.57	<0.57	<0.57	<0.57	<0.22	<0.22	<0.22	<0.22	<0.22	<0.11	<0.11
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.31	<0.31	<0.31	<0.43	<0.43	<0.43	<0.43	<0.53	<0.53	<0.53	<0.53	<0.53	<0.39	<0.39
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.33	<0.33	<0.33	<0.40	<0.40	<0.40	<0.40	<0.12	<0.12	<0.12	<0.12	<0.12	<0.18	<0.18
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.18	<0.18	<0.18	<0.26	<0.26	<0.26	<0.26	<0.15	<0.15	<0.15	<0.15	<0.15	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.69	<0.69	<0.69	<0.69	<0.69	<0.69	<0.69	<0.21	<0.21	<0.21	<0.32	<0.32	<0.32	<0.32	<0.24	<0.24	<0.24	<0.24	<0.24	<0.22	<0.22
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.12	<0.12	<0.12	<0.15	<0.15	<0.15	<0.15	<0.27	<0.27	<0.27	<0.27	<0.27	<0.28	<0.28
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.13	<0.13	<0.13	<0.18	<0.18	<0.18	<0.18	<0.29	<0.29	<0.29	<0.29	<0.29	<0.15	<0.15
Bromoform	µg/L	~	4.00	~	~	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.19	<0.19	<0.19	<0.26	<0.26	<0.26	<0.26	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
Bromomethane	µg/L	~	10.00	~	~	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.18	<0.18	<0.18	<0.43	<0.43	<0.43	<0.43	<0.23	<0.23	<0.23	<0.23	<0.23	<0.28	<0.28
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.099	<0.099	<0.099	<0.18	<0.18	<0.18	<0.18	<0.14	<0.14	<0.14	<0.14	<0.14	<0.17	<0.17
Chlorobenzene	µg/L	~	50.00	~	~	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.21	<0.21	<0.21	<0.21	<0.26	<0.26	<0.26	<0.26	<0.26	<0.19	<0.19
Chloroethane	µg/L	~	~	~	~	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.20	<0.20	<0.20	<0.48	<0.48	<0.48	<0.48	<0.47	<0.47	<0.47	<0.47	<0.47	<0.40	<0.40
Chloroform	µg/L	~	70.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.094	<0.094	<0.094	<0.18	<0.18	<0.18	<0.18	<0.17	<0.17	<0.17	<0.17	<0.17	<0.15	<0.15
Chloromethane	µg/L	~	30.00	~	~	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.17	<0.17	<0.17	<0.34	<0.34	<0.34	<0.34	<0.16	<0.16	<0.16	<0.16	<0.16	<0.20	<0.20
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.15	<0.15	<0.15	<0.22	<0.22	<0.22	<0.22	<0.24	<0.24	<0.24	<0.24	<0.24	<0.20	<0.20
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.16	<0.16	<0.16	<0.20	<0.20	<0.20	<0.20	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.11	<0.11	<0.11	<0.26	<0.26	<0.26	<0.26	<0.23	<0.23	<0.23	<0.23	<0.23	<0.18	<0.18
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	<0.91	<0.91	<0.91	<1.3	<1.3	<1.3	<1.3	<0.64	<0.64	<0.64	<0.64	<0.64	<0.72	<0.72
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.15	<0.15	<0.15	<0.15	<0.22	<0.22	<0.22	<0.22	<0.22	<0.18	<0.18
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.30	<0.30	<0.30	<0.30	<0.17	<0.17	<0.17	<0.17	<0.17	<0.31	<0.31
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.58	<0.58	<0.58	<0.18	<0.18	<0.18	<0.18	<0.51	<0.51	<0.51	<0.51	<0.51	<0.19	<0.19
Toluene	µg/L	~	600.00	~	~	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.20	<0.20	<0.20	<0.19	<0.19	<0.19	<0.19	<0.24	<0.24	<0.24	<0.24	<0.24	<0.12	<0.12
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.38	<0.38	<0.38	<0.38	<0.38	<0.38	<0.38	<0.18	<0.18	<0.18	<0.20	<0.20	<0.20	<0.20	<0.35	<0.35	<0.35	<0.35	<0.35	<0.27	<0.27
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.21	<0.21	<0.21	<0.31	<0.31	<0.31	<0.31	<0.20	<0.20	<0.20	<0.20	<0.20	<0.18	<0.18
Trichloroethene	µg/L	1751	1.00	~	~	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.45	<0.45	<0.45	<0.14	<0.14	<0.14	<0.14	<0.25	<0.25	<0.25	<0.25	<0.25	<0.17	<0.17
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<0.44	<0.44	<0.44	<0.46	<0.46	<0.46	<0.46	<0.20	<0.20	<0.20	<0.20	<0.20	<0.60	<0.60
Vinyl chloride	µg/L	~	1.00	~	~	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.16	<0.16	<0.16	<0.21	<0.21	<0.21	<0.21	<0.16	<0.16	<0.16	<0.16	<0.16	<0.18	<0.18
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.15	<0.15	<0.15	<0.27	<0.27	<0.27	<0.27	<0.35	<0.35	<0.35	<0.35	<0.35	<0.17	<0.17
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	79.7 J	59.4 J	65.1 J	105.6 J	76.4 J	102.7 J	164 J	55.2 J	32.6 J	98 J	32.9 J	29.7 J	56.5 J	74.1 J	73.9 J	37.8 J	46.9 J	103.5 J	76.6 J	57 J	77 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2012-04-11	2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.16	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.12	<0.12	<0.12	<0.12	<0.086	<0.086	<0.086	<0.086	<0.17	<0.17	<0.17	<0.17	<0.17
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.16	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.13	<0.13	<0.13	<0.13	<0.12	<0.12	<0.12	<0.12	<0.18	<0.18	<0.18	<0.18	<0.18
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.23	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.29	<0.29	<0.29	<0.29	<0.13	<0.13	<0.13	<0.13	<0.18	<0.18	<0.18	<0.18	<0.18
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.14	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.15	<0.12	<0.12	<0.12	<0.12	<0.16	<0.16	<0.16	<0.16	<0.16
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.30	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.24	<0.24	<0.24	<0.24	<0.16	<0.16	<0.16	<0.16	<0.22	<0.22	<0.22	<0.22	<0.22
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.11	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.11	<0.11	<0.11	<0.11	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.39	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.17	<0.17	<0.17	<0.17	<0.090	<0.090	<0.090	<0.090	<0.21	<0.21	<0.21	<0.21	<0.21
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.18	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.20	<0.20	<0.20	<0.20	<0.11	<0.11	<0.11	<0.11	<0.17	<0.17	<0.17	<0.17	<0.17
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.20	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.11	<0.11	<0.11	<0.11	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.22	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11	<0.13	<0.13	<0.13	<0.13	<0.13
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<0.28	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.12	<0.12	<0.12	<0.12	<0.10	<0.10	<0.10	<0.10	0.27 J	<0.11	0.45 J	<0.11	<0.11
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<0.15	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.18	<0.18	<0.18	<0.18	<0.10	<0.10	<0.10	<0.10	<0.14	<0.14	<0.14	<0.14	<0.14
Bromoform	µg/L	~	4.00	~	~	<0.19	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.15	<0.15	<0.15	<0.15	<0.17	<0.17	<0.17	<0.17	<0.15	<0.15	<0.15	<0.15	<0.15
Bromomethane	µg/L	~	10.00	~	~	<0.28	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.32	<0.32	<0.32	<0.32	<0.57	<0.57	<0.57	<0.57	<0.20	<0.20	<0.20	<0.20	<0.20
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.17	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.16	<0.16	<0.16	<0.16	<0.096	<0.096	<0.096	<0.096	<0.19	<0.19	<0.19	<0.19	<0.19
Chlorobenzene	µg/L	~	50.00	~	~	<0.19	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.12	<0.12	<0.12	<0.12	<0.093	<0.093	<0.093	<0.093	<0.12	<0.12	<0.12	<0.12	<0.12
Chloroethane	µg/L	~	~	~	~	<0.40	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.45	<0.45	<0.45	<0.45	<0.21	<0.21	<0.21	<0.21	<0.19	<0.19	<0.19	<0.19	<0.19
Chloroform	µg/L	~	70.00	~	~	<0.15	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.14	<0.14	<0.14	<0.14	<0.091	<0.091	<0.091	<0.091	<0.11	<0.11	<0.11	<0.11	<0.11
Chloromethane	µg/L	~	30.00	~	~	<0.20	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.16	<0.16	<0.16	<0.16	<0.11	<0.11	<0.11	<0.11	<0.22	<0.22	<0.22	<0.22	<0.22
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.20	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.23	<0.23	<0.23	<0.23	<0.12	<0.12	<0.12	<0.12	<0.30	<0.30	<0.30	<0.30	<0.30
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.17	<0.17	<0.17	<0.17	<0.12	<0.12	<0.12	<0.12	<0.16	<0.16	<0.16	<0.16	<0.16
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<0.18	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.22	<0.22	<0.22	<0.22	<0.22
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<0.72	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.46	<0.46	<0.46	<0.46	<0.29	<0.29	<0.29	<0.29	<0.54	<0.54	<0.54	<0.54	<0.54
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.093	<0.093	<0.093	<0.093	<0.22	<0.22	<0.22	<0.22	<0.11	<0.11	<0.11	<0.11	<0.11
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<0.31	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.20	<0.20	<0.20	<0.20	<0.22	<0.22	<0.22	<0.22	<0.16	<0.16	<0.16	<0.16	<0.16
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.17	<0.17	<0.17	<0.17	<0.14	<0.14	<0.14	<0.14	<0.17	<0.17	<0.17	<0.17	<0.17
Toluene	µg/L	~	600.00	~	~	<0.12	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.15	<0.15	<0.15	<0.15	<0.25	<0.25	<0.25	<0.25	<0.12	<0.12	<0.12	<0.12	<0.12
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.27	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.24	<0.24	<0.24	<0.24	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.18	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.16	<0.16	<0.16	<0.16	<0.15	<0.15	<0.15	<0.15	<0.17	<0.17	<0.17	<0.17	<0.17
Trichloroethene	µg/L	1751	1.00	~	~	<0.17	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.17	<0.17	<0.17	<0.17	<0.12	<0.12	<0.12	<0.12	<0.16	<0.16	<0.16	<0.16	<0.16
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<0.60	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.31	<0.31	<0.31	<0.31	<0.20	<0.20	<0.20	<0.20	<0.55	<0.55	<0.55	<0.55	<0.55
Vinyl chloride	µg/L	~	1.00	~	~	<0.18	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.22	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.19	<0.19	<0.19	<0.19	<0.19
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	<0.17	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.12	<0.12	<0.12	<0.12	<0.22	<0.22	<0.22	<0.22	<0.24	<0.24	<0.24	<0.24	<0.24
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total VOC TICs	µg/L	~	500.00	~	~	103.9 J	21.2 J	70.9 J	28 J	41.1 J	17 J	21.5 J	19 J	35 J	28.6 J	78.8 J	60.4 J	70.5 J	107.3 J	56.4 J	231.1 J	169.8 J	124.9 J	270.3 J	150 J	194.7 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<2.10	<2.10	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.16	<0.16	<0.16	<0.16	<0.16	<0.34	<0.34	<0.78	<0.78	<0.78
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<2.90	<2.90	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.38	<0.38	<0.38	<0.38	<0.38	<0.26	<0.26	<0.28	<0.28	<0.28
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<3.00	<3.00	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.4	<0.4	<0.40	<0.40	<0.40	<0.45	<0.45	<0.59	<0.59	<0.59
1,1-Dichloroethane	µg/L	~	50.00	~	~	<2.10	<2.10	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.28	<0.28	<0.28	<0.28	<0.28	<0.32	<0.32	<0.55	<0.55	<0.55
1,1-Dichloroethene	µg/L	~	1.00	~	~	<2.50	<2.50	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.36	<0.36	<0.36	<0.36	<0.36	<0.66	<0.66	<0.69	<0.69	<0.69
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<3.50	<3.50	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.61	<0.61	<0.61	<0.61	<0.61	<0.52	<0.52	<0.58	<0.58	<0.58
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<2.20	<2.20	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53	<0.13	<0.13	<0.13	<0.13	<0.13	<0.26	<0.26	<0.75	<0.75	<0.75
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<1.90	<1.90	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.3	<0.3	<0.30	<0.30	<0.30	<0.25	<0.25	<0.29	<0.29	<0.29
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<3.00	<3.00	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.49	<0.49	<0.49	<0.49	<0.49	<0.29	<0.29	<0.66	<0.66	<0.66
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<3.50	<3.50	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.23	<0.23	<0.23	<0.23	<0.23	<0.54	<0.54	<0.70	<0.70	<0.70
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<2.30	<2.30	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.25	<0.25	<0.25	<0.25	<0.25	<0.27	<0.27	<0.27	<0.27	<0.27
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<2.30	<2.30	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.26	<0.26	<0.26	<0.26	<0.26	<0.14	<0.14	<0.19	<0.19	<0.19
Bromoform	µg/L	~	4.00	~	~	<3.10	<3.10	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.11	<0.11	<0.11	<0.11	<0.11	<0.25	<0.25	<0.53	<0.53	<0.53
Bromomethane	µg/L	~	10.00	~	~	<3.00	<3.00	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.19	<0.19	<0.19	<0.19	<0.19	<0.56	<0.56	<0.72	<0.72	<0.72
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<1.80	<1.80	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.1	<0.1	<0.10	<0.10	<0.10	<0.33	<0.33	<0.67	<0.67	<0.67
Chlorobenzene	µg/L	~	50.00	~	~	<2.50	<2.50	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.21	<0.21	<0.21	<0.21	<0.21	<0.27	<0.27	<0.31	<0.31	<0.31
Chloroethane	µg/L	~	~	~	~	<3.10	<3.10	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.51	<0.51	<0.51	<0.51	<0.51	<0.82	<0.82	<0.86	<0.86	<0.86
Chloroform	µg/L	~	70.00	~	~	<2.20	<2.20	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.26	<0.26	<0.26	<0.26	<0.26	<0.36	<0.36	<0.60	<0.60	<0.60
Chloromethane	µg/L	~	30.00	~	~	<3.40	<3.40	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.88	<0.88	<0.88	<0.88	<0.88	<0.60	<0.60	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<2.40	<2.40	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.39	<0.39	<0.39	<0.39	<0.39	<0.33	<0.33	<0.89	<0.89	<0.89
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<2.20	<2.20	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.22	<0.22	<0.22	<0.22	<0.22	<0.16	<0.16	<0.55	<0.55	<0.55
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<2.80	<2.80	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.18	<0.18	<0.18	<0.18	<0.18	<0.26	<0.26	<0.28	<0.28	<0.28
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	NA	NA	NA	<5	<5	<5	<5	<5	<5	<5	<5	<0.51	<0.51	<0.51	<0.51	<0.51	<0.53	<0.53	<1.1	<1.1	<1.1
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	110 JN	NA	94 JN	74 JN	72 JN	46 JN	51 JN	28 JN	21 JN	26 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<2.40	<2.40	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.39	<0.39	<0.39	<0.39	<0.39	<0.23	<0.23	<0.60	<0.60	<0.60
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<2.70	<2.70	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.4	<0.4	<0.40	<0.40	<0.40	<0.30	<0.30	<0.39	1.7	<0.39
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<2.00	<2.00	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.21	<0.21	<0.21	<0.21	<0.21	<0.37	<0.37	<0.91	<0.91	<0.91
Toluene	µg/L	~	600.00	~	~	<2.10	<2.10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.14	<0.14	<0.14	<0.14	<0.14	<0.33	<0.33	<0.62	<0.62	<0.62
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<2.20	<2.20	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.44	<0.44	<0.44	<0.44	<0.44	<0.40	<0.40	<0.89	<0.89	<0.89
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<2.20	<2.20	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.2	<0.2	<0.20	<0.20	<0.20	<0.31	<0.31	<0.60	<0.60	<0.60
Trichloroethene	µg/L	1751	1.00	~	~	<2.10	<2.10	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.18	<0.18	<0.18	<0.18	<0.18	<0.27	<0.27	<0.30	<0.30	<0.30
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<2.80	<2.80	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<0.54	<1.3	<1.3	<1.3
Vinyl chloride	µg/L	~	1.00	~	~	<2.70	<2.70	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<1.6	<1.6	<1.6	<1.6	<1.6	<0.54	<0.54	<1.3	<1.3	<1.3
m/p-xylene	µg/L	~	~	~	~	<4.90	<4.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	<2.50	<2.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	NA	NA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.53	<0.53	<0.53	<0.53	<0.53	<0.29	<0.29	<1.2	<1.2	<1.2
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	<0	<0	144	39.7	143.4	134.9	108.1	867.8	76.1	45.5	32.2	43.5	31.7	104	49.7	69.0	113	102	105	54.0	129

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.78	<0.78	<0.78	<0.10	<0.10	<0.10	<0.53	<0.53	<0.53	<0.53	<0.53	<0.14	<0.14	<0.14	<0.14	<0.087	<0.087	<0.087	<0.24	<0.24	<0.24
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.28	<0.28	<0.28	<0.12	<0.12	<0.12	<0.090	<0.090	<0.090	<0.090	<0.090	<0.13	<0.13	<0.13	<0.13	<0.24	<0.24	<0.24	<0.26	<0.26	<0.26
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.59	<0.59	<0.59	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.34	<0.34	<0.34	<0.34	<0.18	<0.18	<0.18	<0.61	<0.61	<0.61
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.55	<0.55	<0.55	<0.11	<0.11	<0.11	<0.31	<0.31	<0.31	<0.31	<0.31	<0.12	<0.12	<0.12	<0.12	<0.14	<0.14	<0.14	<0.70	<0.70	<0.70
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.69	<0.69	<0.69	<0.17	<0.17	<0.17	<0.43	<0.43	<0.43	<0.43	<0.43	<0.35	<0.35	<0.35	<0.35	<0.49	<0.49	<0.49	<0.58	<0.58	<0.58
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.58	<0.58	<0.58	<0.33	<0.33	<0.33	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.30	<0.30	<0.30
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.75	<0.75	<0.75	<0.41	<0.41	<0.41	<0.22	<0.22	<0.22	<0.22	<0.22	<0.17	<0.17	<0.17	<0.17	<0.31	<0.31	<0.31	<0.48	<0.48	<0.48
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.29	<0.29	<0.29	<0.13	<0.13	<0.13	<0.16	<0.16	<0.16	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.18	<0.18	<0.18	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.66	<0.67	<0.67	<0.24	<0.24	<0.24	<0.26	<0.26	<0.26	<0.26	<0.26	<0.30	<0.30	<0.30	<0.30	<0.17	<0.17	<0.17	<0.23	<0.23	<0.23
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.70	<0.70	<0.70	<0.17	<0.17	<0.17	<0.41	<0.41	<0.41	<0.41	<0.41	<0.27	<0.27	<0.27	<0.27	<0.26	<0.26	<0.26	<0.69	<0.69	<0.69
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<0.27	<0.27	<0.27	<0.23	<0.23	<0.23	<0.19	<0.19	<0.19	<0.19	<0.19	<0.33	<0.33	<0.33	<0.33	<0.11	<0.11	<0.11	<0.18	<0.18	<0.18
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.65	<0.65	<0.65	<0.65	<0.65	<0.14	<0.14	<0.14	<0.14	<0.13	<0.13	<0.13	<0.14	<0.14	<0.14
Bromoform	µg/L	~	4.00	~	~	<0.53	<0.53	<0.53	<0.14	<0.14	<0.14	<0.75	<0.75	<0.75	<0.75	<0.75	<0.26	<0.26	<0.26	<0.26	<0.32	<0.32	<0.32	<0.27	<0.27	<0.27
Bromomethane	µg/L	~	10.00	~	~	<0.72	<0.72	<0.72	<0.20	<0.20	<0.20	<0.54	<0.54	<0.54	<0.54	<0.54	<0.27	<0.27	<0.27	<0.27	<0.23	<0.23	<0.23	<0.75	<0.75	<0.75
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.67	<0.67	<0.67	<0.095	<0.095	<0.095	<0.58	<0.58	<0.58	<0.58	<0.58	<0.18	<0.18	<0.18	<0.18	<0.10	<0.10	<0.10	<0.30	<0.30	<0.30
Chlorobenzene	µg/L	~	50.00	~	~	<0.31	<0.31	<0.31	<0.16	<0.16	<0.16	<0.24	<0.24	<0.24	<0.24	<0.24	<0.11	<0.11	<0.11	<0.11	<0.14	<0.14	<0.14	<0.13	<0.13	<0.13
Chloroethane	µg/L	~	~	~	~	<0.86	<0.87	<0.87	<0.23	<0.23	<0.23	<0.64	<0.64	<0.64	<0.64	<0.64	<0.99	<0.99	<0.99	<0.99	<0.30	<0.30	<0.30	<0.33	<0.33	<0.33
Chloroform	µg/L	~	70.00	~	~	<0.60	<0.60	<0.60	<0.13	<0.13	<0.13	<0.22	<0.22	<0.22	<0.22	<0.22	<0.13	<0.13	<0.13	<0.13	<0.14	<0.14	<0.14	<0.19	<0.19	<0.19
Chloromethane	µg/L	~	30.00	~	~	<1.0	<1.0	<1.0	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.25	<0.25	<0.25	<0.25	<0.14	<0.14	<0.14	<0.42	<0.42	<0.42
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.89	<0.89	<0.89	<0.16	<0.16	<0.16	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.15	<0.17	<0.17	<0.17	<0.56	<0.56	<0.56
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.55	<0.55	<0.55	<0.12	<0.12	<0.12	<0.31	<0.31	<0.31	<0.31	<0.31	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.22	<0.22	<0.22
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<0.28	<0.28	<0.28	<0.11	<0.11	<0.11	<0.20	<0.20	<0.20	<0.20	<0.20	<0.14	<0.14	<0.14	<0.14	<0.16	<0.16	<0.16	<0.18	<0.18	<0.18
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<1.1	<1.1	<1.1	<1.0	<1.0	<1.0	<1.2	<1.2	<1.2	<1.2	<1.2	<0.71	<0.71	<0.71	<0.71	<0.33	<0.33	<0.33	<0.76	<0.76	<0.76
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.60	<0.60	<0.60	<0.12	<0.12	<0.12	<0.65	<0.65	<0.65	<0.65	<0.65	<0.22	<0.22	<0.22	<0.22	<0.38	<0.38	<0.38	<0.23	<0.23	<0.23
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<0.39	<0.39	<0.39	<0.14	<0.47	<0.47	<0.64	<0.64	<0.64	<0.64	<0.64	<0.13	<0.13	<0.13	<0.13	<0.22	<0.22	<0.22	<0.19	<0.19	<0.19
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.91	<0.91	<0.91	<0.14	<0.14	<0.14	<0.18	<0.18	<0.18	<0.18	<0.18	<0.26	<0.26	<0.26	<0.26	<0.17	<0.17	<0.17	<0.28	<0.28	<0.28
Toluene	µg/L	~	600.00	~	~	<0.62	<0.62	<0.62	<0.15	<0.15	<0.15	<0.24	<0.24	<0.24	<0.24	<0.24	<0.11	<0.11	<0.11	<0.11	<0.14	<0.14	<0.14	<0.31	<0.31	<0.31
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.89	<0.89	<0.89	<0.11	<0.11	<0.11	<0.53	<0.53	<0.53	<0.53	<0.53	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.38	<0.38	<0.38
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.60	<0.60	<0.60	<0.12	<0.12	<0.12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.24	<0.24	<0.24	<0.24	<0.15	<0.15	<0.15	<0.16	<0.16	<0.16
Trichloroethene	µg/L	1751	1.00	~	~	<0.30	<0.30	<0.30	<0.15	<0.15	<0.15	<0.19	<0.19	<0.19	<0.19	<0.19	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.20	<0.20	<0.20
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<1.3	<1.3	<1.3	<0.11	<0.11	<0.11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.41	<0.41	<0.41	<0.41	<0.16	<0.16	<0.16	<1.2	<1.2	<1.2
Vinyl chloride	µg/L	~	1.00	~	~	<1.3	<1.3	<1.3	<0.14	<0.14	<0.14	<0.67	<0.67	<0.67	<0.67	<0.67	<0.27	<0.27	<0.27	<0.27	<0.13	<0.13	<0.13	<0.35	<0.35	<0.35
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	<1.2	<1.2	<1.2	<0.11	<0.11	<0.11	<0.056	<0.55	<0.55	<0.55	<0.55	<0.26	<0.26	<0.26	<0.26	<0.18	<0.18	<0.18	<0.25	<0.25	<0.25
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	73.4	226	940	184	138	113	87.8	63.5 J	84.3 J	69 J	55.9 J	94.2 J	63.1 J	25.4 J	21.4 J	75.5 J	112 J	79.7 J	141 J	70.6 J	78.6 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.11	<0.11	<0.11	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.16	<0.16	<0.16
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.10	<0.10	<0.10	<0.13	<0.13	<0.13	<0.13	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	<0.15	<0.15	<0.15	<0.46	<0.46	<0.46	<0.46	<0.21	<0.21	<0.21	<0.21	<0.21	<0.23	<0.23	<0.23
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.10	<0.10	<0.10	<0.26	<0.26	<0.26	<0.26	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.17	<0.17	<0.17	<0.38	<0.38	<0.38	<0.38	<0.24	<0.24	<0.24	<0.24	<0.24	<0.30	<0.30	<0.30
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.57	<0.57	<0.57	<0.57	<0.22	<0.22	<0.22	<0.22	<0.22	<0.11	<0.11	<0.11
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.31	<0.31	<0.31	<0.43	<0.43	<0.43	<0.43	<0.53	<0.53	<0.53	<0.53	<0.53	<0.39	<0.39	<0.39
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.33	<0.33	<0.33	<0.40	<0.40	<0.40	<0.40	<0.12	<0.12	<0.12	<0.12	<0.12	<0.18	<0.18	<0.18
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.18	<0.18	<0.18	<0.26	<0.26	<0.26	<0.26	<0.15	<0.15	<0.15	<0.15	<0.15	<0.20	<0.20	<0.20
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.69	<0.69	<0.69	<0.69	<0.69	<0.69	<0.21	<0.21	<0.21	<0.32	<0.32	<0.32	<0.32	<0.24	<0.24	<0.24	<0.24	<0.24	<0.22	<0.22	<0.22
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.12	<0.12	<0.12	<0.15	<0.15	<0.15	<0.15	<0.27	<0.27	<0.27	<0.27	<0.27	<0.28	<0.28	<0.28
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.13	<0.13	<0.13	<0.18	<0.18	<0.18	<0.18	<0.29	<0.29	<0.29	<0.29	<0.29	<0.15	<0.15	<0.15
Bromoform	µg/L	~	4.00	~	~	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.19	<0.19	<0.19	<0.26	<0.26	<0.26	<0.26	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
Bromomethane	µg/L	~	10.00	~	~	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.18	<0.18	<0.18	<0.43	<0.43	<0.43	<0.43	<0.23	<0.23	<0.23	<0.23	<0.23	<0.28	<0.28	<0.28
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.099	<0.099	<0.099	<0.18	<0.18	<0.18	<0.18	<0.14	<0.14	<0.14	<0.14	<0.14	<0.17	<0.17	<0.17
Chlorobenzene	µg/L	~	50.00	~	~	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.21	<0.21	<0.21	<0.21	<0.26	<0.26	<0.26	<0.26	<0.26	<0.19	<0.19	<0.19
Chloroethane	µg/L	~	~	~	~	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.20	<0.20	<0.20	<0.48	<0.48	<0.48	<0.48	<0.47	<0.47	<0.47	<0.47	<0.47	<0.40	<0.40	<0.40
Chloroform	µg/L	~	70.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.094	<0.094	<0.094	<0.18	<0.18	<0.18	<0.18	<0.17	<0.17	<0.17	<0.17	<0.17	<0.15	<0.15	<0.15
Chloromethane	µg/L	~	30.00	~	~	<0.42	<0.42	<0.42	<0.42	<0.42	<0.42	<0.17	<0.17	<0.17	<0.34	<0.34	<0.34	<0.34	<0.16	<0.16	<0.16	<0.16	<0.16	<0.20	<0.20	<0.20
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.15	<0.15	<0.15	<0.22	<0.22	<0.22	<0.22	<0.24	<0.24	<0.24	<0.24	<0.24	<0.20	<0.20	<0.20
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.16	<0.16	<0.16	<0.20	<0.20	<0.20	<0.20	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.11	<0.11	<0.11	<0.26	<0.26	<0.26	<0.26	<0.23	<0.23	<0.23	<0.23	<0.23	<0.18	<0.18	<0.18
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	<0.91	<0.91	<0.91	<1.3	<1.3	<1.3	<1.3	<0.64	<0.64	<0.64	<0.64	<0.64	<0.72	<0.72	<0.72
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.15	<0.15	<0.15	<0.15	<0.22	<0.22	<0.22	<0.22	<0.22	<0.18	<0.18	<0.18
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.30	<0.30	<0.30	<0.30	<0.17	<0.17	<0.17	<0.17	<0.17	<0.31	<0.31	<0.31
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.58	<0.58	<0.58	<0.18	<0.18	<0.18	<0.18	<0.51	<0.51	<0.51	<0.51	<0.51	<0.19	<0.19	<0.19
Toluene	µg/L	~	600.00	~	~	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.20	<0.20	<0.20	<0.19	<0.19	<0.19	<0.19	<0.24	<0.24	<0.24	<0.24	<0.24	<0.12	<0.12	<0.12
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.38	<0.38	<0.38	<0.38	<0.38	<0.38	<0.18	<0.18	<0.18	<0.20	<0.20	<0.20	<0.20	<0.35	<0.35	<0.35	<0.35	<0.35	<0.27	<0.27	<0.27
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.21	<0.21	<0.21	<0.31	<0.31	<0.31	<0.31	<0.20	<0.20	<0.20	<0.20	<0.20	<0.18	<0.18	<0.18
Trichloroethene	µg/L	1751	1.00	~	~	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.45	<0.45	<0.45	<0.14	<0.14	<0.14	<0.14	<0.25	<0.25	<0.25	<0.25	<0.25	<0.17	<0.17	<0.17
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<0.44	<0.44	<0.44	<0.46	<0.46	<0.46	<0.46	<0.20	<0.20	<0.20	<0.20	<0.20	<0.60	<0.60	<0.60
Vinyl chloride	µg/L	~	1.00	~	~	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.16	<0.16	<0.16	<0.21	<0.21	<0.21	<0.21	<0.16	<0.16	<0.16	<0.16	<0.16	<0.18	<0.18	<0.18
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.15	<0.15	<0.15	<0.27	<0.27	<0.27	<0.27	<0.35	<0.35	<0.35	<0.35	<0.35	<0.17	<0.17	<0.17
Total VOC Alkanes	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOC TICs	µg/L	~	500.00	~	~	48.4 J	96.7 J	125.1 J	167 J	58.3 J	102.1 J	29 J	14 J	33.4 J	4.8 J	4.7 J	9.5 J	13 J	11 J	9.3 J	14 J	36.7 J	5.7 J	4.1 J	0	6.1 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																			
Date						2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)						B1																			
Chemical	Units																								
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.12	<0.12	<0.12	<0.12	<0.086	<0.086	<0.086	<0.086	<0.17	<0.17	<0.17	<0.17	<0.17
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.13	<0.13	<0.13	<0.13	<0.12	<0.12	<0.12	<0.12	<0.18	<0.18	<0.18	<0.18	<0.18
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.29	<0.29	<0.29	<0.29	<0.13	<0.13	<0.13	<0.13	<0.18	<0.18	<0.18	<0.18	<0.18
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.15	<0.12	<0.12	<0.12	<0.12	<0.16	<0.16	<0.16	<0.16	<0.16
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.24	<0.24	<0.24	<0.24	<0.16	<0.16	<0.16	<0.16	<0.22	<0.22	<0.22	<0.22	<0.22
1,2,3-trichlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-dibromoethane	µg/L	~	0.03	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.11	<0.11	<0.11	1.7	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.17	<0.17	<0.17	<0.17	<0.090	<0.090	<0.090	<0.090	<0.21	<0.21	<0.21	<0.21	<0.21
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.20	<0.20	<0.20	<0.20	<0.11	<0.11	<0.11	<0.11	<0.17	<0.17	<0.17	<0.17	<0.17
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.11	<0.11	<0.11	<0.11	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11	<0.13	<0.13	<0.13	<0.13	<0.13
1-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-butanone	µg/L	302728	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-methyl-2-pentanone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	µg/L	32435	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	µg/L	1535	1.00	~	~	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.12	<0.12	<0.12	<0.12	<0.10	<0.10	<0.10	<0.10	<0.11	<0.11	<0.11	<0.11	<0.11
bromochloromethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	µg/L	~	1.00	~	~	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.18	<0.18	<0.18	<0.18	<0.10	<0.10	<0.10	<0.10	<0.14	<0.14	<0.14	<0.14	<0.14
Bromoform	µg/L	~	4.00	~	~	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.15	<0.15	<0.15	<0.15	<0.17	<0.17	<0.17	<0.17	<0.15	<0.15	<0.15	<0.15	<0.15
Bromomethane	µg/L	~	10.00	~	~	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.32	<0.32	<0.32	<0.32	<0.57	<0.57	<0.57	<0.57	<0.20	<0.20	<0.20	<0.20	<0.20
Carbon disulfide	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.16	<0.16	<0.16	<0.16	<0.096	<0.096	<0.096	<0.096	<0.19	<0.19	<0.19	<0.19	<0.19
Chlorobenzene	µg/L	~	50.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.12	<0.12	<0.12	<0.12	<0.093	<0.093	<0.093	<0.093	<0.12	<0.12	<0.12	<0.12	<0.12
Chloroethane	µg/L	~	~	~	~	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.45	<0.45	<0.45	<0.45	<0.21	<0.21	<0.21	<0.21	<0.19	<0.19	<0.19	<0.19	<0.19
Chloroform	µg/L	~	70.00	~	~	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.14	<0.14	<0.14	<0.14	<0.091	<0.091	<0.091	<0.091	<0.11	<0.11	<0.11	<0.11	<0.11
Chloromethane	µg/L	~	30.00	~	~	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.16	<0.16	<0.16	<0.16	<0.11	<0.11	<0.11	<0.11	<0.22	<0.22	<0.22	<0.22	<0.22
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.23	<0.23	<0.23	<0.23	<0.12	<0.12	<0.12	<0.12	<0.30	<0.30	<0.30	<0.30	<0.30
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.17	<0.17	<0.17	<0.17	<0.12	<0.12	<0.12	<0.12	<0.16	<0.16	<0.16	<0.16	<0.16
cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	µg/L	~	1.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.22	<0.22	<0.22	<0.22	<0.22
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.46	<0.46	<0.46	<0.46	<0.29	<0.29	<0.29	<0.29	<0.54	<0.54	<0.54	<0.54	<0.54
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.093	<0.093	<0.093	<0.093	<0.22	<0.22	<0.22	<0.22	<0.11	<0.11	<0.11	<0.11	<0.11
Hexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isopropylbenzene	µg/L	~	700.000	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl acetate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
methyl cyclohexane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	µg/L	~	3.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.20	<0.20	<0.20	<0.20	<0.22	<0.22	<0.22	<0.22	<0.16	<0.16	<0.16	<0.16	<0.16
n-Propylbenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.17	<0.17	<0.17	<0.17	<0.14	<0.14	<0.14	<0.14	<0.17	<0.17	<0.17	<0.17	<0.17
Toluene	µg/L	~	600.00	~	~	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.15	<0.15	<0.15	<0.15	<0.25	<0.25	<0.25	<0.25	<0.12	<0.12	<0.12	<0.12	<0.12
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.24	<0.24	<0.24	<0.24	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.16	<0.16	<0.16	<0.16	<0.15	<0.15	<0.15	<0.15	<0.17	<0.17	<0.17	<0.17	<0.17
Trichloroethene	µg/L	1751	1.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.17	<0.17	<0.17	<0.17	<0.12	<0.12	<0.12	<0.12	<0.16	<0.16	<0.16	<0.16	<0.16
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.31	<0.31	<0.31	<0.31	<0.20	<0.20	<0.20	<0.20	<0.55	<0.55	<0.55	<0.55	<0.55
Vinyl chloride	µg/L	~	1.00	~	~	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.22	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.19	<0.19	<0.19	<0.19	<0.19
m/p-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xylenes, total	µg/L	~	1000.00	~	~	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.12	<0.12	<0.12	<0.12	<0.22	<0.22	<0.22	<0.22	<0.24	<0.24	<0.24	<0.24	<0.24
Total VOC Alkanes	µg/L	~	100.00	~	~	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total VOC TICs	µg/L	~	500.00	~	~	0	8.3 J	3.1 J	0	0	0	0	5.1 J	33 J	6.2 J	3.2 J	23 J	187.4 J	168.5 J	339 J	215.6 J	306 J	320.9 J	270.9 J	229.2 J

TABLE 2A
GROUND WATER ANALYTICAL DATA
VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-16A
Date						2014-09-18
Grid Cell (Figures 2A, 2B and 2C)						B1
Chemical	Units					
1,1,1-Trichloroethane	µg/L	649	30.00	~	~	<0.32
1,1,2,2-Tetrachloroethane	µg/L	~	1.00	~	~	<0.39
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	~	~	~	~	<0.45
1,1,2-Trichloroethane	µg/L	~	3.00	~	~	<0.28
1,1-Dichloroethane	µg/L	~	50.00	~	~	<0.35
1,1-Dichloroethene	µg/L	~	1.00	~	~	<0.50
1,2,3-trichlorobenzene	µg/L	~	~	~	~	<0.26
1,2,4-trichlorobenzene	µg/L	~	9.00	~	~	<0.22
1,2-dibromo-3-chloropropane	µg/L	~	~	~	~	<1.2
1,2-dibromoethane	µg/L	~	0.03	~	~	<0.23
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.16
1,2-Dichloroethane	µg/L	2141	2.00	~	~	<0.30
1,2-dichloroethylene, total	µg/L	~	70.00	~	~	NA
1,2-Dichloropropane	µg/L	843	1.00	~	~	<0.43
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.26
1,4-Dichlorobenzene	µg/L	~	75.00	~	~	<0.24
1-Butanol	µg/L	~	~	~	~	NA
2-Butanol	µg/L	~	~	~	~	NA
2-butanone	µg/L	302728	300.00	~	~	<2.5
2-Hexanone	µg/L	~	~	~	~	<1.7
4-methyl-2-pentanone	µg/L	~	~	~	~	<1.1
Acetone	µg/L	32435	6000.00	~	~	<2.6
Benzene	µg/L	1535	1.00	~	~	<0.21
bromochloromethane	µg/L	~	~	~	~	<0.49
Bromodichloromethane	µg/L	~	1.00	~	~	<0.28
Bromoform	µg/L	~	4.00	~	~	<0.31
Bromomethane	µg/L	~	10.00	~	~	<0.39
Carbon disulfide	µg/L	~	700.00	~	~	1.4 J
Carbon tetrachloride	µg/L	~	1.00	~	~	<0.24
Chlorobenzene	µg/L	~	50.00	~	~	<0.27
Chloroethane	µg/L	~	~	~	~	<0.56
Chloroform	µg/L	~	70.00	~	~	<0.20
Chloromethane	µg/L	~	30.00	~	~	<0.33
cis-1,2-Dichloroethene	µg/L	~	70.00	~	~	<0.33
cis-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.28
cyclohexane	µg/L	~	~	~	~	<0.37
Dibromochloromethane	µg/L	~	1.00	~	~	<0.25
Dichlorodifluoromethane	µg/L	~	1000.00	~	~	<0.73
Diisopropyl Ether (DIPE)	µg/L	~	~	~	~	NA
Ethane	µg/L	~	~	~	~	NA
Ethylbenzene	µg/L	~	700.00	~	~	<0.40
Hexane	µg/L	~	~	~	~	NA
isopropylbenzene	µg/L	~	700.000	~	~	<0.26
methyl acetate	µg/L	~	~	~	~	<3.1
methyl cyclohexane	µg/L	~	~	~	~	<0.22
Methyl Tertiary Butyl Ether	µg/L	1369	70.00	53,000	18,000	10.4
Methylene chloride	µg/L	~	3.00	~	~	<0.81
n-Propylbenzene	µg/L	~	~	~	~	NA
Styrene	µg/L	~	100.00	~	~	<0.26
tert-Butyl alcohol	µg/L	~	100.00	~	~	NA
Tetrachloroethene	µg/L	93	1.00	~	~	<0.35
Toluene	µg/L	~	600.00	~	~	<0.22
trans-1,2-Dichloroethene	µg/L	~	100.00	~	~	<0.51
trans-1,3-Dichloropropene	µg/L	~	1.00	~	~	<0.32
Trichloroethene	µg/L	1751	1.00	~	~	<0.25
Trichlorofluoromethane	µg/L	~	2000.00	~	~	<0.28
Vinyl chloride	µg/L	~	1.00	~	~	<0.17
m/p-xylene	µg/L	~	~	~	~	<0.45
o-xylene	µg/L	~	~	~	~	0.34 J
xylenes, total	µg/L	~	1000.00	~	~	0.34 J
Total VOC Alkanes	µg/L	~	100.00	~	~	0
Total VOC TICs	µg/L	~	500.00	~	~	377.5 J

Notes:

~	No standard exists for this compound in this classification.
VOC	Volatile organic compound
TICs	Tentatively identified compounds
µg/L	Micrograms per liter
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
N	Presumptive evidence of a compound
B	Analyte detected in associated method blank
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
GWQC	NJDEP Ground Water Quality Criteria
GWRS	NJDEP Ground Water Remediation Standard
ESC	NJDEP Ecological Screening Criteria

Yellow highlight Concentration exceeds the Class II-A GWRS

Class III-B GWQC conditionally approved by the NJDEP on December 13, 2002.

If more than one applicable GWRS, GWQC or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.

If no site-specific Class IIIB GWQC exists, analytical results are compared to the Class IIA GWRS.

ESCs do not apply to monitoring wells EB-3S, EB-4S, GMW-228, GMW-688, GMW-690 and GMW-691.

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	AWP-600	AWP-601	AWP-602	AWP-603	AWP-604	EB-2S																	
Date						2019-05-08	2019-05-07	2019-05-07	2019-05-07	2019-05-08	1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						B3	C3	C3	C3	B3	B1																	
Chemical	Units																											
2-chlorophenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.84
4-chloro-3-methylphenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.91
2,4-dichlorophenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.3
2,4-dimethylphenol	µg/L	~	~	~	~	<3	<3	<3	<3	<3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.5
2,4-dinitrophenol	µg/L	~	~	~	~	<14	<14	<14	<14	<14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.6
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	<8	<8	<8	<8	<8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.90
2-nitrophenol	µg/L	~	~	~	~	<3	<3	<3	<3	<3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.98
4-nitrophenol	µg/L	~	~	~	~	<10	<10	<10	<10	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2
phenol	µg/L	99467658	2000.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	20.00	30.00	<0.40
2,4,5-trichlorophenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.4
2,4,6-trichlorophenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.94
Acenaphthene	µg/L	~	400.00	~	~	<0.1	<0.1	<0.1	<0.1	0.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.19
Acenaphthylene	µg/L	~	100.00	~	~	<0.1	0.3 J	<0.1	<0.1	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.14
Anthracene	µg/L	~	2000.00	~	~	3	0.3 J	<0.1	<0.1	0.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
benzo[a]anthracene	µg/L	~	0.10	~	~	0.5	0.6	0.06	0.01 J	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.023
benzo[a]pyrene	µg/L	~	0.10	~	~	0.4	0.7	0.06	0.01 J	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.034
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.044
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	0.4 J	0.8	<0.1	<0.1	0.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.35
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.034
2-chloronaphthalene	µg/L	~	600.00	~	~	<0.4	<0.4	<0.4	<0.4	<0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.24
4-bromophenyl phenyl ether	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.41
butyl benzyl phthalate	µg/L	~	100.00	~	~	<2	<2	<2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.47
4-chloroaniline	µg/L	~	30.00	~	~	<4	<4	<4	<4	<4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.35
Carbazole	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.23
Chrysene	µg/L	~	5.00	~	~	<0.1	1	<0.1	<0.1	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.18
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.41
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.37
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<0.21
2,4-dinitrotoluene	µg/L	~	10.00	~	~	<1	<1	<1	<1	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.56
2,6-dinitrotoluene	µg/L	~	10.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.49
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	<3	<3	<3	<3	<3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.52
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Dibenzofuran	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
di-n-butyl phthalate	µg/L	~	700.00	~	~	<2	<2	<2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.51
di-n-octyl phthalate	µg/L	~	100.00	~	~	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.24
diethyl phthalate	µg/L	~	6000.00	~	~	<2	<2	<2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.27

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	AWP-600	AWP-601	AWP-602	AWP-603	AWP-604	EB-2S																
Date						2019-05-08	2019-05-07	2019-05-07	2019-05-07	2019-05-08	1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						B3	C3	C3	C3	B3	B1																
Chemical	Units																										
dimethyl phthalate	µg/L	~	~	~	~	<2	<2	<2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	6 J	5 J	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.7
Fluoranthene	µg/L	~	300.00	~	~	<0.1	0.6	<0.1	<0.1	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.17
Fluorene	µg/L	~	300.00	~	~	<0.1	<0.1	<0.1	<0.1	0.4 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.17
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.011
hexachlorobutadiene	µg/L	~	1.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.018
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.8
hexachloroethane	µg/L	~	7.00	~	~	<1	<1	<1	<1	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.40
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.039
isophorone	µg/L	~	40.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28
2-Methylnaphthalene	µg/L	~	30.0	~	~	<0.1	0.3 J	<0.1	<0.1	0.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21
2-nitroaniline	µg/L	~	~	~	~	<2	<2	<2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28
3-nitroaniline	µg/L	~	~	~	~	<3	<3	<3	<3	<3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.39
4-nitroaniline	µg/L	~	~	~	~	<0.9	<0.9	<0.9	<0.9	<0.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.45
Naphthalene (extractable)	µg/L	6487	300.00	~	~	<0.1	0.2 J	<0.1	<0.1	0.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.24
nitrobenzene	µg/L	~	6.00	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.66
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	<0.7	<0.7	<0.7	<0.7	<0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.49
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	<0.7	<0.7	<0.7	<0.7	<0.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.23
Phenanthrene	µg/L	~	~	~	~	<0.1	0.2 J	<0.1	<0.1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.18
Pyrene	µg/L	~	200.00	~	~	4	2	0.1 J	<0.1	0.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
2-Methylphenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.91
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	0.66 J
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.2	<0.2	<0.2	<0.2	<0.2	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<0.19
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	<0.3	<0.3	<0.3	<0.3	<0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.50
1,1'-Biphenyl	µg/L	~	~	~	~	<3	<3	<3	<3	<3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.38
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19.7
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	<4	<4	<4	<4	<4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.5
4-Methylphenol	µg/L	~	~	~	~	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	<4	<4	<4	<4	<4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21
Atrazine	µg/L	~	3.00	~	~	<2	<2	<2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.46
Benzaldehyde	µg/L	~	~	~	~	<3	<3	<3	<3	<3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.29
Caprolactam	µg/L	~	~	~	~	<5	<5	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.66
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	<1	<1	<1	<1	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.13
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
Total SVOC TICs	µg/L	~	500.00	~	~	970 J	5200 J	1100 J	390 JB	720 JB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.2 J

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-3S																		
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	1999-06-23	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						B1																		
Chemical	Units																							
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.88
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.96
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<1.4
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<2.6
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<1.7
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<0.16
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.95
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<1.0
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<1.2
phenol	µg/L	99467658	2000.00	~	~	<50.00	<50.00	<50.00	<50.00	<50.00	<50.00	100.00	<50.00	<50.00	100.00	<50.00	54.00	<50.00	<50.00	<50.00	70.00	40.00	<10	<0.42
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<1.4
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.99
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.21
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.15
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.23
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.025
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.036
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.047
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.37
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.036
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.25
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.43
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.49
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.37
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.25
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.19
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.30
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.27
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.43
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.39
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<10	<0.21
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5	<0.59
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5	<0.51
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.55
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.039
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.24
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.53
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.25
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.28

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-3S																		
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	1999-06-23	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						B1																		
Chemical	Units																							
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.23
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<1.8
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.18
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.18
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.012
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.9	<0.019
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<3.0
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.42
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.041
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.30
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.23
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<0.30
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<0.42
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<25	<0.47
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.25
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.69
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.52
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.24
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.19
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.24
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<0.95
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	5.60	6.80	11.00	9.10	5.70	18.00	23.00	9.00	2.60	13.00	1.30 J	<3.50	<3.50	3.40 J	<3.50	12.00	24.00	8 J	<0.23
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<25.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<5.00	<5.00	<5.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<10	<0.19
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<9	<0.50
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.23
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.40
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.052
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.6
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.48
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.70
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.3	<0.14
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	427	5.7 J

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-4S																
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13
Grid Cell (Figures 2A, 2B and 2C)						B1																
Chemical	Units																					
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	<50.00	159.00	130.00	187.00	140.00	110.00	150.00	133.00	70.00	100.00	70.00	170.00	95.00	110.00	<50.00	130.00	110.00
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<25.00	<5.00	<25.00	<8.80	<3.50	<3.50	<3.50	<7.00	<3.50	<3.50
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

KLEINFELDER
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ESC - Chronic

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-4S																
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13
Grid Cell (Figures 2A, 2B and 2C)						B1																
Chemical	Units																					
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<9.50	<4.80	<4.80	<4.80	<9.50	<1.90	<1.90	<9.50	<1.90	<9.50	<8.80	<3.50	<3.50	<3.50	<7.00	<3.50	<3.50
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<50.00	<25.00	<25.00	<25.00	<50.00	<10.00	<10.00	<25.00	<5.00	<25.00	<7.50	<3.00	<3.00	<3.00	<6.00	<3.00	<3.00
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-123												GMW-126											
Date						1998-12-02	1999-07-07	2013-10-31	2013-12-10	2014-09-16	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-07	1998-12-02	1999-07-07	2013-10-31	2013-12-10	2014-09-17	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-09
Grid Cell (Figures 2A, 2B and 2C)						C3												D3											
Chemical	Units																												
2-chlorophenol	µg/L	~	~	~	~	<10	<10	<0.97	<1.1	<1.4	<1.4	<0.93	<0.82	<0.82	<0.86	<0.5	<0.5	<10	<10	<0.97	<1.1	<1.3	<1.3	<0.93	<0.91	<0.90	<0.82	<0.5	<0.5
4-chloro-3-methylphenol	µg/L	~	~	~	~	<10	<10	<1.8	<2.0	<1.5	<1.4	<1.4	<0.89	<0.89	<0.94	<0.5	<0.5	<10	<10	<1.8	<2.0	<1.4	<1.3	<1.4	<0.99	<0.98	<0.89	<0.5	<0.5
2,4-dichlorophenol	µg/L	~	~	~	~	<10	<10	<1.2	<1.3	<1.8	<1.8	<1.3	<1.3	<1.3	<1.3	<0.5	<0.5	<10	<10	<1.2	<1.3	<1.7	<1.6	<1.3	<1.4	<1.4	<1.3	<0.5	<0.5
2,4-dimethylphenol	µg/L	~	~	~	~	1 J	<10	<1.5	<1.7	<2.1	<2.0	<1.3	<2.4	<2.4	<2.6	<3	<3	2 J	<10	<1.5	<1.7	<1.9	1.9 J	<1.3	<2.7	<2.7	<2.4	<3	<3
2,4-dinitrophenol	µg/L	~	~	~	~	<25	<25	<17	<18	<7.3	<7.2	<1.1	<1.6	<1.6	<1.6	<14	<14	<25	<25	<17	<18	<6.8	<6.5	<1.1	<1.7	<1.7	<1.6	<14	<14
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	<25	<25	<0.99	<1.1	<1.5	<0.099	<0.090	<0.15	<0.15	<0.16	<8	<8	<25	<25	<0.99	<1.1	<1.4	<0.090	<0.090	<0.17	<0.17	<0.15	<8	<8
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	<0.93	<1.0	<1.2	<1.2	<0.67	<0.88	<0.88	<0.93	NA	NA	NA	NA	<0.93	<1.0	<1.1	<1.1	<0.67	<0.98	<0.97	<0.88	NA	NA
2-nitrophenol	µg/L	~	~	~	~	<10	<10	<1.5	<1.7	<2.1	<2.1	<1.4	<0.96	<0.96	<1.0	<3	<3	<10	<10	<1.5	<1.6	<1.9	<1.9	<1.4	<1.1	<1.1	<0.96	<3	<3
4-nitrophenol	µg/L	~	~	~	~	<25	<25	<5.2	<5.8	<1.0	<1.0	<1.1	<1.2	<1.2	<1.2	<10	<10	<25	<25	<5.2	<5.7	<0.94	<0.91	<1.1	<1.3	<1.3	<1.2	<10	<10
phenol	µg/L	99467658	2000.00	~	~	<10	<10	<1.3	<1.4	<0.61	<0.61	<0.31	<0.39	<0.39	<0.41	<0.5	<0.5	<10	<10	<1.3	<1.4	<0.57	<0.55	<0.31	<0.44	<0.43	<0.39	<0.5	<0.5
2,4,5-trichlorophenol	µg/L	~	~	~	~	<25	<25	<1.6	<1.7	<1.9	<1.9	<1.5	<1.3	<1.3	<1.4	<0.5	<0.5	<25	<25	<1.6	<1.7	<1.8	<1.7	<1.5	<1.5	<1.5	<1.3	<0.5	<0.5
2,4,6-trichlorophenol	µg/L	~	~	~	~	<10	<10	<1.3	<1.4	<1.7	<1.7	<1.4	<0.92	<0.92	<0.97	<0.5	<0.5	<10	<10	<1.3	<1.4	<1.6	<1.5	<1.4	<1.0	<1.0	<0.92	<0.5	<0.5
Acenaphthene	µg/L	~	400.00	~	~	<10	<10	<0.020	0.262	0.136	<0.33	<0.29	<0.19	<0.19	<0.20	<0.1	<0.1	<10	<10	<0.020	0.230	0.305	<0.30	<0.29	0.53 J	<0.21	<0.19	0.3 J	0.3 J
Acenaphthylene	µg/L	~	100.00	~	~	<10	<10	<0.024	<0.026	<0.027	<0.22	<0.24	<0.14	<0.14	<0.14	<0.1	<0.1	<10	<10	<0.024	<0.026	<0.025	<0.20	<0.24	<0.15	<0.15	<0.14	<0.1	<0.1
Anthracene	µg/L	~	2000.00	~	~	<10	<10	<0.020	0.161	<0.023	<0.21	<0.25	<0.21	<0.21	<0.22	<0.1	<0.1	<10	<10	<0.020	0.141	0.174	<0.19	<0.25	<0.23	<0.23	<0.21	<0.1	<0.1
benzo[a]anthracene	µg/L	~	0.10	~	~	<10	<10	<0.012	<0.013	<0.013	<0.021	<0.019	<0.023	<0.023	0.172	0.04 J	0.03 J	<10	<10	<0.012	<0.013	<0.012	<0.019	<0.019	<0.025	<0.025	<0.023	0.09	0.08
benzo[a]pyrene	µg/L	~	0.10	~	~	<10	<10	<0.012	<0.014	<0.014	<0.033	<0.030	<0.033	<0.033	0.0585	0.04 J	<0.01	<10	<10	<0.012	<0.013	<0.013	<0.030	<0.030	<0.037	<0.037	<0.033	0.04 J	0.04 J
benzo[b]fluoranthene	µg/L	~	0.20	~	~	<10	<10	<0.010	<0.011	<0.011	<0.023	<0.021	<0.043	<0.043	<0.046	0.06	0.02 J	<10	<10	<0.010	<0.011	<0.011	<0.021	<0.021	<0.048	<0.048	<0.043	0.06	0.06
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	<10	<10	<0.016	<0.017	<0.018	<0.34	<0.41	<0.34	<0.34	<0.36	<0.1	<0.1	<10	<10	<0.016	<0.017	<0.016	<0.31	<0.41	<0.38	<0.37	<0.34	<0.1	<0.1
benzo[k]fluoranthene	µg/L	~	0.50	~	~	<10	<10	<0.015	<0.016	<0.017	<0.021	<0.019	<0.033	<0.033	<0.035	0.02 J	<0.01	<10	<10	<0.015	<0.016	<0.015	<0.019	<0.019	<0.037	<0.036	<0.033	0.01 J	0.02 J
2-chloronaphthalene	µg/L	~	600.00	~	~	<10	<10	<0.30	<0.33	<0.39	<0.38	<0.30	<0.24	<0.24	<0.25	<0.4	<0.4	<10	<10	<0.30	<0.32	<0.36	<0.34	<0.30	<0.26	<0.26	<0.24	<0.4	<0.4
4-bromophenyl phenyl ether	µg/L	~	~	~	~	<10	<10	<0.36	<0.40	<0.28	<0.28	<0.37	<0.40	<0.40	<0.43	<0.5	<0.5	<10	<10	<0.36	<0.39	<0.26	<0.25	<0.37	<0.45	<0.44	<0.40	<0.5	<0.5
butyl benzyl phthalate	µg/L	~	100.00	~	~	<10	<10	<0.29	<0.32	<0.25	<0.25	<0.27	<0.46	<0.46	<0.48	<2	<2	<10	<10	<0.29	<0.31	<0.23	<0.22	<0.27	<0.51	<0.50	<0.46	<2	<2
4-chloroaniline	µg/L	~	30.00	~	~	<10	<10	<0.53	<0.59	<0.34	<0.33	<0.23	<0.34	<0.34	<0.36	<4	<4	<10	<10	<0.53	<0.57	<0.31	<0.30	<0.23	<0.38	<0.37	<0.34	<4	<4
Carbazole	µg/L	~	~	~	~	<10	<10	<0.36	<0.40	<0.19	<0.19	<0.29	<0.23	<0.23	<0.24	<0.5	<0.5	<10	<10	<0.36	<0.39	<0.18	<0.17	<0.29	<0.25	<0.25	<0.23	<0.5	<0.5
Chrysene	µg/L	~	5.00	~	~	<10	<10	<0.012	<0.013	<0.013	<0.18	<0.35	<0.18	<0.18	<0.19	<0.1	<0.1	<10	<10	<0.012	<0.013	<0.012	<0.16	<0.35	<0.20	<0.19	<0.18	<0.1	<0.1
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	<10	<10	<0.31	<0.34	<0.47	<0.47	<0.26	<0.28	<0.28	<0.29	<0.5	<0.5	<10	<10	<0.31	<0.33	<0.44	<0.42	<0.26	<0.31	<0.31	<0.28	<0.5	<0.5
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	<10	<10	<0.31	<0.34	<0.49	<0.48	<0.34	<0.25	<0.25	<0.26	<0.5	<0.5	<10	<10	<0.31	<0.33	<0.45	<0.43	<0.34	<0.28	<0.27	<0.25	<0.5	<0.5
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	<10	<10	<0.45	<0.50	<0.46	<0.45	<0.28	<0.40	<0.40	<0.42	<0.5	<0.5	<10	<10	<0.45	<0.49	<0.42	<0.41	<0.28	<0.45	<0.44	<0.40	<0.5	<0.5
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	<10	<10	<0.31	<0.35	<0.43	<0.42	<0.27	<0.37	<0.37	<0.39	<0.5	<0.5	<10	<10	<0.31	<0.34	<0.40	<0.38	<0.27	<0.41	<0.40	<0.37	<0.5	<0.5
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<10	<10	<1.5	<0.60	<0.24	<0.27	<0.27	<0.21	<0.21	<0.50	<0.2	<1	<10	<10	<1.5	<0.60	<0.47	<0.27	<0.27	<0.21	<0.21	<0.50	<10	<2
2,4-dinitrotoluene	µg/L	~	10.00	~	~	<5.0	<5	<0.43	<0.47	<0.36	<0.36	<0.26	<0.55	<0.55	<0.58	<1	<1	<5	<5	<0.43	<0.46	<0.33	<0.32	<0.26	<0.61	<0.61	<0.55	<1	<1
2,6-dinitrotoluene	µg/L	~	10.00	~	~	<5.0	<5	<0.46	<0.51	<0.29	<0.28	<0.32	<0.48	<0.48	<0.50	<0.5	<0.5	<5	<5	<0.46	<0.50	<0.27	<0.26	<0.32	<0.53	<0.52	<0.48	<0.5	<0.5
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	<10	<10	<0.36	<0.40	<0.63	<0.62	<0.53	<0.51	<0.51	<0.53	<3	<3	<10	<10	<0.36	<0.39	<0.58	<0.56	<0.53	<0.56	<0.56	<0.51	<3	<3
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	<10	<10	<0.017	<0.018	<0.019	<0.039	<0.035	<0.036	<0.036	<0.038	<0.02	<0.02	<10	<10	<0.017	<0.018	<0.017	<0.035	<0.035	<0.040	<0.040	<0.036	<0.02	<0.02
Dibenzofuran	µg/L	~	~	~	~	<10	<10	<0.27	<0.29	<0.26	<0.25	<0.27	<0.22	<0.22	<0.23	<0.5	<0.5	<10	<10	<0.27	<0.29	<0.24	<0.23	<0.27	<0.24	<0.24	<0.22	<0.5	<0.5
di-n-butyl phthalate	µg/L	~	700.00	~	~	<10	<10	<0.56	<0.62	7.1	<0.65	<0.79	<0.50	<0.50	<0.52	<2	<2	<10	<10	<0.56	<0.60	6.8 B	<0.58	<0.79	<0.55	<0.55	<0.50	<2	<2
di-n-octyl phthalate	µg/L	~	100.00	~	~	<10	<10	<0.31	<0.34	<0.28	<0.28	<0.29	<0.23	<0.23	<0.25	<5	<5	<10	<10	<0.31	<0.33	<0.26	<0.25	<0.29	<0.26	<0.26	<0.23	<5	<5
diethyl phthalate	µg/L	~	6000.00	~	~	<10	<10	<0.33	<0.36	<0.26	<0.26	<0.24	<0.26	<0.26	<0.28	<2	<2	<10	<10	<0.33	<0.36	<0.24	<0.23	<0.24	<0.29	<0.29	<0.26	<2	<2

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-123												GMW-126											
Date						1998-12-02	1999-07-07	2013-10-31	2013-12-10	2014-09-16	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-07	1998-12-02	1999-07-07	2013-10-31	2013-12-10	2014-09-17	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-09
Grid Cell (Figures 2A, 2B and 2C)						C3												D3											
Chemical	Units																												
dimethyl phthalate	µg/L	~	~	~	~	<10	<10	<0.28	<0.31	<0.29	<0.29	<0.31	<0.22	<0.22	<0.23	<2	<2	<10	<10	<0.28	<0.31	<0.27	<0.26	<0.31	<0.24	<0.24	<0.22	<2	<2
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	<10	<10	<0.59	1.5 J	2.4 B	<0.62	<0.77	<1.7	<1.7	<1.7	<5	<5	<10	<10	<0.59	<0.64	3.1 B	<0.55	<0.77	<1.8	<1.8	<1.7	<5	<5
Fluoranthene	µg/L	~	300.00	~	~	<10	<10	<0.013	<0.015	<0.015	<0.18	<0.23	<0.17	<0.17	<0.18	<0.1	<0.1	<10	<10	<0.013	<0.014	<0.014	<0.16	<0.23	<0.19	<0.19	<0.17	<0.1	<0.1
Fluorene	µg/L	~	300.00	~	~	<10	1 J	<0.017	<0.019	<0.019	<0.30	<0.29	<0.17	<0.17	<0.18	<0.1	<0.1	<10	<10	<0.017	<0.018	<0.018	<0.27	<0.29	<0.19	<0.19	<0.17	<0.1	<0.1
hexachlorobenzene	µg/L	~	0.02	~	~	<10	<10	<0.017	<0.018	<0.019	<0.016	<0.015	<0.011	<0.011	<0.012	<0.01	<0.01	<10	<10	<0.017	<0.018	<0.017	<0.015	<0.015	<0.012	<0.012	<0.011	<0.01	<0.01
hexachlorobutadiene	µg/L	~	1.00	~	~	<1.0	<1.9	<0.51	<0.57	<0.44	<0.43	<0.011	<0.018	<0.018	<0.019	<0.5	<0.5	<1	<1.9	<0.51	<0.56	<0.40	<0.39	<0.011	<0.020	<0.020	<0.018	<0.5	<0.5
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	<10	<10	<7.1	<7.9	<0.54	<0.54	<0.29	<2.8	<2.8	<2.9	<5	<5	<10	<10	<7.1	<7.7	<0.50	<0.48	<0.29	<3.1	<3.1	<2.8	<5	<5
hexachloroethane	µg/L	~	7.00	~	~	<10	<10	<0.55	<0.61	<0.32	<0.32	<0.22	<0.39	<0.39	<0.41	<1	<1	<10	<10	<0.55	<0.60	<0.30	<0.29	<0.22	<0.43	<0.43	<0.39	<1	<1
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	<10	<10	<0.014	<0.016	<0.016	<0.035	<0.031	<0.038	<0.038	<0.040	0.04 J	<0.01	<10	<10	<0.014	<0.016	<0.015	<0.031	<0.031	<0.042	<0.042	<0.038	0.02 J	0.03 J
isophorone	µg/L	~	40.00	~	~	<10	<10	<0.27	<0.30	<0.38	<0.38	<0.29	<0.28	<0.28	<0.29	<0.5	<0.5	42	<10	<0.27	<0.30	<0.35	<0.34	<0.29	<0.31	<0.30	<0.28	<0.5	<0.5
2-Methylnaphthalene	µg/L	~	30.0	~	~	24	<10	<0.38	<0.43	<0.33	<0.32	<0.29	<0.21	<0.21	<0.22	<0.1	<0.1	7 J	2 J	<0.38	<0.42	<0.30	<0.29	<0.29	<0.23	<0.23	<0.21	<0.1	0.1 J
2-nitroaniline	µg/L	~	~	~	~	<25	<25	<1.1	<1.2	<0.36	<0.35	<0.21	<0.28	<0.28	<0.29	<2	<2	<25	<25	<1.1	<1.2	<0.33	<0.32	<0.21	<0.31	<0.30	<0.28	<2	<2
3-nitroaniline	µg/L	~	~	~	~	<25	<25	<1.3	<1.4	<0.29	<0.29	<0.24	<0.39	<0.39	<0.41	<3	<3	<25	<25	<1.3	<1.4	<0.27	<0.26	<0.24	<0.43	<0.43	<0.39	<3	<3
4-nitroaniline	µg/L	~	~	~	~	<25	<25	<1.7	<1.8	<0.34	<0.33	<0.34	<0.44	<0.44	<0.46	<0.9	<0.9	<25	<25	<1.7	<1.8	<0.31	<0.30	<0.34	<0.49	<0.48	<0.44	<0.9	<0.9
Naphthalene (extractable)	µg/L	6487	300.00	~	~	24	10	<0.036	<0.039	<0.040	<0.29	<0.28	<0.23	<0.23	<0.24	<0.1	<0.1	10	3 J	<0.036	1.14	<0.037	0.43 J	<0.28	<0.26	1.2	0.47 J	0.4 J	<0.1
nitrobenzene	µg/L	~	6.00	~	~	<10	<10	<0.42	<0.47	<0.58	<0.58	<0.46	<0.64	<0.64	<0.68	<0.5	<0.5	<10	<10	<0.42	<0.46	<0.54	<0.52	<0.46	<0.71	<0.71	<0.64	<0.5	<0.5
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	<10	<10	<0.30	<0.34	<0.42	<0.42	<0.31	<0.48	<0.48	<0.51	<0.7	<0.7	<10	<10	<0.30	<0.33	<0.39	<0.38	<0.31	<0.53	<0.53	<0.48	<0.7	<0.7
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	<10	<10	<0.31	<0.34	<0.23	<0.23	<0.29	<0.22	<0.22	<0.23	<0.7	<0.7	<10	<10	<0.31	<0.33	<0.21	<0.21	<0.29	<0.25	<0.24	<0.22	<0.7	<0.7
Phenanthrene	µg/L	~	~	~	~	<10	2 J	<0.021	<0.023	<0.023	<0.21	<0.23	<0.18	<0.18	<0.18	<0.1	<0.1	<10	<10	<0.021	<0.023	<0.022	<0.19	<0.23	<0.19	<0.19	<0.18	<0.1	<0.1
Pyrene	µg/L	~	200.00	~	~	<10	<10	<0.015	0.156	<0.017	<0.21	<0.34	<0.22	<0.22	<0.23	<0.1	<0.1	<10	<10	<0.015	0.122	0.205	<0.19	<0.34	<0.24	<0.24	<0.22	0.3 J	0.4 J
2-Methylphenol	µg/L	~	~	~	~	<10	<10	<1.0	<1.2	<1.4	<1.4	<0.82	<0.89	<0.89	<0.93	<0.5	<0.5	<10	<10	<1.0	<1.1	<1.3	<1.3	<0.82	<0.99	<0.98	<0.89	<0.5	<0.5
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	<1.0	<0.41	<0.16	<0.19	<0.19	<0.23	<0.23	<0.50	<0.2	<1	<10	<10	<1.0	<0.41	<0.32	<0.19	<0.19	<0.23	<0.23	<0.50	<10	<2
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	<1.6	<0.63	<0.26	<0.23	<0.23	<0.19	<0.19	<0.50	<0.2	<1	<10	<10	<1.6	<0.63	<0.51	<0.23	<0.23	<0.19	<0.19	<0.50	<10	<2
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	<9.0	<9	<1.1	<0.43	<0.22	<0.21	<0.21	<0.25	<0.50	<0.50	<0.3	<2	<9	<9	<1.1	<0.43	<0.45	<0.21	<0.21	<0.25	<0.50	<0.50	<15	<3
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	<0.30	<0.34	<0.31	<0.30	<0.26	<0.21	<0.21	<0.22	<3	<3	NA	NA	<0.30	<0.33	<0.29	<0.27	<0.26	<0.24	<0.23	<0.21	<3	<3
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	<0.31	<0.34	<0.50	<0.49	<0.36	<0.37	<0.37	<0.39	<0.5	<0.5	NA	NA	<0.31	<0.33	<0.46	<0.44	<0.36	<0.41	<0.41	<0.37	<0.5	<0.5
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	<0.27	<0.30	<0.80	<0.79	0.522	0.844	0.234	0.490	0.9	0.5	NA	NA	<0.27	<0.30	<0.74	<0.72	0.582	0.686	0.294	0.524	0.5	0.5
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	<0.94	<1.0	<1.6	<1.6	<1.4	<1.5	<1.5	<1.5	<4	<4	NA	NA	<0.94	<1.0	<1.5	<1.4	<1.4	<1.6	<1.6	<1.5	<4	<4
4-Methylphenol	µg/L	~	~	~	~	3 J	<10	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	7 J	<10	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5
Acetophenone	µg/L	~	~	~	~	NA	NA	<0.29	<0.32	<0.41	<0.40	<0.28	<0.21	<0.21	<0.22	<4	<4	NA	NA	<0.29	<0.31	<0.38	<0.36	<0.28	<0.23	<0.23	<0.21	<4	<4
Atrazine	µg/L	~	3.00	~	~	NA	NA	<0.49	<0.54	<0.48	<0.47	<0.42	<0.45	<0.45	<0.47	<2	<2	NA	NA	<0.49	<0.53	<0.44	<0.42	<0.42	<0.50	<0.49	<0.45	<2	<2
Benzaldehyde	µg/L	~	~	~	~	NA	NA	<3.3	<3.6	<0.76	<0.75	<0.34	<0.29	<0.29	<0.30	<3	<3	NA	NA	<3.3	<3.5	<0.70	<0.67	<0.34	<0.32	<0.32	<0.29	<3	<3
Caprolactam	µg/L	~	~	~	~	NA	NA	<0.69	<0.77	<0.46	<0.45	<0.43	<0.65	<0.65	38.7	<5	<5	NA	NA	<0.69	<0.75	<0.42	<0.41	<0.43	<0.72	<0.71	<0.65	<5	<5
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	12 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.4 JN	15 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	<1.0	<3.3	<0.10	<0.11	<0.11	<0.12	<0.11	<0.13	<0.13	<0.14	<1	<1	<1	<3.3	<0.10	<0.11	<0.10	<0.11	<0.11	<0.14	<0.14	<0.13	<1	<1
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	0	0	0	0	0	0	0	0	0 J	NA	NA	NA	0	0	0	0	0	0	0	0	0 J	NA
Total SVOC TICs	µg/L	~	500.00	~	~	895	1646	205.3 J	1739.5 J	75 J	13 J	229.8 J	674.7 J	111 J	10 J	91 JB	170 J	1522.7	1594	1600 J	1667.2 J	380 J	36.7 J	203 J	488.2 J	11.1 J	93.4 J	200 JB	74 JB

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-137												GMW-138											
Date						1998-12-01	1999-07-02	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-02	2016-08-26	2016-12-09	2017-08-11	2018-09-19	2019-08-29	1998-12-02	1999-07-02	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-03	2016-08-25	2017-01-17	2017-08-11	2018-09-19	2019-08-08
Grid Cell (Figures 2A, 2B and 2C)						NJ Ecological												B3											
Chemical	Units																												
2-chlorophenol	µg/L	~	~	~	~	<10	<10	NA	<0.97	NA	NA	<0.93	NA	<0.91	NA	NA	NA	<10	<10	NA	<1.0	NA	NA	<0.93	NA	<0.86	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	<10	<10	NA	<1.8	NA	NA	<1.4	NA	<0.99	NA	NA	NA	<10	<10	NA	<1.9	NA	NA	<1.4	NA	<0.94	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	<10	<10	NA	<1.2	NA	NA	<1.3	NA	<1.4	NA	NA	NA	<10	<10	NA	<1.2	NA	NA	<1.3	NA	<1.3	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	3 J	2 J	NA	<1.5	NA	NA	<1.3	NA	<2.7	NA	NA	NA	2 J	<10	NA	<1.6	NA	NA	<1.3	NA	<2.6	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	<25	<25	NA	<17	NA	NA	<1.1	NA	<1.7	NA	NA	NA	<25	<25	NA	<17	NA	NA	<1.1	NA	<1.6	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	<25	<25	NA	<0.99	NA	NA	<0.090	NA	<0.17	NA	NA	NA	<25	<25	NA	<1.0	NA	NA	<0.090	NA	<0.16	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	<0.93	NA	NA	<0.67	NA	<0.98	NA	NA	NA	NA	NA	NA	<0.95	NA	NA	<0.67	NA	<0.93	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	<10	<10	NA	<1.5	NA	NA	<1.4	NA	<1.1	NA	NA	NA	<10	<10	NA	<1.5	NA	NA	<1.4	NA	<1.0	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	<25	<25	NA	<5.2	NA	NA	<1.1	NA	<1.3	NA	NA	NA	<25	<25	NA	<5.4	NA	NA	<1.1	NA	<1.2	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	27	<10	NA	<1.3	NA	NA	<0.31	NA	<0.44	NA	NA	NA	<10	<10	NA	<1.3	NA	NA	<0.31	NA	<0.41	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	<25	<25	NA	<1.6	NA	NA	<1.5	NA	<1.5	NA	NA	NA	<25	<25	NA	<1.6	NA	NA	<1.5	NA	<1.4	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	<10	<10	NA	<1.3	NA	NA	<1.4	NA	<1.0	NA	NA	NA	<10	<10	NA	<1.3	NA	NA	<1.4	NA	<0.97	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	<10	<10	NA	<0.020	NA	NA	<0.29	NA	<0.21	NA	NA	NA	<10	<10	NA	<0.021	NA	NA	<0.29	NA	<0.20	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	<10	<10	NA	<0.024	NA	NA	<0.24	NA	<0.15	NA	NA	NA	<10	<10	NA	<0.024	NA	NA	<0.24	NA	<0.14	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	<10	<10	NA	<0.020	NA	NA	<0.25	NA	<0.23	NA	NA	NA	<10	<10	NA	<0.021	NA	NA	<0.25	NA	<0.22	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	<10	<10	NA	0.125	NA	NA	<0.019	NA	<0.025	NA	NA	NA	<10	<10	NA	<0.012	NA	NA	<0.019	NA	0.161	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	<10	<10	NA	<0.012	NA	NA	<0.030	NA	<0.037	NA	NA	NA	<10	<10	NA	<0.013	NA	NA	<0.030	NA	<0.035	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	<10	<10	NA	<0.010	NA	NA	<0.021	NA	<0.048	NA	NA	NA	<10	<10	NA	<0.010	NA	NA	<0.021	NA	<0.046	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	<10	<10	NA	<0.016	NA	NA	<0.41	NA	<0.38	NA	NA	NA	<10	<10	NA	<0.016	NA	NA	<0.41	NA	<0.36	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	<10	<10	NA	<0.015	NA	NA	<0.019	NA	<0.037	NA	NA	NA	<10	<10	NA	<0.015	NA	NA	<0.019	NA	<0.035	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	<10	<10	NA	<0.30	NA	NA	<0.30	NA	<0.26	NA	NA	NA	<10	<10	NA	<0.31	NA	NA	<0.30	NA	<0.25	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	<10	<10	NA	<0.36	NA	NA	<0.37	NA	<0.45	NA	NA	NA	<10	<10	NA	<0.37	NA	NA	<0.37	NA	<0.43	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	<10	<10	NA	<0.29	NA	NA	<0.27	NA	<0.51	NA	NA	NA	<10	<10	NA	<0.30	NA	NA	<0.27	NA	<0.48	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	<10	<10	NA	<0.53	NA	NA	<0.23	NA	<0.38	NA	NA	NA	<10	<10	NA	<0.54	NA	NA	<0.23	NA	<0.36	NA	NA	NA
Carbazole	µg/L	~	~	~	~	<10	<10	NA	<0.36	NA	NA	<0.29	NA	<0.25	NA	NA	NA	<10	<10	NA	<0.37	NA	NA	<0.29	NA	<0.24	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	<10	<10	NA	<0.012	NA	NA	<0.35	NA	<0.20	NA	NA	NA	<10	<10	NA	<0.012	NA	NA	<0.35	NA	<0.19	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	<10	<10	NA	<0.31	NA	NA	<0.26	NA	<0.31	NA	NA	NA	<10	<10	NA	<0.32	NA	NA	<0.26	NA	<0.29	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	<10	<10	NA	<0.31	NA	NA	<0.34	NA	<0.28	NA	NA	NA	<10	<10	NA	<0.32	NA	NA	<0.34	NA	<0.26	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	<10	<10	NA	<0.45	NA	NA	<0.28	NA	<0.45	NA	NA	NA	<10	<10	NA	<0.47	NA	NA	<0.28	NA	<0.42	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	<10	<10	NA	<0.31	NA	NA	<0.27	NA	<0.41	NA	NA	NA	<10	<10	NA	<0.32	NA	NA	<0.27	NA	<0.39	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<10	<10	<7.5	<0.30	<0.47	<0.27	<0.27	<0.21	<0.21	<0.50	<2	<0.2	<10	<10	<3.0	<0.30	<0.47	<0.27	<0.27	<1.1	<0.21	<0.50	<2	<1
2,4-dinitrotoluene	µg/L	~	10.00	~	~	<5	<5	NA	<0.43	NA	NA	<0.26	NA	<0.61	NA	NA	NA	<5	<5	NA	<0.44	NA	NA	<0.26	NA	<0.58	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	<5	<5	NA	<0.46	NA	NA	<0.32	NA	<0.53	NA	NA	NA	<5	<5	NA	<0.48	NA	NA	<0.32	NA	<0.50	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	<10	<10	NA	<0.36	NA	NA	<0.53	NA	<0.56	NA	NA	NA	<10	<10	NA	<0.37	NA	NA	<0.53	NA	<0.53	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	<10	<10	NA	<0.017	NA	NA	<0.035	NA	<0.040	NA	NA	NA	<10	<10	NA	<0.017	NA	NA	<0.035	NA	<0.038	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	<10	<10	NA	<0.27	NA	NA	<0.27	NA	<0.24	NA	NA	NA	<10	<10	NA	<0.27	NA	NA	<0.27	NA	<0.23	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	<10	<10	NA	<0.56	NA	NA	<0.79	NA	<0.55	NA	NA	NA	<10	<10	NA	<0.57	NA	NA	<0.79	NA	<0.52	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	<10	<10	NA	<0.31	NA	NA	<0.29	NA	<0.26	NA	NA	NA	<10	<10	NA	<0.32	NA	NA	<0.29	NA	<0.25	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	<10	<10	NA	<0.33	NA	NA	<0.24	NA	<0.29	NA	NA	NA	<10	<10	NA	<0.34	NA	NA	<0.24	NA	<0.28	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-137												GMW-138											
Date						1998-12-01	1999-07-02	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-02	2016-08-26	2016-12-09	2017-08-11	2018-09-19	2019-08-29	1998-12-02	1999-07-02	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-03	2016-08-25	2017-01-17	2017-08-11	2018-09-19	2019-08-08
Grid Cell (Figures 2A, 2B and 2C)						C1												B3											
Chemical	Units																												
dimethyl phthalate	µg/L	~	~	~	~	<10	<10	NA	<0.28	NA	NA	<0.31	NA	<0.24	NA	NA	NA	<10	<10	NA	<0.29	NA	NA	<0.31	NA	<0.23	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	<10	<10	NA	<0.59	NA	NA	<0.77	NA	<1.8	NA	NA	NA	<10	<10	NA	<0.60	NA	NA	<0.77	NA	3.3	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	<10	<10	NA	<0.013	NA	NA	<0.23	NA	<0.19	NA	NA	NA	<10	<10	NA	<0.014	NA	NA	<0.23	NA	<0.18	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	<10	<10	NA	<0.017	NA	NA	<0.29	NA	<0.19	NA	NA	NA	1 J	<10	NA	<0.018	NA	NA	<0.29	NA	<0.18	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	<10	<10	NA	<0.017	NA	NA	<0.015	NA	<0.012	NA	NA	NA	<10	<10	NA	<0.017	NA	NA	<0.015	NA	<0.012	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	<1	<1.9	NA	<0.51	NA	NA	<0.011	NA	<0.020	NA	NA	NA	<1	<1.9	NA	<0.53	NA	NA	<0.011	NA	<0.019	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	<10	<10	NA	<7.1	NA	NA	<0.29	NA	<3.1	NA	NA	NA	<10	<10	NA	<7.3	NA	NA	<0.29	NA	<2.9	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	<10	<10	NA	<0.55	NA	NA	<0.22	NA	<0.43	NA	NA	NA	<10	<10	NA	<0.57	NA	NA	<0.22	NA	<0.41	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	<10	<10	NA	<0.014	NA	NA	<0.031	NA	<0.042	NA	NA	NA	<10	<10	NA	<0.015	NA	NA	<0.031	NA	<0.040	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	<10	<10	NA	<0.27	NA	NA	<0.29	NA	<0.31	NA	NA	NA	3 J	<10	NA	<0.28	NA	NA	<0.29	NA	<0.29	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	4 J	4 J	NA	<0.38	NA	NA	<0.29	NA	<0.23	NA	NA	NA	6 J	1 J	NA	<0.40	NA	NA	<0.29	NA	<0.22	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	<25	<25	NA	<1.1	NA	NA	<0.21	NA	<0.31	NA	NA	NA	<25	<25	NA	<1.1	NA	NA	<0.21	NA	<0.29	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	<25	<25	NA	<1.3	NA	NA	<0.24	NA	<0.43	NA	NA	NA	<25	<25	NA	<1.3	NA	NA	<0.24	NA	<0.41	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	<25	<25	NA	<1.7	NA	NA	<0.34	NA	<0.49	NA	NA	NA	<25	<25	NA	<1.7	NA	NA	<0.34	NA	<0.46	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	2 J	2 J	NA	<0.036	NA	NA	<0.28	NA	<0.26	NA	NA	NA	6 J	2 J	NA	0.121	NA	NA	<0.28	NA	<0.24	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	<10	<10	NA	<0.42	NA	NA	<0.46	NA	<0.71	NA	NA	NA	<10	<10	NA	<0.43	NA	NA	<0.46	NA	<0.68	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	<10	<10	NA	<0.30	NA	NA	<0.31	NA	<0.53	NA	NA	NA	<10	<10	NA	<0.31	NA	NA	<0.31	NA	<0.51	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	<10	<10	NA	<0.31	NA	NA	<0.29	NA	<0.25	NA	NA	NA	<10	<10	NA	<0.31	NA	NA	<0.29	NA	<0.23	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	1 J	<10	NA	<0.021	NA	NA	<0.23	NA	<0.19	NA	NA	NA	1 J	<10	NA	<0.022	NA	NA	<0.23	NA	<0.18	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	<10	<10	NA	<0.015	NA	NA	<0.34	NA	<0.24	NA	NA	NA	<10	<10	NA	0.211	NA	NA	<0.34	NA	<0.23	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	<10	<10	NA	<1.0	NA	NA	<0.82	NA	<0.99	NA	NA	NA	<10	<10	NA	<1.1	NA	NA	<0.82	NA	<0.93	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	<5.1	<0.20	<0.32	<0.19	<0.19	<0.23	<0.23	<0.50	<2	<0.2	<10	<10	<2.0	<0.20	<0.32	<0.19	<0.19	<1.2	<0.23	<0.50	<2	<1
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<10	<10	<7.9	<0.31	<0.51	<0.23	<0.23	<0.19	<0.19	<0.50	<2	<0.2	<10	<10	<3.1	<0.31	<0.51	<0.23	<0.23	<0.97	<0.19	<0.50	<2	<1
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	<9	<9	<5.4	<0.22	<0.45	<0.21	<0.21	<0.25	<0.50	<0.50	<3	<0.3	<9	<9	<2.2	<0.22	<0.45	<0.21	<0.21	<1.2	<0.50	<0.50	<3	<2
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	<0.30	NA	NA	<0.26	NA	<0.24	NA	NA	NA	NA	NA	NA	<0.31	NA	NA	<0.26	NA	<0.22	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	<0.31	NA	NA	<0.36	NA	<0.41	NA	NA	NA	NA	NA	NA	<0.31	NA	NA	<0.36	NA	<0.39	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	6.2	NA	NA	<0.053	<0.053	<0.054	NA	NA	NA	NA	NA	NA	<0.28	NA	NA	0.708	NA	0.513	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	<0.94	NA	NA	<1.4	NA	<1.6	NA	NA	NA	NA	NA	NA	<0.97	NA	NA	<1.4	NA	<1.5	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	5 J	3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 J	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	<0.29	NA	NA	<0.28	NA	<0.23	NA	NA	NA	NA	NA	NA	<0.29	NA	NA	<0.28	NA	<0.22	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	<0.49	NA	NA	<0.42	NA	<0.50	NA	NA	NA	NA	NA	NA	<0.50	NA	NA	<0.42	NA	<0.47	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	<3.3	NA	NA	<0.34	NA	<0.32	NA	NA	NA	NA	NA	NA	<3.4	NA	NA	<0.34	NA	<0.30	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	<0.69	NA	NA	<0.43	NA	<0.72	NA	NA	NA	NA	NA	NA	<0.71	NA	NA	7.0	NA	<0.68	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	8 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8 JN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	<1	<3.3	NA	<0.10	NA	NA	<0.11	NA	<0.14	NA	NA	NA	<1	<3.3	NA	<0.10	NA	NA	<0.11	NA	<0.14	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	0	NA	NA	0	NA	0	NA	NA	NA	NA	NA	NA	4.1 J	NA	NA	0	NA	0	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	964.4	1070	NA	1139.2 J	NA	NA	108.8 J	NA	0	NA	NA	NA	413.7	633	NA	1988.8 J	NA	NA	132.2 J	NA	47 J	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-211R	GMW-212			GMW-213		GMW-229		GMW-647				GMW-648			GMW-649		
Date						2017-01-20	2013-12-12	2016-02-04	2016-12-06	2013-12-12	2016-12-06	2017-01-18	2018-05-22	2013-07-12	2013-08-01	2016-02-04	2016-12-08	2013-08-01	2016-02-04	2016-12-09	2013-12-12	2016-02-17	2016-12-06
Grid Cell (Figures 2A, 2B and 2C)						B2	C1			C2		B2		C3				D3			D2		
Chemical	Units																						
2-chlorophenol	µg/L	~	~	~	~	<4.6	NA	<0.94	<0.84	NA	<0.85	<0.82	<0.5	NA	NA	<0.98	<0.82	NA	<1.0	<0.88	<1.0	<0.93	<0.84
4-chloro-3-methylphenol	µg/L	~	~	~	~	<5.0	NA	<1.4	<0.91	NA	<0.92	<0.89	<0.5	NA	NA	<1.5	<0.89	NA	<1.5	<0.96	<1.9	<1.4	<0.91
2,4-dichlorophenol	µg/L	~	~	~	~	<7.1	NA	<1.3	<1.3	NA	<1.3	<1.3	<0.5	NA	NA	<1.3	<1.3	NA	<1.4	<1.4	<1.2	<1.3	<1.3
2,4-dimethylphenol	µg/L	~	~	~	~	176	NA	72.8	53.7	NA	<2.5	531	180	NA	NA	<1.3	<2.4	NA	<1.4	<2.6	3.1 J	<1.3	<2.5
2,4-dinitrophenol	µg/L	~	~	~	~	<8.6	NA	<1.1	<1.6	NA	<1.6	<1.6	<14	NA	NA	<1.1	<1.6	NA	<1.1	<1.7	<17	<1.1	<1.6
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	<0.17	NA	<0.090	<0.16	NA	<0.16	<0.15	<8	NA	NA	<0.094	<0.15	NA	<0.096	<0.16	<1.0	<0.090	<0.16
3- and 4-methylphenol	µg/L	~	~	~	~	164	NA	<0.68	<0.90	NA	<0.91	10.7	NA	NA	NA	<0.71	<0.88	NA	<0.72	<0.95	6.4	<0.67	<0.90
2-nitrophenol	µg/L	~	~	~	~	<5.3	NA	<1.4	<0.98	NA	<0.99	<0.96	<3	NA	NA	<1.5	<0.96	NA	<1.5	<1.0	<1.6	<1.4	<0.98
4-nitrophenol	µg/L	~	~	~	~	<6.4	NA	<1.1	<1.2	NA	<1.2	<1.2	<10	NA	NA	<1.1	<1.2	NA	<1.2	<1.2	<5.5	<1.1	<1.2
phenol	µg/L	99467658	2000.00	~	~	<2.2	NA	<0.32	<0.40	NA	<0.40	<0.39	<0.5	NA	NA	<0.33	<0.39	NA	<0.34	<0.42	6.8	<0.31	<0.40
2,4,5-trichlorophenol	µg/L	~	~	~	~	<7.4	NA	<1.5	<1.4	NA	<1.4	<1.3	<0.5	NA	NA	<1.6	<1.3	NA	<1.6	<1.4	<1.6	<1.5	<1.4
2,4,6-trichlorophenol	µg/L	~	~	~	~	<5.1	NA	<1.5	<0.94	NA	<0.95	<0.92	<0.5	NA	NA	<1.5	<0.92	NA	<1.5	<0.99	<1.4	<1.4	<0.94
Acenaphthene	µg/L	~	400.00	~	~	5.6	<0.26	<0.29	<0.19	<0.29	<0.20	0.95 J	<0.1	NA	<0.021	<0.30	<0.19	NA	<0.31	<0.21	<0.020	<0.29	<0.19
Acenaphthylene	µg/L	~	100.00	~	~	<0.76	<0.23	<0.24	<0.14	<0.25	<0.14	<0.14	<0.1	NA	<0.024	<0.25	<0.14	NA	<0.26	<0.15	<0.024	<0.24	<0.14
Anthracene	µg/L	~	2000.00	~	~	7.9	<0.29	<0.25	<0.22	<0.32	<0.22	<0.21	<0.1	NA	0.185	<0.26	<0.21	NA	<0.26	<0.23	<0.020	<0.25	<0.22
benzo[a]anthracene	µg/L	~	0.10	~	~	38.1	<0.23	<0.019	0.132	<0.25	0.156	0.321	0.6	NA	<0.012	<0.019	0.152	NA	<0.020	<0.025	<0.012	0.405	<0.023
benzo[a]pyrene	µg/L	~	0.10	~	~	14.0	<0.23	<0.030	<0.034	<0.25	<0.034	0.108	0.6	<0.23	<0.013	<0.031	<0.034	<0.23	<0.032	<0.036	<0.012	0.204	<0.034
benzo[b]fluoranthene	µg/L	~	0.20	~	~	9.8	<0.46	<0.021	<0.044	<0.50	<0.045	<0.043	0.4	<0.46	<0.010	<0.022	<0.044	<0.47	<0.023	<0.047	<0.010	0.370	<0.044
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	4.2 J	<0.32	<0.41	<0.35	<0.35	<0.35	<0.34	0.2 J	NA	<0.016	<0.43	<0.34	NA	<0.44	<0.37	<0.016	<0.41	<0.35
benzo[k]fluoranthene	µg/L	~	0.50	~	~	1.41	<0.51	<0.019	<0.034	<0.56	<0.034	<0.033	0.08	<0.51	<0.015	<0.020	<0.033	<0.52	<0.021	<0.036	<0.015	<0.019	<0.034
2-chloronaphthalene	µg/L	~	600.00	~	~	<1.3	NA	<0.30	<0.24	NA	<0.24	<0.24	<0.4	NA	NA	<0.31	<0.24	NA	<0.32	<0.25	<0.31	<0.30	<0.24
4-bromophenyl phenyl ether	µg/L	~	~	~	~	<2.2	NA	<0.37	<0.41	NA	<0.42	<0.40	<0.5	NA	NA	<0.39	<0.40	NA	<0.40	<0.43	<0.38	<0.37	<0.41
butyl benzyl phthalate	µg/L	~	100.00	~	~	<2.5	NA	<0.27	<0.47	NA	<0.47	<0.46	<2	NA	NA	<0.29	<0.46	NA	<0.29	<0.49	<0.30	<0.27	<0.47
4-chloroaniline	µg/L	~	30.00	~	~	<1.9	NA	<0.23	<0.35	NA	<0.35	<0.34	<4	NA	NA	<0.24	<0.34	NA	<0.25	<0.37	<0.56	<0.23	<0.35
Carbazole	µg/L	~	~	~	~	4.2 J	NA	<0.30	<0.23	NA	<0.24	<0.23	<0.5	NA	NA	<0.31	<0.23	NA	<0.32	<0.25	<0.38	<0.29	<0.23
Chrysene	µg/L	~	5.00	~	~	36.7	<0.29	<0.35	<0.18	<0.32	<0.18	<0.18	0.4 J	NA	0.214	<0.36	<0.18	NA	<0.37	<0.19	<0.012	1.1	<0.18
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	<1.5	NA	<0.26	<0.28	NA	<0.29	<0.28	<0.5	NA	NA	<0.27	<0.28	NA	<0.28	<0.30	<0.32	<0.26	<0.28
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	<1.4	NA	<0.35	<0.25	NA	<0.26	<0.25	<0.5	NA	NA	<0.36	<0.25	NA	<0.37	<0.27	<0.32	<0.34	<0.25
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	<2.2	NA	<0.29	<0.41	NA	<0.42	<0.40	<0.5	NA	NA	<0.30	<0.40	NA	<0.31	<0.43	<0.48	<0.28	<0.41
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	<2.0	NA	<0.27	<0.37	NA	<0.38	<0.37	<0.5	NA	NA	<0.29	<0.37	NA	<0.29	<0.39	<0.33	<0.27	<0.37
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<2.1	<0.30	<0.55	<0.43	<0.30	<1.1	<1.1	<1	NA	<0.30	<0.27	<0.21	NA	<0.27	<0.21	<0.30	<0.27	<1.1
2,4-dinitrotoluene	µg/L	~	10.00	~	~	<3.1	NA	<0.27	<0.56	NA	<0.57	<0.55	<1	NA	NA	<0.28	<0.55	NA	<0.28	<0.59	<0.45	<0.26	<0.56
2,6-dinitrotoluene	µg/L	~	10.00	~	~	<2.6	NA	<0.33	<0.49	NA	<0.49	<0.48	<0.5	NA	NA	<0.34	<0.48	NA	<0.35	<0.51	<0.49	<0.32	<0.49
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	<2.8	NA	<0.54	<0.52	NA	<0.52	<0.51	<3	NA	NA	<0.56	<0.51	NA	<0.57	<0.55	<0.38	<0.53	<0.52
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	4.93	<0.38	<0.036	<0.037	<0.42	<0.037	<0.036	0.2	NA	<0.017	<0.037	<0.037	NA	<0.038	<0.039	<0.017	0.116	<0.037
Dibenzofuran	µg/L	~	~	~	~	6.6 J	NA	<0.27	<0.22	NA	<0.23	<0.22	<0.5	NA	NA	<0.29	<0.22	NA	<0.29	<0.24	<0.28	<0.27	<0.22
di-n-butyl phthalate	µg/L	~	700.00	~	~	<2.8	NA	<0.79	<0.51	NA	<0.51	<0.50	<2	NA	NA	<0.83	<0.50	NA	<0.85	<0.53	<0.58	<0.79	<0.51
di-n-octyl phthalate	µg/L	~	100.00	~	~	<1.3	NA	<0.29	<0.24	NA	<0.24	<0.23	<5	NA	NA	<0.30	<0.23	NA	<0.31	<0.25	<0.32	<0.29	<0.24
diethyl phthalate	µg/L	~	6000.00	~	~	<1.5	NA	<0.25	<0.27	NA	<0.27	<0.26	<2	NA	NA	<0.26	<0.26	NA	<0.26	<0.28	<0.34	<0.24	<0.27

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-211R	GMW-212			GMW-213		GMW-229		GMW-647				GMW-648			GMW-649		
Date						2017-01-20	2013-12-12	2016-02-04	2016-12-06	2013-12-12	2016-12-06	2017-01-18	2018-05-22	2013-07-12	2013-08-01	2016-02-04	2016-12-08	2013-08-01	2016-02-04	2016-12-09	2013-12-12	2016-02-17	2016-12-06
Grid Cell (Figures 2A, 2B and 2C)						B2	C1			C2		B2		C3				D3			D2		
Chemical	Units																						
dimethyl phthalate	µg/L	~	~	~	~	<1.2	NA	<0.32	<0.22	NA	<0.22	<0.22	<2	NA	NA	<0.33	<0.22	NA	<0.34	<0.23	<0.30	<0.31	<0.22
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	<9.2	<0.59	2.1	2.0	NA	<1.7	<1.7	2	<0.59	NA	<0.81	<1.7	<0.60	<0.83	<1.8	<0.62	1.8 J	<1.7
Fluoranthene	µg/L	~	300.00	~	~	5.5 J	<0.32	<0.23	<0.17	<0.35	<0.18	<0.17	0.2 J	NA	0.213	<0.24	<0.17	NA	<0.25	<0.18	<0.013	<0.23	<0.17
Fluorene	µg/L	~	300.00	~	~	11.9	0.80 J	1.3	1.2	<0.30	<0.18	0.84 J	<0.1	NA	<0.018	<0.31	<0.17	NA	<0.32	<0.18	0.535	<0.29	<0.17
hexachlorobenzene	µg/L	~	0.02	~	~	<0.012	NA	<0.015	<0.011	NA	<0.011	<0.011	<0.01	NA	NA	<0.015	<0.011	NA	<0.016	<0.012	<0.017	<0.015	<0.011
hexachlorobutadiene	µg/L	~	1.00	~	~	<0.020	NA	<0.011	<0.018	NA	<0.018	<0.018	<0.5	NA	NA	<0.011	<0.018	NA	<0.012	<0.019	<0.54	<0.011	<0.018
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	<15	NA	<0.30	<2.8	NA	<2.9	<2.8	<5	NA	NA	<0.31	<2.8	NA	<0.32	<3.0	<7.5	<0.29	<2.8
hexachloroethane	µg/L	~	7.00	~	~	<2.2	NA	<0.22	<0.40	NA	<0.40	<0.39	<1	NA	NA	<0.23	<0.39	NA	<0.24	<0.42	<0.58	<0.22	<0.40
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	1.83	<0.37	<0.031	<0.039	<0.41	<0.039	<0.038	0.2	NA	<0.015	<0.033	<0.038	NA	<0.033	<0.041	<0.014	0.122	<0.039
isophorone	µg/L	~	40.00	~	~	<1.5	<0.27	<0.29	<0.28	NA	<0.29	<0.28	<0.5	<0.27	NA	<0.30	<0.28	<0.28	<0.31	<0.30	<0.29	<0.29	<0.28
2-Methylnaphthalene	µg/L	~	30.0	~	~	143	15.1	19.2	16.5	NA	<0.22	1.6	<0.1	<0.38	NA	<0.30	<0.21	<0.39	<0.31	<0.23	2.2	<0.29	<0.21
2-nitroaniline	µg/L	~	~	~	~	<1.5	NA	<0.21	<0.28	NA	<0.29	<0.28	<2	NA	NA	<0.22	<0.28	NA	<0.22	<0.30	<1.2	<0.21	<0.28
3-nitroaniline	µg/L	~	~	~	~	<2.2	NA	<0.24	<0.39	NA	<0.40	<0.39	<3	NA	NA	<0.25	<0.39	NA	<0.26	<0.42	<1.3	<0.24	<0.39
4-nitroaniline	µg/L	~	~	~	~	<2.4	NA	<0.35	<0.45	NA	<0.45	<0.44	<0.9	NA	NA	<0.36	<0.44	NA	<0.37	<0.47	<1.7	<0.34	<0.45
Naphthalene (extractable)	µg/L	6487	300.00	~	~	110	1.3	<0.29	<0.24	2.0	<0.24	2.1	<0.1	NA	0.282	<0.30	<0.23	NA	<0.30	<0.25	1.54	<0.28	<0.24
nitrobenzene	µg/L	~	6.00	~	~	<3.6	NA	<0.47	<0.66	NA	<0.66	<0.64	<0.5	NA	NA	<0.49	<0.64	NA	<0.50	<0.69	<0.44	<0.46	<0.66
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	<2.7	NA	<0.32	<0.49	NA	<0.50	<0.48	<0.7	NA	NA	<0.33	<0.48	NA	<0.34	<0.52	<0.32	<0.31	<0.49
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	<1.2	NA	<0.30	<0.23	NA	<0.23	<0.22	<0.7	NA	NA	<0.31	<0.22	NA	<0.32	<0.24	<0.32	<0.29	<0.23
Phenanthrene	µg/L	~	~	~	~	31.7	1.2	1.1	1.1	<0.32	<0.18	<0.18	<0.1	NA	0.464	<0.24	<0.18	NA	<0.25	<0.19	0.725	1.3	<0.18
Pyrene	µg/L	~	200.00	~	~	18.8	<0.27	<0.34	<0.22	<0.30	<0.23	<0.22	0.9	NA	0.533	<0.35	<0.22	NA	<0.36	<0.24	<0.015	1.2	<0.22
2-Methylphenol	µg/L	~	~	~	~	45.9	NA	<0.83	<0.91	NA	<0.92	156	320	NA	NA	<0.86	<0.89	NA	<0.88	<0.95	<1.1	<0.82	<0.91
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<2.3	<0.20	<0.37	<0.47	<0.20	<1.2	<1.2	<1	NA	<0.22	<0.19	<0.23	NA	<0.19	<0.23	<0.20	<0.19	<1.2
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<1.9	<0.31	<0.45	<0.39	<0.31	<0.97	<0.97	<1	NA	<0.22	<0.23	<0.19	NA	<0.23	<0.19	<0.31	<0.23	<0.97
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	<5.0	<0.22	<0.42	<1.0	<0.22	<2.5	<2.5	<1	NA	<0.20	<0.21	<0.50	NA	<0.21	<0.50	<0.22	<0.21	<2.5
1,1'-Biphenyl	µg/L	~	~	~	~	13.9	NA	<0.26	<0.22	NA	<0.22	<0.21	<3	NA	NA	<0.27	<0.21	NA	<0.28	<0.23	<0.32	<0.26	<0.22
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	<2.1	NA	<0.37	<0.38	NA	<0.38	<0.37	<0.5	NA	NA	<0.38	<0.37	NA	<0.39	<0.40	<0.32	<0.36	<0.38
1,4-Dioxane	µg/L	~	0.4	~	~	<0.054	NA	<0.054	<0.050	NA	0.594	<0.049	<0.1	NA	<75	<0.056	0.483	NA	<0.057	<0.052	<0.29	0.398	0.333
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	<8.1	NA	<1.4	<1.5	NA	<1.5	<1.5	<4	NA	NA	<1.5	<1.5	NA	<1.5	<1.6	<0.99	<1.4	<1.5
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	<1.2	NA	<0.28	<0.21	NA	<0.21	<0.21	<4	NA	NA	<0.29	<0.21	NA	<0.30	<0.22	<0.30	<0.28	<0.21
Atrazine	µg/L	~	3.00	~	~	<2.5	NA	<0.42	<0.46	NA	<0.46	<0.45	<2	NA	NA	<0.44	<0.45	NA	<0.45	<0.48	<0.51	<0.42	<0.46
Benzaldehyde	µg/L	~	~	~	~	<1.6	NA	<0.34	<0.29	NA	<0.30	<0.29	<3	NA	NA	<0.35	<0.29	NA	<0.36	<0.31	<3.4	<0.34	<0.29
Caprolactam	µg/L	~	~	~	~	<3.6	NA	<0.43	<0.66	NA	<0.67	<0.65	<5	NA	NA	3.9	<0.65	NA	104	6.5	<0.73	31.7	15.0
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	<0.14	NA	<0.11	<0.13	NA	<0.13	<0.13	<1	NA	NA	<0.12	<0.13	NA	<0.12	<0.14	<0.10	<0.11	<0.13
Total SVOC Alkanes	µg/L	~	100.0	~	~	1429 J	NA	0	0	NA	0	11 J	27 J	NA	NA	0	0	NA	0	0	0	56.8 J	0
Total SVOC TICs	µg/L	~	500.00	~	~	2123 J	NA	578.9 J	754 J	NA	41.1 J	722.6 J	420 J	NA	NA	28204.8 J	9.6 J	NA	114.4 J	4.3 J	409.3 J	152.9 J	31 J

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-650	GMW-686		GMW-687		GMW-688	GMW-689	GMW-690	GMW-691	GMW-692	GMW-748	GMW-749	GMW-750
Date						2016-12-05	2016-02-05	2016-12-05	2016-02-05	2016-12-08	2017-01-20	2017-01-17	2016-12-12	2017-01-19	2016-12-14	2019-05-06	2019-05-06	2019-05-06
Grid Cell (Figures 2A, 2B and 2C)						B1	C2		C3		B2	B2	B2	B2	B2	B1	B2	C2
Chemical	Units																	
2-chlorophenol	µg/L	~	~	~	~	<8.8	<1.0	<0.84	<0.98	<0.82	<0.89	<1.7	<0.84	<8.9	<0.85	<3	<3	<3
4-chloro-3-methylphenol	µg/L	~	~	~	~	<9.6	<1.5	<0.91	<1.5	<0.89	<0.97	<1.9	<0.91	<9.7	<0.93	<3	<3	<3
2,4-dichlorophenol	µg/L	~	~	~	~	<14	<1.4	<1.3	<1.3	<1.3	<1.4	<2.7	<1.3	<14	<1.3	<3	<3	<3
2,4-dimethylphenol	µg/L	~	~	~	~	94.2	12.5	18.5	<1.3	<2.4	71.0	33.2	<2.5	126	172	<16	<16	<16
2,4-dinitrophenol	µg/L	~	~	~	~	<17	<1.2	<1.6	<1.1	<1.6	<1.7	<3.3	<1.6	<17	<1.6	<75	<74	<77
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	<1.6	<0.098	<0.16	<0.094	<0.15	<0.17	<0.16	<0.16	<1.7	<0.16	<43	<43	<44
3- and 4-methylphenol	µg/L	~	~	~	~	<9.5	5.7	<0.90	<0.71	<0.88	19.5	<1.9	<0.90	<9.6	20.7	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	<10	<1.6	<0.98	<1.5	<0.96	<1.0	<2.0	<0.98	<10	<1.0	<16	<16	<16
4-nitrophenol	µg/L	~	~	~	~	<12	<1.2	<1.2	<1.1	<1.2	<1.3	<2.4	<1.2	<13	<1.2	<53	<53	<55
phenol	µg/L	99467658	2000.00	~	~	<4.2	<0.35	<0.40	<0.33	<0.39	6.4	<0.83	<0.40	<4.3	<0.41	<3	<3	<3
2,4,5-trichlorophenol	µg/L	~	~	~	~	<14	<1.6	<1.4	<1.6	<1.3	<1.4	<2.8	<1.4	<14	<1.4	<3	<3	<3
2,4,6-trichlorophenol	µg/L	~	~	~	~	<9.9	<1.6	<0.94	<1.5	<0.92	<1.0	<1.9	<0.94	<10	<0.96	<3	<3	<3
Acenaphthene	µg/L	~	400.00	~	~	29.2	0.52 J	<0.19	<0.30	<0.19	3.1	3.3	1.9	27.1	2.1	2 J	<0.5	<0.5
Acenaphthylene	µg/L	~	100.00	~	~	<1.5	<0.26	<0.14	<0.25	<0.14	<0.15	<0.29	<0.14	<1.5	<0.14	<0.5	<0.5	<0.5
Anthracene	µg/L	~	2000.00	~	~	55.0	<0.27	<0.22	<0.26	<0.21	3.8	5.9	1.2	49.1	1.1	3	<0.5	<0.5
benzo[a]anthracene	µg/L	~	0.10	~	~	388	0.689	0.247	<0.019	<0.023	13.0	25.2	2.27	208	0.272	21	0.6	2
benzo[a]pyrene	µg/L	~	0.10	~	~	219	0.406	<0.034	<0.031	<0.033	6.1	15.9	0.979	77.3	0.111	11	0.4	1
benzo[b]fluoranthene	µg/L	~	0.20	~	~	125	0.350	<0.044	<0.022	<0.043	4.04	10.3	0.725	52.4	<0.045	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	63.1	<0.45	<0.35	<0.43	<0.34	1.5	6.4	0.52 J	21.5	<0.36	2 J	<0.5	0.6 J
benzo[k]fluoranthene	µg/L	~	0.50	~	~	23.7	<0.021	<0.034	<0.020	<0.033	0.865	2.3	0.207	12.5	<0.034	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	<2.5	<0.33	<0.24	<0.31	<0.24	<0.26	<0.50	<0.24	<2.6	<0.25	<2	<2	<2
4-bromophenyl phenyl ether	µg/L	~	~	~	~	<4.3	<0.40	<0.41	<0.39	<0.40	<0.44	<0.85	<0.41	<4.4	<0.42	<3	<3	<3
butyl benzyl phthalate	µg/L	~	100.00	~	~	<4.9	<0.30	<0.47	<0.29	<0.46	<0.50	<0.96	<0.47	<5.0	<0.48	<11	<11	<11
4-chloroaniline	µg/L	~	30.00	~	~	<3.7	<0.25	<0.35	<0.24	<0.34	<0.37	<0.72	<0.35	<3.7	<0.35	<21	<21	<22
Carbazole	µg/L	~	~	~	~	<2.5	<0.32	<0.23	<0.31	<0.23	5.1	2.9	<0.23	8.6 J	<0.24	<3	<3	<3
Chrysene	µg/L	~	5.00	~	~	365	0.77 J	<0.18	<0.36	<0.18	11.9	28.5	2.9	176	0.65 J	12	<0.5	2 J
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	<3.0	<0.29	<0.28	<0.27	<0.28	<0.30	<0.59	<0.28	<3.0	<0.29	<3	<3	<3
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	<2.7	<0.38	<0.25	<0.36	<0.25	<0.27	<0.52	<0.25	<2.7	<0.26	<3	<3	<3
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	<4.3	<0.31	<0.41	<0.30	<0.40	<0.44	<0.85	<0.41	<4.4	<0.42	<3	<3	<3
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	<3.9	<0.30	<0.37	<0.29	<0.37	<0.40	<0.77	<0.37	<4.0	<0.38	<3	<3	<3
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<2.1	<0.27	<1.1	<0.27	<0.21	<1.1	<0.21	<0.21	<2.1	<0.85	<0.2	<2	<2
2,4-dinitrotoluene	µg/L	~	10.00	~	~	<5.9	<0.29	<0.56	<0.28	<0.55	<0.60	<1.2	<0.56	<6.0	<0.58	<5	<5	<5
2,6-dinitrotoluene	µg/L	~	10.00	~	~	<5.1	<0.35	<0.49	<0.34	<0.48	<0.52	<1.0	<0.49	<5.2	<0.50	<3	<3	<3
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	<5.5	<0.59	<0.52	<0.56	<0.51	<0.55	<1.1	<0.52	<5.5	<0.53	<16	<16	<16
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	66.6	0.193	<0.037	<0.037	<0.036	2.42	6.8	0.352	39.1	<0.038	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	<2.4	0.47 J	0.59 J	<0.29	<0.22	2.7 J	2.9 J	1.1 J	32.5 J	1.9 J	<3	<3	<3
di-n-butyl phthalate	µg/L	~	700.00	~	~	<5.3	<0.86	<0.51	<0.83	<0.50	<0.54	<1.0	<0.51	<5.4	<0.52	<11	<11	<11
di-n-octyl phthalate	µg/L	~	100.00	~	~	<2.5	<0.32	<0.24	<0.30	<0.23	<0.25	<0.49	<0.24	<2.5	<0.24	<27	<27	<27
diethyl phthalate	µg/L	~	6000.00	~	~	<2.8	<0.27	<0.27	<0.26	<0.26	<0.28	<0.55	<0.27	<2.8	<0.27	<11	<11	<11

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-650	GMW-686		GMW-687		GMW-688	GMW-689	GMW-690	GMW-691	GMW-692	GMW-748	GMW-749	GMW-750
Date						2016-12-05	2016-02-05	2016-12-05	2016-02-05	2016-12-08	2017-01-20	2017-01-17	2016-12-12	2017-01-19	2016-12-14	2019-05-06	2019-05-06	2019-05-06
Grid Cell (Figures 2A, 2B and 2C)						B1	C2		C3		B2	B2	B2	B2	B2	B1	B2	C2
Chemical	Units																	
dimethyl phthalate	µg/L	~	~	~	~	<2.3	<0.34	<0.22	<0.33	<0.22	<0.24	<0.46	<0.22	<2.4	<0.23	<11	<11	<11
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	<18	<0.84	<1.7	<0.81	<1.7	<1.8	<3.5	<1.7	<18	<1.7	510	<27	<27
Fluoranthene	µg/L	~	300.00	~	~	37.1	<0.25	<0.17	<0.24	<0.17	1.8	3.5	0.81 J	25.0	<0.18	2 J	<0.5	<0.5
Fluorene	µg/L	~	300.00	~	~	44.8	0.67 J	0.85 J	<0.31	<0.17	5.3	6.1	1.6	57.1	2.9	5	<0.5	<0.5
hexachlorobenzene	µg/L	~	0.02	~	~	<0.12	<0.016	<0.011	<0.015	<0.011	<0.012	<0.012	<0.011	<0.12	<0.012	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	<0.19	<0.012	<0.018	<0.011	<0.018	<0.019	<0.019	<0.018	<0.19	<0.019	<3	<3	<3
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	<30	<0.32	<2.8	<0.31	<2.8	<3.0	<5.9	<2.8	<30	<2.9	<27	<27	<27
hexachloroethane	µg/L	~	7.00	~	~	<4.2	<0.24	<0.40	<0.23	<0.39	<0.42	<0.82	<0.40	<4.2	<0.41	<5	<5	<5
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	54.9	0.144	<0.039	<0.033	<0.038	0.902	3.29	0.249	11.7	<0.040	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	<3.0	<0.31	<0.28	<0.30	<0.28	<0.30	<0.58	<0.28	<3.0	<0.29	<3	<3	<3
2-Methylnaphthalene	µg/L	~	30.0	~	~	366	13.3	14.5	<0.30	<0.21	62.0	38.0	5.9	600	63.6	18	3	<0.5
2-nitroaniline	µg/L	~	~	~	~	<3.0	<0.23	<0.28	<0.22	<0.28	<0.30	<0.58	<0.28	<3.0	<0.29	<11	<11	<11
3-nitroaniline	µg/L	~	~	~	~	<4.2	<0.26	<0.39	<0.25	<0.39	<0.42	<0.81	<0.39	<4.2	<0.40	<16	<16	<16
4-nitroaniline	µg/L	~	~	~	~	<4.7	<0.38	<0.45	<0.36	<0.44	<0.48	<0.93	<0.45	<4.8	<0.46	<5	<5	<5
Naphthalene (extractable)	µg/L	6487	300.00	~	~	135	14.6	13.7	<0.30	<0.23	59.1	24.7	6.8	264	114	5	3	<0.5
nitrobenzene	µg/L	~	6.00	~	~	<6.9	<0.51	<0.66	<0.49	<0.64	<0.70	<1.4	<0.66	<7.0	<0.67	<3	<3	<3
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	<5.2	<0.34	<0.49	<0.33	<0.48	<0.52	<1.0	<0.49	<5.2	<0.50	<4	<4	<4
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	<2.4	<0.32	<0.23	<0.31	<0.22	<0.24	<0.47	<0.23	<2.4	<0.23	<4	<4	<4
Phenanthrene	µg/L	~	~	~	~	175	1.0 J	1.1	<0.24	<0.18	11.8	16.6	1.9	163	6.3	15	2 J	<0.5
Pyrene	µg/L	~	200.00	~	~	118	<0.37	<0.22	<0.35	<0.22	5.5	10.9	3.1	103	1.8	9	1 J	2 J
2-Methylphenol	µg/L	~	~	~	~	<9.5	1.5 J	<0.91	<0.86	<0.89	8.1	<1.9	<0.91	<9.7	59.7	<3	3 J	<3
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<2.3	<0.19	<1.2	<0.19	<0.23	<1.2	<0.23	<0.23	<2.3	<0.93	<0.2	<2	<2
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<1.9	<0.23	<0.97	<0.23	<0.19	<0.97	<0.19	<0.19	<1.9	<0.77	<0.2	<2	<2
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	<5.0	<0.21	<2.5	<0.21	<0.50	<2.5	<0.50	<0.50	<5.0	<2.0	<0.3	<3	<3
1,1'-Biphenyl	µg/L	~	~	~	~	47.2	0.93 J	1.1	<0.27	<0.21	5.6	2.7	<0.22	69.2	3.0	<16	<16	<16
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	<4.0	<0.40	<0.38	<0.38	<0.37	<0.40	<0.78	<0.38	<4.0	<0.39	<3	<3	<3
1,4-Dioxane	µg/L	~	0.4	~	~	<0.52	<0.058	<0.050	<0.056	<0.049	<0.053	<0.051	0.172	<0.53	<0.051	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	<16	<1.5	<1.5	<1.5	<1.5	<1.6	<3.1	<1.5	<16	<1.5	<21	<21	<22
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3	<3	<3
Acetophenone	µg/L	~	~	~	~	<2.2	<0.30	<0.21	<0.29	<0.21	<0.23	<0.44	<0.21	<2.3	<0.22	<21	<21	<22
Atrazine	µg/L	~	3.00	~	~	<4.8	<0.46	<0.46	<0.44	<0.45	<0.49	<0.94	<0.46	<4.9	<0.47	<11	<11	<11
Benzaldehyde	µg/L	~	~	~	~	<3.1	<0.37	<0.29	<0.35	<0.29	<0.31	<0.61	<0.29	<3.1	<0.30	<16	<16	<16
Caprolactam	µg/L	~	~	~	~	<7.0	<0.47	<0.66	<0.45	<0.65	<0.71	<1.4	<0.66	<7.1	<0.68	<27	<27	<27
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	<1.4	<0.12	<0.13	<0.12	<0.13	<0.14	<0.14	<0.13	<1.4	<0.13	<5	<5	<5
Total SVOC Alkanes	µg/L	~	100.0	~	~	5540 J	7.6 J	0	0	0	321 J	233 J	86.1 J	5910 J	0	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	3890 J	344.3 J	891.2 J	245.2 J	707.7 J	875 J	873 J	257.6 J	4710 J	874 J	1600 J	770 J	1300 J

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	10	<10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<3.50	<3.50	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.23	<0.23	<0.23	<0.23	<0.23	<0.54	<0.54	<0.70	<0.70	<0.70
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<3.50	<3.50	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.61	<0.61	<0.61	<0.61	<0.61	<0.52	<0.52	<0.58	<0.58	<0.58
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<3.00	<3.00	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.49	<0.49	<0.49	<0.49	<0.49	<0.29	<0.29	<0.66	<0.66	<0.66
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<50	<50	<50	<50	<50	<50	<50	<50
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.70	<0.70	<0.70	<0.17	<0.17	<0.17	<0.41	<0.41	<0.41	<0.41	<0.41	<0.27	<0.27	<0.27	<0.27	<0.26	<0.26	<0.26	<0.69	<0.69	<0.69
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.58	<0.58	<0.58	<0.33	<0.33	<0.33	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.30	<0.30	<0.30
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.66	<0.67	<0.67	<0.24	<0.24	<0.24	<0.26	<0.26	<0.26	<0.26	<0.26	<0.30	<0.30	<0.30	<0.30	<0.17	<0.17	<0.17	<0.23	<0.23	<0.23
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	<50	<50	<100	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<200	<200	<200	<200	<200	<200	<200	<200
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.69	<0.69	<0.69	<0.69	<0.69	<0.69	<0.21	<0.21	<0.21	<0.32	<0.32	<0.32	<0.32	<0.24	<0.24	<0.24	<0.24	<0.24	<0.22	<0.22	<0.22
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.57	<0.57	<0.57	<0.57	<0.22	<0.22	<0.22	<0.22	<0.22	<0.11	<0.11	<0.11
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.18	<0.18	<0.18	<0.26	<0.26	<0.26	<0.26	<0.15	<0.15	<0.15	<0.15	<0.15	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																			
Date						2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)						B1																			
Chemical	Units																								
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11	<0.13	<0.13	<0.13	<0.13	<0.13
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																			
Date						2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)						B1																			
Chemical	Units																								
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.11	<0.11	<0.11	<0.11	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.11	<0.11	<0.11	<0.11	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	20	<10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<3.50	<3.50	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.23	<0.23	<0.23	<0.23	<0.23	<0.54	<0.54	<0.70	<0.70	<0.70
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<3.50	<3.50	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.61	<0.61	<0.61	<0.61	<0.61	<0.52	<0.52	<0.58	<0.58	<0.58
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<3.00	<3.00	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.49	<0.49	<0.49	<0.49	<0.49	<0.29	<0.29	<0.66	<0.66	<0.66
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<50	<50	<50	<50	<50	<50	<50	<50
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.70	<0.70	<0.70	<0.17	<0.17	<0.17	<0.41	<0.41	<0.41	<0.41	<0.41	<0.27	<0.27	<0.27	<0.27	<0.26	<0.26	<0.26	<0.69	<0.69	<0.69
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.58	<0.58	<0.58	<0.33	<0.33	<0.33	<0.20	<0.20	<0.20	<0.20	<0.20	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.30	<0.30	<0.30
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.66	<0.67	<0.67	<0.24	<0.24	<0.24	<0.26	<0.26	<0.26	<0.26	<0.26	<0.30	<0.30	<0.30	<0.30	<0.17	<0.17	<0.17	<0.23	<0.23	<0.23
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	<50	<50	<100	<250	<250	<250	<250	<250	<250	<250	<250	<250	330	<200	<200	<200	<200	<200	<200	<200	<200
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenol	µg/L	99467658	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.69	<0.69	<0.69	<0.69	<0.69	<0.69	<0.21	<0.21	<0.21	<0.32	<0.32	<0.32	<0.32	<0.24	<0.24	<0.24	<0.24	<0.24	<0.22	<0.22	<0.22
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.57	<0.57	<0.57	<0.57	<0.22	<0.22	<0.22	<0.22	<0.22	<0.11	<0.11	<0.11
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.18	<0.18	<0.18	<0.26	<0.26	<0.26	<0.26	<0.15	<0.15	<0.15	<0.15	<0.15	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics	µg/L	~	~	~	~	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	NJ Ecological																				L-16A
Date						2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10	2014-09-18
Grid Cell (Figures 2A, 2B and 2C)						B1																				B1
Chemical	Units																									
2-chlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.5
4-chloro-3-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.6
2,4-dichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.0
2,4-dimethylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.2
2,4-dinitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<7.9
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.6
3- and 4-methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.3
2-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.2
4-nitrophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.1
phenol	µg/L	99467658	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.66
2,4,5-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.1
2,4,6-trichlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.9
Acenaphthene	µg/L	~	400.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.46
Acenaphthylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.029
Anthracene	µg/L	~	2000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.42
benzo[a]anthracene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.940
benzo[a]pyrene	µg/L	~	0.10	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.322
benzo[b]fluoranthene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.218
benzo[g,h,i]perylene	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.019
benzo[k]fluoranthene	µg/L	~	0.50	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.018
2-chloronaphthalene	µg/L	~	600.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.42
4-bromophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.30
butyl benzyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.27
4-chloroaniline	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.36
Carbazole	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.20
Chrysene	µg/L	~	5.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.31
bis(2-chloroethoxy) methane	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.51
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.53
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.49
4-chlorophenyl phenyl ether	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.46
1,4-dichlorobenzene	µg/L	~	75.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.12	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11	<0.13	<0.13	<0.13	<0.13	<0.13	<0.24
2,4-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.39
2,6-dinitrotoluene	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31
3,3-dichlorobenzidine	µg/L	~	30.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.68
dibenz[a,h]anthracene	µg/L	~	0.30	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.020
Dibenzofuran	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28
di-n-butyl phthalate	µg/L	~	700.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.5 B
di-n-octyl phthalate	µg/L	~	100.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.30
diethyl phthalate	µg/L	~	6000.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				L-16A
Date						2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10	2014-09-18
Grid Cell (Figures 2A, 2B and 2C)						B1																				B1
Chemical	Units																									
dimethyl phthalate	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.32
bis(2-ethylhexyl) phthalate	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.8 B
Fluoranthene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.631
Fluorene	µg/L	~	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.0
hexachlorobenzene	µg/L	~	0.02	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.020
hexachlorobutadiene	µg/L	~	1.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.47
hexachlorocyclopentadiene	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.58
hexachloroethane	µg/L	~	7.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.35
indeno[1,2,3-c,d]pyrene	µg/L	~	0.20	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.017
isophorone	µg/L	~	40.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.41
2-Methylnaphthalene	µg/L	~	30.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6 B
2-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.38
3-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.32
4-nitroaniline	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.36
Naphthalene (extractable)	µg/L	6487	300.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.043
nitrobenzene	µg/L	~	6.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.63
n-nitrosodi-n-propylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.46
n-nitrosodiphenylamine	µg/L	~	10.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25
Phenanthrene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12.2
Pyrene	µg/L	~	200.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.91
2-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.5
1,2-Dichlorobenzene	µg/L	~	600.00	~	~	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.11	<0.11	<0.11	1.7	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15	<0.16
1,3-Dichlorobenzene	µg/L	~	600.00	~	~	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.11	<0.11	<0.11	<0.11	<0.19	<0.19	<0.19	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15	<0.26
1,2,4-Trichlorobenzene	µg/L	~	9.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.22
1,1'-Biphenyl	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.33
1,2,4,5-Tetrachlorobenzene	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.54
1,4-Dioxane	µg/L	~	0.4	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.87
2,3,4,6-Tetrachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.7
4-Methylphenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.44
Atrazine	µg/L	~	3.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.51
Benzaldehyde	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.81
Caprolactam	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15
Total recoverable phenolics	µg/L	~	~	~	~	<200	<200	<200	<200	200	<200	210	<200	<200	200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	NA
1-methylnaphthalene	µg/L	~	5	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	~	~	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.12
Total SVOC Alkanes	µg/L	~	100.0	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	273 J
Total SVOC TICs	µg/L	~	500.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	506 J

TABLE 2B
GROUND WATERANALYTICAL DATA
SEMI-VOLATILE ORGANIC COMPOUNDS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic
Date					
Grid Cell (Figures 2A, 2B and 2C)					
Chemical	**Units**				
2-chlorophenol	µg/L	~	~	~	~
4-chloro-3-methylphenol	µg/L	~	~	~	~
2,4-dichlorophenol	µg/L	~	~	~	~
2,4-dimethylphenol	µg/L	~	~	~	~
2,4-dinitrophenol	µg/L	~	~	~	~
4,6-dinitro-2-methylphenol	µg/L	~	~	~	~
3- and 4-methylphenol	µg/L	~	~	~	~
2-nitrophenol	µg/L	~	~	~	~
4-nitrophenol	µg/L	~	~	~	~
phenol	µg/L	99467658	2000.00	~	~
2,4,5-trichlorophenol	µg/L	~	~	~	~
2,4,6-trichlorophenol	µg/L	~	~	~	~
Acenaphthene	µg/L	~	400.00	~	~
Acenaphthylene	µg/L	~	100.00	~	~
Anthracene	µg/L	~	2000.00	~	~
benzo[a]anthracene	µg/L	~	0.10	~	~
benzo[a]pyrene	µg/L	~	0.10	~	~
benzo[b]fluoranthene	µg/L	~	0.20	~	~
benzo[g,h,i]perylene	µg/L	~	100.00	~	~
benzo[k]fluoranthene	µg/L	~	0.50	~	~
2-chloronaphthalene	µg/L	~	600.00	~	~
4-bromophenyl phenyl ether	µg/L	~	~	~	~
butyl benzyl phthalate	µg/L	~	100.00	~	~
4-chloroaniline	µg/L	~	30.00	~	~
Carbazole	µg/L	~	~	~	~
Chrysene	µg/L	~	5.00	~	~
bis(2-chloroethoxy) methane	µg/L	~	~	~	~
bis(2-chloroethyl) ether	µg/L	~	7.00	~	~
Bis(2-chloro-1-methylethyl) ether	µg/L	~	300.00	~	~
4-chlorophenyl phenyl ether	µg/L	~	~	~	~
1,4-dichlorobenzene	µg/L	~	75.00	~	~
2,4-dinitrotoluene	µg/L	~	10.00	~	~
2,6-dinitrotoluene	µg/L	~	10.00	~	~
3,3-dichlorobenzidine	µg/L	~	30.00	~	~
dibenz[a,h]anthracene	µg/L	~	0.30	~	~
Dibenzofuran	µg/L	~	~	~	~
di-n-butyl phthalate	µg/L	~	700.00	~	~
di-n-octyl phthalate	µg/L	~	100.00	~	~
diethyl phthalate	µg/L	~	6000.00	~	~

Notes:

~	No standard exists for this compound in this classification.
SVOC	Semi-volatile organic compound
TICs	Tentatively identified compounds
µg/L	Micrograms per liter
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
B	Analyte detected in associated method blank
N	Presumptive evidence of a compound
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
GWQC	NJDEP Ground Water Quality Criteria
GWRS	NJDEP Ground Water Remediation Standard
ESC	NJDEP Ecological Screening Criteria
Yellow highlight	Concentration exceeds the Class II-A GWRS

Class III-B GWQC conditionally approved by the NJDEP on December 13, 2002.

If more than one applicable GWRS, GWQC or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.

If no site-specific Class IIIB GWQC exists, analytical results are compared to the Class IIA GWRS.

ESCs do not apply to monitoring wells EB-3S, EB-4S, GMW-228, GMW-688, GMW-690 and GMW-691.

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	AWP-600	AWP-601	AWP-602	AWP-603	AWP-604
Date						2019-05-08	2019-05-07	2019-05-07	2019-05-07	2019-05-08
Grid Cell (Figures 2A, 2B and 2C)						B3	C3	C3	C3	B3
Chemical	Units									
Aluminum	ug/l		200.00			<153	<153	<153	6390	33500
Antimony	ug/l		6.00			3.4	6.6	4.3	2.1	3.2
Arsenic	ug/l		3.00	69	36	20.0	*67.2*	4.2	*40.2*	7.5 J
Barium	ug/l		6000.00			134	73.2	60.2	63.7	950
Beryllium	ug/l		1.00			0.89	1.1	0.31 J	0.27 J	1.7
Cadmium	ug/l		4.00	40	8.8	<0.15	<3.0	<0.15	<0.15	<0.76
Calcium	ug/l					270000	238000	215000	281000	261000
Chromium (total)	ug/l		70.00			264	4350	6.1 J	71.2	23.1
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA
Cobalt	ug/l					5.2	<1.5	10.9	17.7	20.9
Copper	ug/l		1300.00	4.8	3.1	**109**	**617**	<6.2	<6.2	**25.3**
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA
Iron	ug/l		300.00			19100	48800	22200	81.2 J	54100
Lead	ug/l	222	5.00	210	24	<1.1	<21.4	<1.1	*132*	<5.4
Magnesium	ug/l					849000	646000	600000	780000	720000
Manganese	ug/l		50.00			575	472	2020	495	403
Mercury	ug/l		2.00	1.8	0.94	**3.4**	**2.8**	0.60	<0.050	**4.8**
Molybdenum	ug/l					NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	52.5	<3.1	<3.1	**286**	<3.1
Palladium	ug/l					NA	NA	NA	NA	NA
Potassium	ug/l			~	~	266000	222000	214000	258000	195000
Selenium	ug/l		40.00	290	71	<21.0	<21.0	21.6 J	<21.0	<21.0
Silver	ug/l		40.00	1.9	~	<5.0	<5.0	<5.0	<5.0	<5.0
Sodium	ug/l		50000.00	~	~	6730000	5970000	5670000	6350000	5600000
Thallium	ug/l		2.00	~	~	0.24 J	0.29 J	<0.11	<0.11	<0.55 K3
Vanadium	ug/l			~	~	<3.0	<3.0	7.8 J	22.4	127
Zinc	ug/l		2000.00	90	81	122	677	121	<3.0	3.8 J

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-2S																	
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						B1																	
Chemical	Units																						
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<200
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<6.0
Arsenic	ug/l		3.00	69	36	<20.00	NA	3.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	12.00	NA	<10.00	NA	<10.00	5.8
Barium	ug/l		6000.00			350.00	NA	440.00	NA	730.00	NA	510.00	NA	520.00	NA	741.00	NA	597.00	NA	571.00	NA	594.00	412
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0
Cadmium	ug/l		4.00	40	8.8	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	<3.0
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47100
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10.00	<10
Chromium VI	ug/l		70.00			<50.00	<10.00	<10.00	<10.00	20.00	<10.00	<50.00	<10.00	<50.00	<100.00	<200.00	<100.00	<10.00	<10.00	<100.00	<10.00	<100.00	NA
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<50
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10
Cyanide	ug/l		100.00			335.00	NA	560.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA
Iron	ug/l		300.00			16100.00	NA	13300.00	NA	2990.00	NA	11400.00	NA	12000.00	NA	20900.00	NA	12100.00	NA	10400.00	NA	19500.00	114
Lead	ug/l	222	5.00	210	24	<10.00	<1.00	<1.00	<3.00	<3.00	<3.00	<3.00	<10.00	<10.00	<2.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	165000
Manganese	ug/l		50.00			3550.00	NA	4920.00	NA	4520.00	NA	4590.00	NA	4490.00	NA	7860.00	NA	6480.00	NA	4540.00	NA	4410.00	3560
Mercury	ug/l		2.00	1.8	0.94	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	0.50	NA	<0.20	NA	<0.20	<0.20
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11.4
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	84400
Selenium	ug/l		40.00	290	71	<1.00	NA	<3.00	NA	<5.00	NA	1.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	<10
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10
Sodium	ug/l		50000.00	~	~	3120000.00	NA	3010000.00	NA	2980000.00	NA	3010000.00	NA	3440000.00	NA	3090000.00	NA	3260000.00	NA	2710000.00	NA	2640000.00	2340000
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.0
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<50
Zinc	ug/l		2000.00	90	81	11.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-3S																		
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13	1999-06-23	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)						195000																		
Chemical	Units																							
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	928
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.06	9.5
Arsenic	ug/l		3.00	69	36	10.00	NA	4.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	8.8 B	<3.0
Barium	ug/l		6000.00			150.00	NA	180.00	NA	160.00	NA	250.00	NA	274.00	NA	223.00	NA	264.00	NA	376.00	NA	493.00	677	<200
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.005	<1.0
Cadmium	ug/l		4.00	40	8.8	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	<0.005	<3.0
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	225000	19100
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10.00	2.9 B	<10
Chromium VI	ug/l		70.00			<50.00	<10.00	10.00	<10.00	<10.00	<10.00	<50.00	<10.00	<10.00	<1000.00	<1000.00	<500.00	<20.00	<10.00	<100.00	<10.00	<100.00	NA	NA
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6 B	<50
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.025	**56.0**
Cyanide	ug/l		100.00			1770.00	NA	420.00	NA	<10.00	NA	<20.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	<0.01	NA
Iron	ug/l		300.00			36000.00	NA	41800.00	NA	33900.00	NA	39700.00	NA	45200.00	NA	45800.00	NA	52000.00	NA	58800.00	NA	59300.00	56800 N	252
Lead	ug/l	222	5.00	210	24	60.00	<1.00	<1.00	<3.00	<3.00	<3.00	<3.00	<10.00	<10.00	<2.00	<3.00	3.00	<3.00	4.00	<3.00	<3.00	14.00	<0.003	*28.3*
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	222000	12400
Manganese	ug/l		50.00			37800.00	NA	38800.00	NA	33800.00	NA	34300.00	NA	32400.00	NA	32700.00	NA	37000.00	NA	41700.00	NA	41600.00	35800	222
Mercury	ug/l		2.00	1.8	0.94	0.70	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	0.30	NA	<0.20	NA	<0.20	<0.2	<0.30
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.01	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	69.5	18.5
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11800
Selenium	ug/l		40.00	290	71	<1.00	NA	<3.00	NA	<5.00	NA	<1.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	<0.005	<10
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.7 B	<10
Sodium	ug/l		50000.00	~	~	1340000.00	NA	1280000.00	NA	1160000.00	NA	1380000.00	NA	1380000.00	NA	939000.00	NA	1180000.00	NA	1290000.00	NA	1470000.00	NA	212000
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35.6	<2.0
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.6 B	<50
Zinc	ug/l		2000.00	90	81	12.00	<10.00	<10.00	10.00	<10.00	<10.00	<10.00	<10.00	<10.00	21.00	<10.00	18.00	<10.00	<10.00	<10.00	<10.00	<10.00	5.5	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	EB-4S																
Date						1992-06-25	1992-10-08	1993-01-25	1993-04-14	1993-07-07	1993-10-19	1994-01-13	1994-04-07	1994-07-13	1994-10-06	1995-01-13	1995-04-07	1995-07-13	1995-10-06	1996-01-13	1996-04-07	1996-07-13
Grid Cell (Figures 2A, 2B and 2C)						B1																
Chemical	Units																					
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	30.00	NA	18.00	NA	11.00	NA	20.00	NA	<10.00	NA	20.00	NA	22.00	NA	18.00	NA	14.00
Barium	ug/l		6000.00			310.00	NA	280.00	NA	250.00	NA	360.00	NA	365.00	NA	436.00	NA	385.00	NA	461.00	NA	432.00
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10.00
Chromium VI	ug/l		70.00			<50.00	<10.00	10.00	<10.00	<10.00	<10.00	<50.00	<20.00	<50.00	<1000.00	<1000.00	<500.00	<50.00	<10.00	<100.00	<10.00	<100.00
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			1510.00	NA	640.00	NA	30.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00	NA	<10.00
Iron	ug/l		300.00			50300.00	NA	48100.00	NA	32800.00	NA	62400.00	NA	68800.00	NA	77600.00	NA	78100.00	NA	77400.00	NA	70600.00
Lead	ug/l	222	5.00	210	24	<10.00	8.00	<1.00	<3.00	<3.00	3.00	<3.00	<10.00	<10.00	<2.00	<3.00	<3.00	14.00	3.00	<3.00	<3.00	8.00
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			6300.00	NA	7030.00	NA	7700.00	NA	9630.00	NA	9060.00	NA	10600.00	NA	10300.00	NA	10900.00	NA	9520.00
Mercury	ug/l		2.00	1.8	0.94	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	2.00	NA	<3.00	NA	<5.00	NA	1.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00	NA	<5.00
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	762000.00	NA	912000.00	NA	907000.00	NA	1000000.00	NA	1000000.00	NA	1060000.00	NA	1120000.00	NA	1140000.00	NA	990000.00
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	27.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-123										
Date						1998-12-02	1999-07-07	2013-10-31	2013-12-10	2014-09-16	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21
Grid Cell (Figures 2A, 2B and 2C)						C3										
Chemical	Units															
Aluminum	ug/l		200.00			525 N	466	1580	308	204	358	1910	826	<200	1210	818
Antimony	ug/l		6.00			2.6 B	<0.06	<60	<6.0	<18	<30	<6.0	<30	<30	<12	1.8 J
Arsenic	ug/l		3.00	69	36	22.2	13.9	<30	<30	23.3	29.1	<15	21.8	31.5	33.8	16.0
Barium	ug/l		6000.00			263 *	269	<200	<200	221	210	<200	248	<200	<400	232
Beryllium	ug/l		1.00			0.49 B	<0.005	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<2.0	<0.091 K4
Cadmium	ug/l		4.00	40	8.8	<5.0	<0.005	<30	<3.0	<3.0	<15	<3.0	<15	<15	<6.0	<0.15
Calcium	ug/l					340000	270000	209000	270000	243000	255000	236000	307000	305000	270000	247000
Chromium (total)	ug/l		70.00			5.3 B	2.8 B	<100	<10	<10	<50	<10	<50	<50	<20	5.4 J
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	ug/l					<50.0	0.71 B	<500	<500	<50	<250	<100	<1300	<250	<500	1.7 J
Copper	ug/l		1300.00	4.8	3.1	<25.0	<0.025	<100	<10	<10	<50	**27.6**	<50	<50	**23.8**	<6.2
Cyanide	ug/l		100.00			<10 N*	<0.01	NA	<10	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			585	495	<100	611	<100	729	4070	1430	<100	2270	1310
Lead	ug/l	222	5.00	210	24	22.3	11.7	*82.6*	<30	<9.0	18.5	115	<75	<15	*67.4*	*35.8*
Magnesium	ug/l					1020000	760000	673000	831000	729000	732000	715000	879000	977000	755000	637000
Manganese	ug/l		50.00			906	684	279	206	252	218	243	267	166	250	190
Mercury	ug/l		2.00	1.8	0.94	<0.20	0.32	<0.60	<0.20	<0.20	<0.20	<0.20	<0.20	<1.2	<0.60	0.082 J
Molybdenum	ug/l					1.3 B	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	2.0 B	<0.04	<100	<100	<10	<50	<20	<250	<50	<100	<3.1
Palladium	ug/l					<50.0	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	277000 E	NA	238000	238000	245000	229000	199000	268000	263000	237000	249000
Selenium	ug/l		40.00	290	71	<5.0	<0.005	<100	11.5	<10	<50	<20	<50	<10	<100	<21.0
Silver	ug/l		40.00	1.9	~	<10.0	<0.01	<100	<10	<10	<50	<10	<50	<50	<20	<5.0
Sodium	ug/l		50000.00	~	~	7330000	NA	5310000	6130000	6080000	6150000	5350000	6890000	7390000	6160000	6520000
Thallium	ug/l		2.00	~	~	<10.0	<0.01	<20	<20	<6.0	<10	<10	<50	<10	<20	<0.11
Vanadium	ug/l			~	~	5.4 B	7.2 B	<500	<50	<50	<250	<50	<250	<250	<100	4.1 J
Zinc	ug/l		2000.00	90	81	9.2 B	6.6 B	<200	<20	<20	<100	113	<100	<20	42.6	41.3

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic		GMW-126											
Date						2019-08-07	1998-12-02	1999-07-07	2013-10-31	2013-12-10	2014-09-17	2015-10-16	2016-02-02	2016-08-26	2016-12-07	2017-08-03	2018-09-21	2019-08-09
Grid Cell (Figures 2A, 2B and 2C)							D3											
Chemical	Units																	
Aluminum	ug/l		200.00			<153	277	150 B	235	<200	<200	<200	259	<1000	<200	<400	470 J	640
Antimony	ug/l		6.00			<40.6	11 B	6.6 B	<60	<6.0	<30	<30	<6.0	<30	<6.0	<12	1.8 J	<40.6
Arsenic	ug/l		3.00	69	36	<68.0	*62.7*	*46.7*	<30	*38.0*	<15	<15	*44.9*	<15	*42.7*	9.4	9.6	<68.0
Barium	ug/l		6000.00			214	542	358	434	469	368	453	523	<1000	563	525	770	537
Beryllium	ug/l		1.00			<0.091	0.32 B	<0.005	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<2.0	<0.091 K4	<9.1
Cadmium	ug/l		4.00	40	8.8	<15.1	0.22 B	<0.005	<30	<3.0	<15	<15	<3.0	<15	<3.0	<6.0	<0.15	<15.1
Calcium	ug/l					193000	354000	325000	266000	241000	309000	322000	318000	369000	319000	279000	314000	313000
Chromium (total)	ug/l		70.00			6.1 J	7 B	2.6 B	<100	<10	<50	<50	<20	<50	<50	<20	11.1 J	13.0 J
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	ug/l					4.8 J	3.2 B	1.2 B	<500	<250	<250	<250	<1300	<2500	<250	<1000	1.5 J	2.8 J
Copper	ug/l		1300.00	4.8	3.1	<6.2 K2	**19.1 B**	<0.025	<100	<10	<50	<50	<20	<50	<50	<20	<6.2	<6.2
Cyanide	ug/l		100.00			NA	<5	<0.01	NA	30	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			148	379	36 B	<100	203	<100	126	223	<500	<100	<200	589	640
Lead	ug/l	222	5.00	210	24	<107	12.2	4.3	<30	<15	18.5	<15	<75	<150	<15	<60	22.3	<107
Magnesium	ug/l					555000	952000	884000	812000	694000	931000	886000	884000	1020000	778000	755000	752000	772000
Manganese	ug/l		50.00			144	1480	690	<150	45.9	<75	<75	74.2	<75	81.7	85.2	103	88.9
Mercury	ug/l		2.00	1.8	0.94	<0.050	<0.2	<0.2	<0.60	<0.20	<0.60	<0.20	<0.20	<0.40	<1.2	<0.60	<0.050	<0.050
Molybdenum	ug/l					NA	4.1 B	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	<3.1	13.1 B	3.1 B	<100	<50	<50	<50	<250	<500	<50	<200	4.6 J	5.1 J
Palladium	ug/l					NA	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	232000	249000	NA	237000	190000	263000	232000	232000	292000	226000	218000	240000	266000
Selenium	ug/l		40.00	290	71	<21.0	<0.005	<0.005	<100	17.8	<50	<50	<10	<50	<10	<20	<21.0	<21.0
Silver	ug/l		40.00	1.9	~	<5.0	1.3 B	<0.01	<100	<10	<50	<50	<20	<50	<50	<20	<5.0	<5.0
Sodium	ug/l		50000.00	~	~	5500000	7400000	NA	5870000	6280000	6870000	7050000	6450000	8210000	5880000	6320000	6530000	6500000
Thallium	ug/l		2.00	~	~	<10.9	<0.01	3.4 B	<20	<50	<10	<10	<50	<100	<10	<40	<0.11	<10.9
Vanadium	ug/l			~	~	3.8 J	31.2 B	41.3 B	<500	<50	<250	<250	<100	<250	<250	<100	15.6 J	15.2
Zinc	ug/l		2000.00	90	81	10.2 J	23.1	6.5 B	<200	<20	<100	<100	<20	<100	<20	69.0	8.4 J	13.1 J

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-137										
Date						1998-12-01	1999-07-02	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-02	2016-08-26	2016-12-09	2017-08-11	2018-09-19
Grid Cell (Figures 2A, 2B and 2C)						C1										
Chemical	Units															
Aluminum	ug/l		200.00			701	122 B	200	<200	<200	838	324	240	<200	447	580 J
Antimony	ug/l		6.00			3.9 B	<0.06	<60	<6.0	<12	<30	<6.0	<30	<6.0	<12	2.1 J
Arsenic	ug/l		3.00	69	36	28.7	15.8	<30	<15	7.2	<15	<15	<15	7.9	<6.0	5.1
Barium	ug/l		6000.00			152 B	111 B	<200	<200	<200	<200	<200	<200	<200	<400	115
Beryllium	ug/l		1.00			<0.005	<0.005	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<0.091
Cadmium	ug/l		4.00	40	8.8	<0.005	<0.005	<30	<3.0	<6.0	<3.0	<3.0	<15	<3.0	<6.0	<0.15
Calcium	ug/l					243000	205000	186000	199000	167000	217000	212000	195000	180000	188000	201000
Chromium (total)	ug/l		70.00			5.2 B	2.1 B	<100	<10	<20	<10	<10	<50	<10	<20	<5.3
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	ug/l					1.2 B	0.86 B	<500	<250	<100	<250	<100	<250	<50	<100	1.7 J
Copper	ug/l		1300.00	4.8	3.1	<0.025	<0.025	<100	<10	<20	**15.6**	<10	<50	<10	<20	<6.2
Cyanide	ug/l		100.00			<5	25.9 N	NA	<10	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			191	<0.1	<100	145	250	774	225	118	<100	604	452
Lead	ug/l	222	5.00	210	24	7.8	<0.003	<30	<15	<15	<15	<6.0	<15	<15	19.0	10.5
Magnesium	ug/l					602000	509000	626000	730000	524000	634000	632000	658000	613000	566000	617000
Manganese	ug/l		50.00			245	163	208	189	186	152	169	217	173	217	227
Mercury	ug/l		2.00	1.8	0.94	<0.2	<0.2	<0.60	<0.20	<0.20	<0.20	<0.20	<0.40	<1.2	<0.60	<0.050
Molybdenum	ug/l					<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	5.3 B	2.4 B	<100	<50	<50	<50	<20	<50	<10	<20	<3.1
Palladium	ug/l					2.4 B	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	191000	208000	190000	171000	162000	184000	194000	191000	178000	183000	190000
Selenium	ug/l		40.00	290	71	<0.005	<0.005	<100	<50	<20	<50	<20	<50	<10	<20	<21.0
Silver	ug/l		40.00	1.9	~	0.85 B	<0.01	<100	<10	<20	<10	<10	<50	<10	<20	<5.0
Sodium	ug/l		50000.00	~	~	5510000	3820000	4870000	4840000	4270000	4290000	5020000	4920000	4420000	4730000	4870000
Thallium	ug/l		2.00	~	~	<0.01	<0.01	<20	<10	<10	<10	<10	<10	<10	<4.0	<0.11
Vanadium	ug/l			~	~	15.3 B	6 B	<500	<50	<100	<50	<50	<250	<50	<100	3.5 J
Zinc	ug/l		2000.00	90	81	6.3 B	6.1 B	<200	<20	<40	24.5	<20	<100	<20	<40	9.5 J

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-138												
Date						2019-08-29	1998-12-02	1999-07-02	2013-10-31	2013-12-11	2014-09-15	2015-10-27	2016-02-03	2016-08-25	2017-01-17	2017-08-11	2018-09-19	2019-08-08
Grid Cell (Figures 2A, 2B and 2C)							B3											
Chemical	Units																	
Aluminum	ug/l		200.00			460	541	116 B	<200	<1000	<200	<200	<200	239	<670	<400	755	320
Antimony	ug/l		6.00			0.79 J	3.6 B	<0.06	<60	<30	<12	<30	<12	<60	<20	<12	2.5 J	<40.6
Arsenic	ug/l		3.00	69	36	4.3	6.4 B	<0.01	<30	34.9	27.0	29.9	26.3	<30	*37.3*	30.6	24.3	<68.0
Barium	ug/l		6000.00			113	312	228	613	682	603	560	496	619	<670	535	587	345
Beryllium	ug/l		1.00			<0.091	0.28 B	<0.005	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.3	<2.0	<0.091	<0.091
Cadmium	ug/l		4.00	40	8.8	<0.15	<0.005	<0.005	<30	<15	<6.0	<3.0	<6.0	<30	<10	<6.0	<0.15	<15.1
Calcium	ug/l					213000	406000	346000	208000	234000	193000	253000	230000	233000	238000	255000	254000	264000
Chromium (total)	ug/l		70.00			4.5 J	4.4 B	1.6 B	<100	<50	<20	<10	<20	<100	<33	<20	6.1 J	<5.3
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	ug/l					1.6 J	1.2 B	<0.05	<500	<250	<250	<250	<1000	<500	<170	<500	1.8 J	2.5 J
Copper	ug/l		1300.00	4.8	3.1	<6.2	**30.6**	**8.6 B**	<100	<50	<20	**10.9**	<20	<100	<33	<20	**20.5 J**	**9.5 J**
Cyanide	ug/l		100.00			NA	<5	<0.01	NA	20	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			366	1120	146	<100	<100	126	222	239	245	<330	<200	864	358
Lead	ug/l	222	5.00	210	24	7.6	*52.4*	18.7	<30	<15	<15	**280**	<60	<30	<10	<30	*53.4*	<107
Magnesium	ug/l					611000	1090000	1100000	707000	884000	687000	733000	720000	782000	712000	780000	730000	802000
Manganese	ug/l		50.00			193	827	1520	<150	107	66.5	63.5	95.2	<150	95.3	81.2	94.8	147
Mercury	ug/l		2.00	1.8	0.94	<0.050	<0.2	<0.2	<0.60	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.60	<0.050	<0.050
Molybdenum	ug/l					NA	6.8 B	1 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	<3.1	6.6 B	9.7 B	<100	<50	<100	<50	<200	<100	<33	<100	4.3 J	4.0 J
Palladium	ug/l					NA	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	187000	271000	392000	231000	225000	219000	228000	211000	229000	201000	229000	229000	256000
Selenium	ug/l		40.00	290	71	<21.0	<0.005	<0.005	<100	<10	<20	<10	<20	<100	<33	<20	<21.0	<21.0
Silver	ug/l		40.00	1.9	~	<4.5	<0.01	<0.01	<100	<50	<20	<10	<20	<100	<33	<20	<5.0	<5.0
Sodium	ug/l		50000.00	~	~	5060000	9920000	6550000	6050000	4860000	5170000	5290000	6170000	5940000	5140000	6340000	5980000	6170000
Thallium	ug/l		2.00	~	~	<0.11	<0.01	9.3 B	<20	<10	<20	<10	<40	<20	<6.7	<20	<0.11	<10.9
Vanadium	ug/l			~	~	<3.0	3.8 B	11.3 B	<500	<250	<100	<50	<100	<500	<170	<100	9.2 J	6.5 J
Zinc	ug/l		2000.00	90	81	12.9 J	20.8	8.4 B	<200	<100	<40	<20	<40	<200	181	<40	62.6	29.5

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-211R	GMW-212			GMW-213		GMW-229		GMW-647				GMW-648			GMW-649		
Date						2017-01-20	2013-12-12	2016-02-04	2016-12-06	2013-12-12	2016-12-06	2017-01-18	2018-05-22	2013-07-12	2013-08-01	2016-02-04	2016-12-08	2013-08-01	2016-02-04	2016-12-09	2013-12-12	2016-02-17	2016-12-06
Grid Cell (Figures 2A, 2B and 2C)						B2	C1			C2		B2		C3				D3			D2		
Chemical	Units																						
Aluminum	ug/l		200.00			<400	1490	508	<200	7580	7860	<200	506	NA	931	279	<200	NA	32400	<200	<200	3400	<200
Antimony	ug/l		6.00			<12	<6.0	<6.0	<6.0	<30	<30	<6.0	0.89 J	<30	<6.0	<30	<12	<6.0	<60	<6.0	<6.0	<30	<12
Arsenic	ug/l		3.00	69	36	**115**	9.0	18.9	11.0	**142**	**106**	5.1	3.5 J	**93.7**	**106**	**122**	**119**	3.9	23.6	6.1	*39.8*	18.3	**69.1**
Barium	ug/l		6000.00			<400	373	610	466	392	<1000	<200	83.0	NA	304	<200	<400	NA	<400	229	<200	228	<400
Beryllium	ug/l		1.00			<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.071	<1.0	<1.0	<1.0	<1.0	<1.0	2.4	<1.0	<1.0	<1.0	<1.0
Cadmium	ug/l		4.00	40	8.8	<6.0	<3.0	<3.0	<3.0	<3.0	<15	<3.0	<0.15	<15	<3.0	<15	<6.0	<3.0	<6.0	<3.0	<3.0	<15	<6.0
Calcium	ug/l					272000	105000	105000	112000	302000	328000	68600	47100	NA	222000	215000	217000	NA	676000	743000	342000	270000	297000
Chromium (total)	ug/l		70.00			<20	<10	<10	<10	16.2	<50	<10	<3.3	<50	<50	<50	<20	<10	54.8	<10	<50	<50	<20
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	ug/l					<100	<50	<250	<250	<50	<250	<50	<1.7	NA	<50	<1300	<50	NA	<500	<50	<500	<250	<500
Copper	ug/l		1300.00	4.8	3.1	**109**	<10	<10	<10	**43.7**	<50	<10	5.5 J	<50	**13.2**	<50	<20	<10	**50.8**	<10	<50	**117**	<20
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	<10	NA	NA	NA	<10	NA	NA	<10	NA	NA
Iron	ug/l		300.00			145000	21700	31800	23600	8960	15600	14700	183 J	NA	1770	581	<100	NA	44300	808	2150	5480	494
Lead	ug/l	222	5.00	210	24	**502**	18.7	18.8	<15	**244**	<75	3.5	*66.8*	<60	<15	<75	<15	<15	**274**	<15	<30	*87.0*	<30
Magnesium	ug/l					141000	461000	417000	407000	1200000	1130000	23800	11000	NA	836000	873000	870000	NA	537000	534000	800000	642000	730000
Manganese	ug/l		50.00			2540	248	245	263	97.4	275	1640	306	NA	634	672	757	NA	945	323	155	112	74.2
Mercury	ug/l		2.00	1.8	0.94	9.0	<0.20	<0.20	<1.2	<0.60	**2.1**	<0.40	<0.050	<0.60	<0.40	<0.20	<1.2	<0.20	<0.20	<1.2	<0.20	<0.60	<1.2
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	<100	NA	NA	NA	<20	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	47.0	<10	<50	<50	20.4	<50	<10	<4.0	<200	<50	<250	<10	<50	<100	<10	<100	<50	<100
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	35700	130000	127000	136000	291000	292000	<10000	5010	NA	247000	242000	257000	NA	110000	114000	261000	161000	195000
Selenium	ug/l		40.00	290	71	<20	<10	<10	<10	<10	<50	<10	<9.3	<50	<10	<50	<10	17.4	<20	<10	16.4	<50	<20
Silver	ug/l		40.00	1.9	~	<20	<10	<10	<10	<10	<50	<10	<2.4	NA	<10	<50	<20	NA	<20	<10	<10	<50	<20
Sodium	ug/l		50000.00	~	~	391000	2760000	3380000	3180000	7830000	10000000	63500	40700	NA	6430000	6950000	7280000	NA	3790000	4240000	5720000	4900000	5730000
Thallium	ug/l		2.00	~	~	<12	<10	<10	<2.0	<250	<10	<2.0	<0.12	<40	<10	<50	<10	<10	<20	<2.0	<20	<10	<100
Vanadium	ug/l			~	~	<100	<50	<50	<50	<50	<250	<50	2.7 J	NA	<50	<250	<50	NA	<100	<50	<250	<250	<100
Zinc	ug/l		2000.00	90	81	<40	<20	<20	<20	62.5	233	<20	<6.5	NA	<100	<100	<40	NA	360	<20	<20	<100	<40

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	GMW-650	GMW-686		GMW-687		GMW-688	GMW-689	GMW-690	GMW-691	GMW-692	GMW-748	GMW-749	GMW-750
Date						2016-12-05	2016-02-05	2016-12-05	2016-02-05	2016-12-08	2017-01-20	2017-01-17	2016-12-12	2017-01-19	2016-12-14	2019-05-06	2019-05-06	2019-05-06
Grid Cell (Figures 2A, 2B and 2C)						B1	C2		C3		B2	B2	B2	B2	B2	B1	B2	C2
Chemical	Units																	
Aluminum	ug/l		200.00			<1000	2420	<1000	1080	<200	269	<670	<200	13500	<200	<153	185 J	<153
Antimony	ug/l		6.00			<12	<30	<30	<30	<12	<6.0	<30	<6.0	<30	<6.0	1.1 J	1.4 J	4.5
Arsenic	ug/l		3.00	69	36	**108**	**76.0**	**108**	**597**	**721**	**93.9**	*64.0*	4.4	*61.0*	5.6	12.1	**154**	21.0
Barium	ug/l		6000.00			<400	348	<1000	441	569	<200	1030	784	<1000	<200	76.5	117	827
Beryllium	ug/l		1.00			<5.0	<1.0	<2.0	<1.0	<1.0	<1.0	<3.3	<1.0	<5.0	<1.0	<0.091	0.34 J	0.33 J
Cadmium	ug/l		4.00	40	8.8	<6.0	<15	<15	<15	<6.0	<3.0	<15	<3.0	<15	<3.0	<0.15	<0.15	<0.15
Calcium	ug/l					85300	204000	233000	404000	351000	116000	169000	214000	145000	15200	99300	249000	204000
Chromium (total)	ug/l		70.00			<20	<50	<50	<50	61.4	10.0	<50	<10	<50	<10	<5.3	8.8 J	<5.3
Chromium VI	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	ug/l					<250	<1300	<100	<1300	<50	<50	<170	<50	<250	<50	<1.5	2.0 J	6.2
Copper	ug/l		1300.00	4.8	3.1	<20	<50	**870**	<50	<20	**27.6**	**55.5**	<10	<50	<10	**26.4**	<6.2	<6.2
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			29600	2760	<200	1340	<100	23900	54300	4690	30700	537	7330	3930	53900
Lead	ug/l	222	5.00	210	24	<6.0	**491**	<15	**292**	<6.0	**273**	**295**	*31.9*	**912**	*115*	1.4 J	<1.1	1.1 J
Magnesium	ug/l					326000	773000	798000	1400000	1240000	77000	290000	63100	422000	8830	25900	656000	409000
Manganese	ug/l		50.00			441	386	2090	495	539	951	2770	485	1430	282	898	929	761
Mercury	ug/l		2.00	1.8	0.94	<1.2	0.35	<1.2	0.55	<1.2	1.4	<1.2	<0.60	<0.60	<0.40	0.35	0.18 J	0.48
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	51.0	<250	<50	<250	<10	**353**	<33	23.7	<50	<10	7.6 J	<3.1	8.7 J
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	67900	203000	222000	370000	343000	48100	80200	26100	120000	<10000	10300	209000	192000
Selenium	ug/l		40.00	290	71	<20	<50	<50	<50	<20	10.9	<33	<10	<50	<10	<21.0	<21.0	<21.0
Silver	ug/l		40.00	1.9	~	<50	<50	<20	<50	<20	<10	<50	<10	<50	<10	<5.0	<5.0	<5.0
Sodium	ug/l		50000.00	~	~	2300000	5720000	372000	11000000	9510000	433000	2160000	134000	2700000	52300	118000	4970000	4130000
Thallium	ug/l		2.00	~	~	<4.0	<50	<8.0	<50	<4.0	<6.0	<10	<2.0	<10	<2.0	<0.11	<0.11	<0.11
Vanadium	ug/l			~	~	<250	<250	<250	<250	<50	<50	<170	137	<250	<50	3.0 J	<3.0	11.9
Zinc	ug/l		2000.00	90	81	<40	<100	<40	<100	<40	75.1	198	<20	<100	<20	21.6	21.1	166

TABLE 2C
GROUND WATERANALYTICAL DATA
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Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	<10.00	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0
Barium	ug/l		6000.00			NA	<100.00	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<200	NA	<200	NA	<200	NA	<200
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	<5.00	<0.004	NA	<0.004	NA	<0.004	NA	<0.004	NA	<0.004	NA	<0.004	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<10	<10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	<50	<50	<50	<50	<50	<50	<50	<50
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	<50.00	<0.1	NA	<0.1	NA	<0.1	NA	109	NA	279	NA	321	NA	136	NA	<100	NA	<100	NA	269
Lead	ug/l	222	5.00	210	24	<3.00	<3.00	4.4	<0.003	<0.003	<0.003	3.7	<0.003	<0.003	13.3	10.6	<0.003	<0.003	<3.0	<3.0	<15	<3.0	<3.0	32.5	<3.0	<3.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	7630.00	12800	NA	13700	NA	12600	NA	13900	NA	10100	NA	11300	NA	10100	NA	9810	NA	10000	NA	10300
Mercury	ug/l		2.00	1.8	0.94	NA	<0.20	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	<5.00	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	11.4	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	168500.00	239000	NA	250000	NA	219000	NA	155000	NA	231000	NA	171000	NA	221000	NA	209000	NA	212000	NA	199000
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	<10.00	<10.00	<0.02	26.8	26	<0.02	24.1	21.3	122	762	1060	<0.02	<0.02	<20	<20	<20	<20	22.4	**4180**	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

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Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-01-21	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	NA	<5.0	NA	<5.0	NA	<8.0	NA	<8.0
Barium	ug/l		6000.00			NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	NA	<200	NA	<200	NA	<200	NA	<200
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	<50	<50	<50	<50	<50	<50	<50
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	<100	NA	301	NA	135	NA	355	NA	1050	NA	266	NA	<100	<100	NA	988	NA	186	NA	220
Lead	ug/l	222	5.00	210	24	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	3.5	<3.0	8.5	<3.0	<3.0	<3.0	<3.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	11200	NA	12500	NA	10400	NA	12300	NA	8090	NA	7350	NA	9870	8930	NA	9050	NA	11700	NA	8460
Mercury	ug/l		2.00	1.8	0.94	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	NA	<5.0	NA	5.2	NA	<10	NA	<10
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	200000	NA	217000	NA	196000	NA	185000	NA	180000	NA	161000	NA	NA	153000	NA	169000	NA	147000	NA	161000
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	<20	<20	<20	<20	<20	27.5	<20	<20	<20	<20	<20	<20	<20	NA	<20	<20	<20	<20	<20	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2006-10-10	2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	<8.0	NA	<8.0	NA	NA	<3.0	NA	<3.0	NA	<8.0	NA	<3.0	NA	<3.0	NA	<8.0	NA	NA	NA	<3.0
Barium	ug/l		6000.00			NA	<200	NA	<200	NA	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	NA	NA	<200
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	<4.0	NA	<4.0	NA	NA	<4.0	NA	<3.0	NA	<3.0	NA	<3.0	NA	<3.0	NA	<3.0	NA	NA	NA	<3.0
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	11	<10	<10	<10	<10
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	241	NA	<100	NA	NA	127	NA	138	NA	<100	NA	<100	NA	273	NA	<100	NA	NA	NA	<100
Lead	ug/l	222	5.00	210	24	7.9	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.2	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	10400	NA	11000	NA	NA	9670	NA	9580	NA	9270	NA	10400	NA	8900	NA	10300	NA	NA	NA	8900
Mercury	ug/l		2.00	1.8	0.94	NA	<0.20	NA	<0.20	NA	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	NA	NA	<0.20
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	<10	NA	<10	NA	NA	<10	NA	<10	NA	<10	NA	<10	NA	<10	NA	<10	NA	NA	NA	<10
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	153000	NA	172000	NA	NA	143000	NA	120000	NA	130000	NA	115000	NA	155000	NA	143000	NA	NA	NA	150000
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	23.1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
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Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15A (continued)																				
Date						2012-04-11	2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	NA	NA	NA	<9.0	NA	NA	<15	NA	NA	NA	<3.0	NA	NA	NA	<9.0	NA	NA	NA	<15	NA
Barium	ug/l		6000.00			NA	NA	NA	NA	<200	NA	NA	271	NA	NA	NA	251	NA	NA	NA	219	NA	NA	NA	229	NA
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	NA	NA	NA	<3.0	NA	NA	<3.0	NA	NA	NA	<3.0	NA	NA	NA	<3.0	NA	NA	NA	<3.0	NA
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	NA	NA	NA	182	NA	NA	264	NA	NA	NA	171	NA	NA	NA	181	NA	NA	NA	392	NA
Lead	ug/l	222	5.00	210	24	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	<3.0	<3.0	3.5	<3.0	<9.0	<9.0	<3.0	<9.0	<9.0	<9.0	<9.0	<9.0	<15	<9.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	NA	NA	NA	17300	NA	NA	32300	NA	NA	NA	24700	NA	NA	NA	22000	NA	NA	NA	22300	NA
Mercury	ug/l		2.00	1.8	0.94	NA	NA	NA	NA	<0.20	NA	NA	<0.20	NA	NA	NA	<0.20	NA	NA	NA	<0.20	NA	NA	NA	<0.20	NA
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	NA	NA	NA	<10	NA	NA	<50	NA	NA	NA	<30	NA	NA	NA	<30	NA	NA	NA	<50	NA
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	NA	NA	NA	157000	NA	NA	156000	NA	NA	NA	199000	NA	NA	NA	209000	NA	NA	NA	252000	NA
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	<20	<20	<20	<20	<20	<20	NA	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
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Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B																				
Date						1996-04-04	1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	<10.00	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0
Barium	ug/l		6000.00			NA	<100.00	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<200	NA	<200	NA	<200	NA	<200
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	<5.00	<0.004	NA	<0.004	NA	<0.004	NA	<0.004	NA	<0.004	NA	<0.004	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<10	<10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	<50	<50	<50	<50	<50	<50	<50	<50
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	<50.00	<0.1	NA	<0.1	NA	<0.1	NA	286	NA	<0.1	NA	592	NA	133	NA	<100	NA	151	NA	377
Lead	ug/l	222	5.00	210	24	<3.00	<3.00	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	*47.7*	<0.003	<3.0	<3.0	<3.0	<3.0	<3.0	15.5	<3.0	<3.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	36.00	22600	NA	21800	NA	16800	NA	10600	NA	11100	NA	11700	NA	9410	NA	9680	NA	14000	NA	15600
Mercury	ug/l		2.00	1.8	0.94	NA	<0.20	0.21	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA	0.24	NA	<0.20	NA	<0.20	NA	<0.20
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	<5.00	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	<0.005	NA	9.8	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	129100.00	248000	NA	260000	NA	199000	NA	185000	NA	202000	NA	143000	NA	156000	NA	165000	NA	197000	NA	166000
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	<10.00	41.00	<0.02	<0.02	<0.02	<0.02	<0.02	29.5	264	389	463	**4830**	<0.02	<20	<20	<20	<20	24.7	**5910**	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2001-10-10	2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)																B1										
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<8.0	NA	<8.0	NA
Barium	ug/l		6000.00			NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA	<4.0	NA
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	<100	NA	<100	NA	148	NA	<100	NA	104	NA	<100	NA	<100	NA	4240	NA	<100	NA	3520	NA
Lead	ug/l	222	5.00	210	24	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	*39.1*	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	8.5
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	11500	NA	11100	NA	14700	NA	12500	NA	12100	NA	6760	NA	4560	NA	9620	NA	13800	NA	9450	NA
Mercury	ug/l		2.00	1.8	0.94	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<5.0	NA	<10	NA	<10	NA
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	161000	NA	157000	NA	143000	NA	117000	NA	126000	NA	64100	NA	60800	NA	93800	NA	135000	NA	91800	NA
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	346	<20	<20	<20	<20	<20	30.0	20.2	<20	<20	<20	<20	<20	<20	<20	23.4	<20	<20	<20	<20	36.5

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																				
Date						2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)						B1																				
Chemical	Units																									
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	<8.0	NA	<8.0	NA	NA	<3.0	NA	<3.0	NA	<8.0	NA	<3.0	NA	<3.0	NA	<8.0	NA	NA	NA	<3.0	NA
Barium	ug/l		6000.00			<200	NA	<200	NA	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	<200	NA	NA	NA	<200	NA
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	<4.0	NA	<4.0	NA	NA	<4.0	NA	<3.0	NA	<3.0	NA	<3.0	NA	<3.0	NA	<3.0	NA	NA	NA	<3.0	NA
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			<100	NA	<100	NA	NA	<100	NA	<100	NA	<100	NA	<100	NA	<100	NA	<100	NA	NA	NA	<100	NA
Lead	ug/l	222	5.00	210	24	<3.0	<3.0	<3.0	3.6	<3.0	<3.0	<3.0	<3.0	4.2	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			7250	NA	6720	NA	NA	7630	NA	3220	NA	6180	NA	5240	NA	4730	NA	6190	NA	NA	NA	5480	NA
Mercury	ug/l		2.00	1.8	0.94	<0.20	NA	<0.20	NA	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	<0.20	NA	NA	NA	<0.20	NA
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	<10	NA	<10	NA	NA	<10	NA	<10	NA	<10	NA	<10	NA	<10	NA	<10	NA	NA	NA	<10	NA
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	88800	NA	114000	NA	NA	89600	NA	50200	NA	56200	NA	52400	NA	46800	NA	54500	NA	NA	NA	43400	NA
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	<20	<20	39.3	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-15B (continued)																			
Date						2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)						B1																			
Chemical	Units																								
Aluminum	ug/l		200.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	ug/l		6.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/l		3.00	69	36	NA	NA	NA	<9.0	NA	NA	4.4	NA	NA	NA	<3.0	NA	NA	NA	<3.0	NA	NA	NA	4.2	NA
Barium	ug/l		6000.00			NA	NA	NA	<200	NA	NA	<200	NA	NA	NA	<200	NA	NA	NA	<200	NA	NA	NA	<200	NA
Beryllium	ug/l		1.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/l		4.00	40	8.8	NA	NA	NA	<3.0	NA	NA	<3.0	NA	NA	NA	<3.0	NA	NA	NA	<3.0	NA	NA	NA	<3.0	NA
Calcium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)	ug/l		70.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	ug/l		70.00			<10	13	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cobalt	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/l		1300.00	4.8	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	ug/l		100.00			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	ug/l		300.00			NA	NA	NA	<100	NA	NA	<100	NA	NA	NA	<100	NA	NA	NA	<100	NA	NA	NA	<100	NA
Lead	ug/l	222	5.00	210	24	<3.0	<3.0	<3.0	<3.0	<3.0	NA	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<6.0	<6.0	<6.0	<6.0	<9.0	<3.0	<6.0
Magnesium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/l		50.00			NA	NA	NA	16200	NA	NA	11700	NA	NA	NA	4950	NA	NA	NA	15300	NA	NA	NA	13300	NA
Mercury	ug/l		2.00	1.8	0.94	NA	NA	NA	<0.20	NA	NA	<0.20	NA	NA	NA	<0.20	NA	NA	NA	<0.20	NA	NA	NA	<0.20	NA
Molybdenum	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/l		100.00	64	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Palladium	ug/l					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	ug/l		40.00	290	71	NA	NA	NA	<10	NA	NA	<10	NA	NA	NA	<10	NA	NA	NA	<20	NA	NA	NA	<20	NA
Silver	ug/l		40.00	1.9	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	ug/l		50000.00	~	~	NA	NA	NA	181000	NA	NA	130000	NA	NA	NA	133000	NA	NA	NA	218000	NA	NA	NA	223000	NA
Thallium	ug/l		2.00	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	ug/l			~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/l		2000.00	90	81	<20	<20	<20	<20	<20	NA	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

TABLE 2C
GROUND WATERANALYTICAL DATA
METALS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		Bayway Specific Class III-B GWQC	NJ Class II-A GWRS	NJ Ecological Saline Water ESC - Acute	NJ Ecological Saline Water ESC - Chronic	L-16A
Date						2014-09-18
Grid Cell (Figures 2A, 2B and 2C)						B1
Chemical	Units					
Aluminum	ug/l		200.00			<200
Antimony	ug/l		6.00			<6.0
Arsenic	ug/l		3.00	69	36	6.2
Barium	ug/l		6000.00			<200
Beryllium	ug/l		1.00			<1.0
Cadmium	ug/l		4.00	40	8.8	<3.0
Calcium	ug/l					98600
Chromium (total)	ug/l		70.00			<10
Chromium VI	ug/l		70.00			NA
Cobalt	ug/l					<50
Copper	ug/l		1300.00	4.8	3.1	<10
Cyanide	ug/l		100.00			NA
Iron	ug/l		300.00			1320
Lead	ug/l	222	5.00	210	24	4.4
Magnesium	ug/l					42500
Manganese	ug/l		50.00			1910
Mercury	ug/l		2.00	1.8	0.94	<0.20
Molybdenum	ug/l					NA
Nickel	ug/l		100.00	64	22	10.1
Palladium	ug/l					NA
Potassium	ug/l			~	~	<10000
Selenium	ug/l		40.00	290	71	<10
Silver	ug/l		40.00	1.9	~	<10
Sodium	ug/l		50000.00	~	~	213000
Thallium	ug/l		2.00	~	~	<2.0
Vanadium	ug/l			~	~	<50
Zinc	ug/l		2000.00	90	81	<20

Notes:

~	No standard exists for this compound in this classification.
SVOC	Semi-volatile organic compound
TICs	Tentatively identified compounds
µg/L	Micrograms per liter
<5.0	Not detected at or above the method detection limit, method detection limit included.
*	Surrogate recovery outside advisable QC limits
E	Value exceeds calibration range
J	Indicates an estimated value
B	Analyte detected in associated method blank
N	Presumptive evidence of a compound
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
GWQC	NJDEP Ground Water Quality Criteria
GWRS	NJDEP Ground Water Remediation Standard
ESC	NJDEP Ecological Screening Criteria
Gray highlight	Concentration exceeds the Bayway-Specific Class III-B GWQC
Yellow highlight	Concentration exceeds the Class II-A GWRS
Bold	Concentration exceeds the NJ Saline Water ESC (acute)
Italics	Concentration exceeds the NJ Saline Water ESC (chronic)

Class III-B GWQC conditionally approved by the NJDEP on December 13, 2002.
If more than one applicable GWRS, GWQC or ESC is exceeded, the highlighting shown is for the standard/criteria with the highest value.
If no site-specific Class IIIB GWQC exists, analytical results are compared to the Class IIA GWRS.
ESCs do not apply to monitoring wells EB-3S, EB-4S, GMW-228, GMW-688, GMW-690 and GMW-691.

TABLE 2D
GROUND WATERANALYTICAL DATA
PESTICIDE COMPOUNDS

Bayway Refinery Complex - IAOC A18

December 1, 1998 through May 22, 2018

Location ID		NJ Class II-A GWRS	EB-3S	GMW-123			GMW-126			GMW-137			GMW-138		
Date			1999-06-23	1998-12-02	1999-07-07	2013-12-10	1998-12-02	1999-07-07	2013-12-10	1998-12-01	1999-07-02	2013-12-11	1998-12-02	1999-07-02	2013-12-11
Grid Cell (Figures 2A, 2B and 2C)			B1	C3			D3			C1			B3		
Chemical	Units														
aldrin	ug/L	~	<4	<0.040	<4	<0.00089	<4	<4	<0.00089	<4	<4	<0.00079	<4	<4	<0.00080
alpha-bhc	ug/L	0.02	<2	<0.020	<2	<0.00026	<2	<2	<0.00026	<2	<2	<0.00023	<2	<2	<0.00024
beta-bhc	ug/L	0.04	<5	<0.051	<5	<0.00026	<5	<5	<0.00026	<5	<5	<0.00023	<5	<5	<0.00023
delta-bhc	ug/L	~	<5	<0.051	<5	<0.00021	<5	<5	<0.00021	<5	<5	<0.00019	<5	<5	<0.00019
gamma-BHC	ug/L	~	<5	<0.051	<5	<0.00019	<5	<5	<0.00019	<5	<5	<0.00017	<5	<5	<0.00018
alpha-chlordane	ug/L	~	<4	<0.051	<4	<0.00032	<5	<4	<0.00032	<5	<4	<0.00029	<5	<4	<0.00029
beta-chlordane	ug/L	~	NA	<0.051	NA	<0.00024	NA	NA	<0.00024	NA	NA	<0.00021	NA	NA	<0.00022
dieldrin	ug/L	0.03	<2	<0.030	<2	<0.00018	<3	<2	<0.00018	<3	<2	<0.00016	<3	<2	<0.00016
4,4-DDD	ug/L	~	<10	<0.10	<10	<0.00028	<10	<10	<0.00028	<10	<10	0.010	<10	<10	0.014
4,4-DDE	ug/L	~	<10	<0.10	<10	<0.00019	<10	<10	<0.00019	<10	<10	<0.00017	<10	<10	<0.00017
4,4-DDT	ug/L	0.10	<1.4	<0.10	<1.4	<0.00036	<10	<1.4	<0.00036	<10	<1.4	<0.00032	<10	<1.4	<0.00032
endrin	ug/L	~	<2	<0.10	<2	<0.00022	<10	<2	<0.00022	<10	<2	<0.00020	<10	<2	<0.00020
endosulfan sulfate	ug/L	40.00	<10	<0.10	<10	<0.00021	<10	<10	<0.00021	<10	<10	<0.00019	<10	<10	<0.00019
endrin aldehyde	ug/L	~	<10	<0.10	<10	<0.00041	<10	<10	<0.00041	<10	<10	<0.00037	<10	<10	<0.00037
endrin ketone	ug/L	~	<10	<0.10	<10	<0.00053	<10	<10	<0.00053	<10	<10	<0.00047	<10	<10	<0.00048
endosulfan I	ug/L	40.00	<5	<0.051	<5	<0.00032	<5	<5	<0.00032	<5	<5	<0.00028	<5	<5	<0.00029
endosulfan II	ug/L	40.00	<9	<0.10	<9	<0.00022	<10	<9	<0.00022	<10	<9	<0.00020	<10	<9	<0.00020
heptachlor	ug/L	0.05	<4	<0.051	<4	<0.00024	<5	<4	<0.00024	<5	<4	<0.00022	<5	<4	<0.00022
heptachlor epoxide	ug/L	0.20	<4	<0.051	<4	<0.00030	<5	<4	<0.00030	<5	<4	<0.00026	<5	<4	<0.00027
methoxychlor	ug/L	~	<30	<0.51	<30	<0.00046	<50	<30	<0.00046	<50	<30	<0.00041	<50	<30	<0.00041
toxaphene	ug/L	2.00	<110	<3.0	<110	<0.017	<300	<110	<0.017	<300	<110	<0.015	<300	<110	<0.015
Chlordane	ug/L	0.50	NA	NA	NA	<0.00024	NA	NA	<0.00024	NA	NA	<0.00021	NA	NA	<0.00022

TABLE 2D
GROUND WATERANALYTICAL DATA
PESTICIDE COMPOUNDS

Bayway Refinery Complex - IAOC A18

December 1, 1998 through May 22, 2018

Location ID		NJ Class II-A GWRS	GMW-212	GMW-229	GMW-647	GMW-648	GMW-649
Date			2013-12-12	2018-05-22	2013-07-12	2013-08-01	2013-12-12
Grid Cell (Figures 2A, 2B and 2C)			C1	B2	C3	D3	D2
Chemical	Units						
aldrin	ug/L	~	NA	0.021 J	NA	NA	<0.0081
alpha-bhc	ug/L	0.02	NA	<0.013	NA	NA	0.058
beta-bhc	ug/L	0.04	NA	<0.014	NA	NA	<0.0024
delta-bhc	ug/L	~	NA	<0.014	NA	NA	<0.0019
gamma-BHC	ug/L	~	NA	<0.0083	NA	NA	<0.0018
alpha-chlordane	ug/L	~	NA	<0.013	NA	NA	<0.0029
beta-chlordane	ug/L	~	NA	<0.029	NA	NA	<0.0022
dieldrin	ug/L	0.03	NA	<0.022	NA	NA	<0.0016
4,4-DDD	ug/L	~	<0.0025	<0.021	0.084	<0.0030	0.066
4,4-DDE	ug/L	~	NA	<0.021	NA	NA	<0.0018
4,4-DDT	ug/L	0.10	NA	<0.022	NA	NA	<0.0033
endrin	ug/L	~	NA	<0.034	NA	NA	<0.0020
endosulfan sulfate	ug/L	40.00	NA	<0.024	NA	NA	<0.0020
endrin aldehyde	ug/L	~	NA	<0.083	NA	NA	<0.0038
endrin ketone	ug/L	~	NA	<0.021	NA	NA	<0.0049
endosulfan I	ug/L	40.00	NA	<0.018	NA	NA	<0.0029
endosulfan II	ug/L	40.00	NA	<0.063	NA	NA	<0.0020
heptachlor	ug/L	0.05	NA	<0.0083	NA	NA	<0.0022
heptachlor epoxide	ug/L	0.20	NA	<0.0096	NA	NA	<0.0027
methoxychlor	ug/L	~	NA	<0.13	NA	NA	<0.0042
toxaphene	ug/L	2.00	NA	<1.3	NA	NA	<0.15
Chlordane	ug/L	0.50	NA	<0.67	NA	NA	<0.0022

Notes:

~	No standard exists for this compound in this classification.
µg/L	Micrograms per liter
<5.0	Not detected at or above the method detection limit, method detection limit included.
J	Indicates an estimated value
NA	Not analyzed
NJDEP	New Jersey Department of Environmental Protection
GWRS	NJDEP Ground Water Remediation Standard
Yellow highlight	Concentration exceeds the Class II-A GWRS

TABLE 2E
GROUND WATERANALYTICAL DATA
POLY-CHLORINATED BIPHENYLS

Bayway Refinery Complex - IAOC A18

December 1, 1998 through May 22, 2018

Location ID		NJ Class II-A GWRS	EB-3S	GMW-123		GMW-126		GMW-137		GMW-138		GMW-229
Date			1999-06-23	1998-12-02	1999-07-07	1998-12-02	1999-07-07	1998-12-01	1999-07-02	1998-12-02	1999-07-02	2018-05-22
Grid Cell (Figures 2A, 2B and 2C)			B1	C3		D3		C1		B3		B2
Chemical	Units											
aroclor-1016	ug/L	~	<50	<0.51	<50	<50	<50	<50	<50	<50	<50	<0.025
aroclor-1221	ug/L	~	<50	<0.51	<50	<50	<50	<50	<50	<50	<50	<0.025
aroclor-1232	ug/L	~	<50	<0.51	<50	<50	<50	<50	<50	<50	<50	<0.025
aroclor-1242	ug/L	~	<50	<0.51	<50	<50	<50	<50	<50	<50	<50	<0.025
aroclor-1248	ug/L	~	<50	<0.51	<50	<50	<50	<50	<50	<50	<50	<0.025
aroclor-1254	ug/L	~	<14	<0.51	<14	<50	<14	<50	<14	<50	<14	<0.025
aroclor-1260	ug/L	~	<50	<0.51	<50	<50	<50	<50	<50	<50	<50	<0.025
aroclor-1262	ug/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.025
aroclor-1268	ug/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.025
Total PCBs	ug/L	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.025

Notes:

~	No standard exists for this compound in this classification.
PCBs	Poly-chlorinated bipheyls
µg/L	Micrograms per liter
<5.0	Not detected at or above the method detection limit, method detection limit included.
GWRS	NJDEP Ground Water Remediation Standard

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	EB-2S									
Date			1992-06-25	1993-01-25	1993-07-07	1994-01-13	1994-07-13	1995-01-13	1995-07-13	1996-01-13	1996-07-13	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)			B1									
Chemical	Units											
pH	pH units	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	mg/L	250000	6362.00	5540.00	5630.00	5590.00	5194.00	4359.00	5100.00	5800.00	6100.00	3770
Sulfate	mg/L	250	<5.00	12.00	<5.00	<10.00	<10.00	56.00	50.00	38.00	16.00	23.8
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	mg/L	~	4.50	5.40	5.00	4.40	5.50	5.80	5.00	7.10	6.30	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.9

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	EB-3S									
Date			1992-06-25	1993-01-25	1993-07-07	1994-01-13	1994-07-13	1995-01-13	1995-07-13	1996-01-13	1996-07-13	2016-12-13
Grid Cell (Figures 2A, 2B and 2C)			B1									
Chemical	Units											
pH	pH units	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	mg/L	250000	2768.00	3500.00	2590.00	3097.00	2592.00	1763.00	2100.00	3200.00	5400.00	149
Sulfate	mg/L	250	78.00	69.00	94.00	<10.00	47.00	56.00	160.00	112.00	50.00	143
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	mg/L	~	5.80	6.40	7.20	5.60	7.20	7.20	9.20	8.70	10.00	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.92

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	EB-4S								
Date			1992-06-25	1993-01-25	1993-07-07	1994-01-13	1994-07-13	1995-01-13	1995-07-13	1996-01-13	1996-07-13
Grid Cell (Figures 2A, 2B and 2C)			B1								
Chemical	**Units**										
pH	pH units	~	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	mg/L	250000	1700.00	1890.00	1730.00	1980.00	1717.00	2001.00	1800.00	2300.00	2100.00
Sulfate	mg/L	250	5.00	58.00	75.00	75.00	70.00	370.00	10.00	138.00	66.00
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	mg/L	~	8.40	9.60	9.80	10.10	10.20	9.60	10.70	11.00	11.00
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	GMW-123		GMW-126		GMW-137		GMW-138		GMW-211R	GMW-212			GMW-213		GMW-229	GMW-647		
Date			2016-02-02	2016-12-07	2016-02-02	2016-12-07	2016-02-02	2016-12-09	2016-02-03	2017-01-17	2017-01-20	2013-12-12	2016-02-04	2016-12-06	2013-12-12	2016-12-06	2017-01-18	2013-08-01	2016-02-04	2016-12-08
Grid Cell (Figures 2A, 2B and 2C)			C3		D3		C1		B3		B2	C1			C2		B2	C3		
Chemical	Units																			
pH	pH units	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	mg/L	250000	NA	NA	NA	NA	NA	9140	NA	11100	416	6260	NA	5910	17900	17700	80.4	15000	NA	14100
Sulfate	mg/L	250	1480	1210	251	118	746	317	175	77.7	1540	<100	<10	<10	1340	813	<10	221	219	<1000
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.5	NA	NA	314	NA	NA	355	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	967	NA	NA	1800	NA	NA	1290	NA	NA
Ammonia	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	21.4	NA	NA	12.2	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	mg/L	~	2.8	14.0	12.7	29.7	13.6	28.9	10.1	27.6	28.8	NA	16.6	14.5	NA	36.0	4.2	NA	6.0	27.4

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	GMW-648		GMW-649		GMW-650	GMW-686		GMW-687		GMW-688	GMW-689	GMW-690	GMW-691	GMW-692
Date			2016-02-04	2016-12-09	2016-02-17	2016-12-06	2016-12-05	2016-02-05	2016-12-05	2016-02-05	2016-12-08	2017-01-20	2017-01-17	2016-12-12	2017-01-19	2016-12-14
Grid Cell (Figures 2A, 2B and 2C)			D3		D2		B1	C2		C3		B2	B2	B2	B2	B2
Chemical	Units															
pH	pH units	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	mg/L	250000	NA	9100	NA	11600	3880	NA	9820	NA	19700	651	4910	99.2	4130	33.0
Sulfate	mg/L	250	54.9	<100	379	128	<10	390	128	194	<1000	611	<10	128	151	<10
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	mg/L	~	15.0	30.7	45.2	49.4	64.7	9.1	39.1	9.3	28.2	29.0	<0.20	2.1	32.2	4.4

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15A																				
Date			1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10	2001-10-10
Grid Cell (Figures 2A, 2B and 2C)			B1																				
Chemical	Units																						
pH	pH units	~	NA	6.2	6.3	6.7	6.4	6.6	6.7	6.7	6.6	6.8	6.7	6.5	7.8	6.6	7.8	NA	6.7	6.6	7.7	7.2	6.7
Chloride	mg/L	250000	450.00	372000	NA	357000	NA	390000	NA	17200000	NA	385000	NA	292000	NA	265	NA	323	NA	208	NA	294	NA
Sulfate	mg/L	250	160.00	136000	NA	119000	NA	116000	NA	97500	NA	129000	NA	127000	NA	124	NA	119	NA	106	NA	102	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	<10.00	20800	NA	21300	NA	<20000	NA	33000	NA	<20000	NA	25000	NA	22.0	NA	22.8	NA	23.4	NA	<20	NA
Ammonia	mg/L	~	0.40	610	NA	800	NA	640	NA	1100	NA	690	NA	840	NA	0.98	NA	0.59	NA	1.0	NA	0.77	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15A (continued)																				
Date			2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-01-21	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10
Grid Cell (Figures 2A, 2B and 2C)			B1																				
Chemical	Units																						
pH	pH units	~	6.2	7.9	7.4	7.0	5.8	6.7	6.6	6.65	6.67	6.25	7.03	6.65	NA	6.27	6.25	6.78	6.65	6.98	7.02	6.85	6.40
Chloride	mg/L	250000	319	NA	302	NA	347	NA	292	NA	265	NA	256	NA	NA	161	NA	206	NA	157	NA	242	NA
Sulfate	mg/L	250	100	NA	85.5	NA	90.4	NA	68.5	NA	81.2	NA	92.8	NA	74.3	87.3	NA	86.8	NA	101	NA	96.7	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	<20	NA	<20	NA	<20	NA	27.9	NA	<20	NA	<20	NA	NA	<20	NA	<20	NA	<20	NA	20.0	NA
Ammonia	mg/L	~	0.77	NA	0.93	NA	0.93	NA	1.0	NA	0.66	NA	0.69	NA	NA	0.82	NA	0.96	NA	1.4	NA	0.60	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15A (continued)																			
Date			2007-01-04	2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)			B1																				
Chemical	Units																						
pH	pH units	~	6.63	6.80	6.69	6.38	6.65	6.57	6.67	7.29	6.88	4.28	5.31	6.02	6.30	6.64	6.61	6.67	6.31	6.66	6.64	6.55	6.86
Chloride	mg/L	250000	212	NA	260	NA	NA	186	NA	98.3	NA	124	NA	130	NA	198	NA	190	NA	NA	NA	164	NA
Sulfate	mg/L	250	103	NA	89.8	NA	NA	69.7	NA	75.6	NA	70.1	NA	64.8	NA	76.1	NA	64.3	NA	NA	NA	53.9	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	20.5	NA	<20	NA	NA	<20	NA	<20	NA	<20	NA	<20	NA	<20	NA	<20	NA	NA	NA	<20	NA
Ammonia	mg/L	~	1.1	NA	0.91	NA	NA	0.87	NA	1.2	NA	0.90	NA	1.2	NA	0.78	NA	0.89	NA	NA	NA	0.77	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15A (continued)																			
Date			2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)			B1																			
Chemical	Units																					
pH	pH units	~	6.37	7.33	6.73	6.36	6.35	6.47	6.42	6.34	7.06	5.95	6.69	6.43	6.25	6.44	6.73	6.4	7.06	6.35	6.58	6.39
Chloride	mg/L	250000	NA	NA	NA	440	NA	NA	733	NA	NA	NA	702	NA	NA	NA	608	NA	NA	NA	647	NA
Sulfate	mg/L	250	NA	NA	NA	67.0	NA	NA	88.7	NA	NA	NA	98.4	NA	NA	NA	93.2	NA	NA	NA	151	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	21.2	NA	NA	40.8	NA	NA	NA	<20	NA	NA	NA	<20	NA	NA	NA	42.5	NA
Ammonia	mg/L	~	NA	NA	NA	1.1	NA	NA	1.2	NA	NA	NA	1.2	NA	NA	NA	0.72	NA	NA	NA	0.85	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15B																				
Date			1996-07-11	1997-01-09	1997-04-03	1997-07-10	1997-10-09	1998-01-08	1998-04-09	1998-07-09	1998-10-08	1999-01-14	1999-04-07	1999-07-14	1999-10-08	2000-01-06	2000-04-06	2000-07-12	2000-10-12	2001-01-09	2001-04-17	2001-07-10	2001-10-10
Grid Cell (Figures 2A, 2B and 2C)			B1																				
Chemical	Units																						
pH	pH units	~	NA	6.3	5.9	6.4	6.2	6.5	6.3	6.5	6.7	6.9	6.6	6.4	7.8	6.6	8.1	NA	6.1	8.3	6.1	6.7	6.5
Chloride	mg/L	250000	380.00	455000	NA	552000	NA	385000	NA	10700000	NA	340000	NA	186000	NA	191	NA	222	NA	202	NA	256	NA
Sulfate	mg/L	250	200.00	166000	NA	116000	NA	121000	NA	123000	NA	103000	NA	96300	NA	82.6	NA	77.3	NA	69.8	NA	55.2	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	<10.00	28600	NA	28800	NA	<20000	NA	25400	NA	<20000	NA	25000	NA	<20	NA	22.8	NA	23.4	NA	<20	NA
Ammonia	mg/L	~	0.40	700	NA	920	NA	430	NA	780	NA	750	NA	2000	NA	0.81	NA	0.97	NA	1.3	NA	1.2	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15B (continued)																				
Date			2002-01-08	2002-04-09	2002-07-16	2002-10-01	2003-01-09	2003-04-09	2003-07-15	2003-10-07	2004-01-13	2004-04-07	2004-07-20	2004-10-19	2005-02-08	2005-04-07	2005-07-12	2005-10-04	2006-01-25	2006-04-11	2006-07-14	2006-10-10	2007-01-04
Grid Cell (Figures 2A, 2B and 2C)			B1																				
Chemical	Units																						
pH	pH units	~	6.7	7.7	7.5	7.0	6.3	7.8	6.7	6.75	6.74	6.37	7.19	6.75	9.08	6.84	6.42	6.75	7.12	7.26	8.00	6.30	6.80
Chloride	mg/L	250000	303	NA	274	NA	335	NA	139	NA	157	NA	65.3	NA	61.7	NA	167	NA	183	NA	163	NA	132
Sulfate	mg/L	250	58.3	NA	46.7	NA	51.2	NA	55.1	NA	48.7	NA	69.6	NA	56.2	NA	39.7	NA	41.2	NA	37.8	NA	38.8
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	<20	NA	<20	NA	<20	NA	22.9	NA	102	NA	21.1	NA	<20	NA	<20	NA	<20	NA	<20	NA	<20
Ammonia	mg/L	~	0.71	NA	0.90	NA	1.6	NA	<0.10	NA	1.3	NA	0.57	NA	0.36	NA	0.69	NA	1.1	NA	0.79	NA	0.62
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15B (continued)																			
Date			2007-04-03	2007-07-09	2007-10-02	2008-04-03	2008-07-10	2008-10-09	2009-01-09	2009-04-09	2009-07-09	2009-10-08	2010-01-14	2010-04-05	2010-07-12	2010-10-18	2011-01-17	2011-04-12	2011-07-13	2011-10-05	2012-01-11	2012-04-11
Grid Cell (Figures 2A, 2B and 2C)			B1																			
Chemical	Units																					
pH	pH units	~	6.81	6.62	6.45	6.71	6.49	6.49	7.12	6.85	4.19	5.64	6.25	6.72	6.65	6.55	6.88	6.44	6.46	6.67	6.51	6.94
Chloride	mg/L	250000	NA	192	NA	NA	84.8	NA	58.5	NA	28.1	NA	30.9	NA	56.3	NA	81.2	NA	NA	NA	8.9	NA
Sulfate	mg/L	250	NA	27.2	NA	NA	48.4	NA	45.5	NA	51.7	NA	45.0	NA	49.3	NA	47.6	NA	NA	NA	43.1	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	20.8	NA	NA	<20	NA	<20	NA	<20	NA	<20	NA	<20	NA	<20	NA	NA	NA	<20	NA
Ammonia	mg/L	~	NA	0.90	NA	NA	0.46	NA	0.36	NA	0.35	NA	0.46	NA	0.24	NA	0.28	NA	NA	NA	<0.20	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2F
GROUND WATERANALYTICAL DATA
GENERAL CHEMISTRY PARAMETERS

Bayway Refinery Complex - IAOC A18

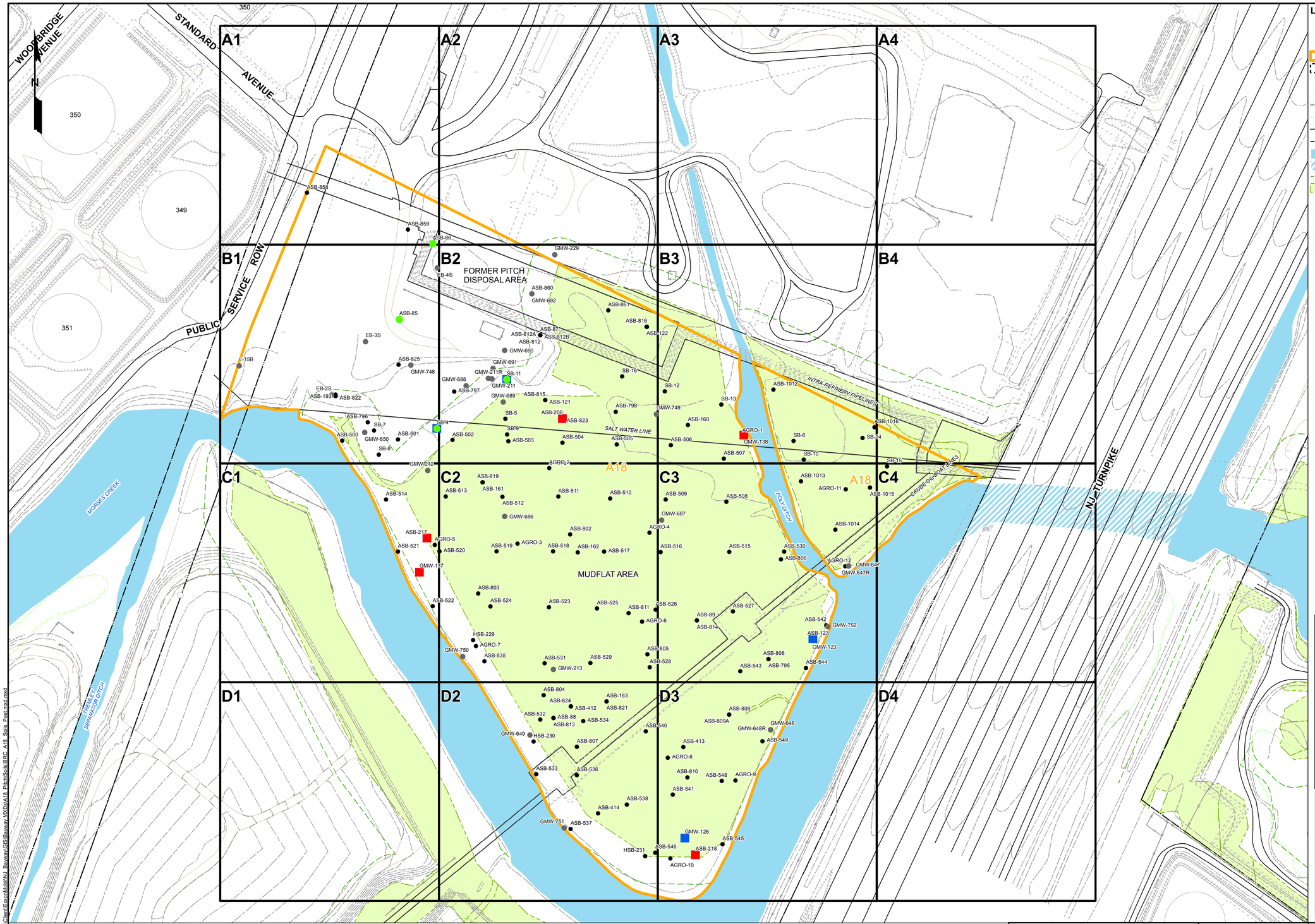
June 25, 1992 through August 29, 2019

Location ID		NJ Class II-A GWRS	L-15B (continued)																			
Date			2012-08-23	2012-11-16	2013-03-07	2013-05-15	2013-08-29	2013-11-11	2014-02-24	2014-04-23	2014-08-21	2014-10-23	2015-02-25	2015-05-15	2015-08-18	2015-10-21	2016-03-04	2016-04-19	2016-07-11	2016-10-10	2017-01-10	2017-04-10
Grid Cell (Figures 2A, 2B and 2C)			B1																			
Chemical	Units																					
pH	pH units	~	6.85	7.00	6.87	6.54	6.01	6.94	6.45	6.31	6.81	6.13	6.64	6.65	6.29	6.47	7.16	6.2	6.43	6.22	6.78	6.72
Chloride	mg/L	250000	NA	NA	NA	938	NA	NA	538	NA	NA	NA	218	NA	NA	NA	514	NA	NA	NA	459	NA
Sulfate	mg/L	250	NA	NA	NA	99.4	NA	NA	106	NA	NA	NA	95.5	NA	NA	NA	51.3	NA	NA	NA	64.9	NA
Biochemical Oxygen Demand (BOD)	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxygen Demand (COD)	mg/L	~	NA	NA	NA	26.0	NA	NA	86.4	NA	NA	NA	<20	NA	NA	NA	26.4	NA	NA	NA	27.5	NA
Ammonia	mg/L	~	NA	NA	NA	<0.20	NA	NA	<0.20	NA	NA	NA	<0.20	NA	NA	NA	0.63	NA	NA	NA	0.30	NA
Total Kjeldahl Nitrogen	mg/L	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

~	No standard exists for this compound in this classification.
mg/L	Milligrams per liter
<5.0	Not detected at or above the method detection limit, method detection limit included.
NJDEP	New Jersey Department of Environmental Protection
GWRS	NJDEP Ground Water Remediation Standard
Yellow highlight	Concentration exceeds the Class II-A GWRS

Figures



LEGEND

- PREVIOUS SOIL BORING LOCATION, TEMPORARY WELL OR EXISTING MONITORING WELL - NOT SAMPLED FOR PARAMETER SHOWN
- OVERBURDEN MONITORING WELL
- IAOC BOUNDARY
- FORMER PITCH DISPOSAL AREA BOUNDARY
- UTILITY POLE
- TANK LOCATION AND DESIGNATION
- FENCE
- ABOVEGROUND PIPING
- CRUDE OIL BOAT LINES, INTRA-REFINERY PIPELINES AND SALT WATER LINE
- PROPERTY BOUNDARY
- OPEN WATER (SEE NOTE 6)
- INFERRED OPEN WATER
- WETLAND TRANSITION (INTERMEDIATE)
- ORDINARY AND INTERMEDIATE RESOURCE WETLANDS (SEE REFERENCE 1 & 4)

RDCSRS/NRDCSRS = RESIDENTIAL/NON-RESIDENTIAL DIRECT CONTACT SOIL REMEDIATION STANDARDS (SEPTEMBER 2017)

- EXCEEDANCE
- NO EXCEEDANCES

LSSL / ER-L / ER-M = LOWER ECOLOGICAL SOIL SCREENING LEVEL / NJDEP SALINE ESTUARY SEDIMENT CRITERIA (LOW) / NJDEP SALINE ESTUARY SEDIMENT CRITERIA (MEDIUM) (MARCH 2009)

- EXCEEDANCE
- NO EXCEEDANCES

NOTES:

1. SOIL ANALYTICAL DATA POSTED ONLY FOR ANALYTES THAT EXCEED THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP) SOIL REMEDIATION STANDARD AND SCREENING LEVELS.

2. IN ACCORDANCE WITH THE NJDEP SRP GUIDANCE, THE IMPACT TO GROUND WATER PATHWAY IN SOIL ONLY PERTAINS TO THE UNSATURATED ZONE. IMPACT TO GROUND WATER SOILS SCREENING LEVELS DO NOT APPLY AS ALL SAMPLES ARE WITHIN THE SATURATED ZONE IN IAOC A18.

3. WATER BODY LIMITS ARE TIDALLY INFLUENCED AND SUBJECT TO VARIATION. ALSO, WETLANDS OUTSIDE OF SOME PROPERTY BOUNDARIES WERE NOT ACCESSIBLE AND NOT DEFINED.

4. SLIGHT ADJUSTMENTS WERE MADE TO IAOC BOUNDARIES TO REFLECT TAX MAPS, METES AND BOUNDS DESCRIPTION OF THE PROPERTY, AND MORE ACCURATELY MIRRORED GEOREFERENCED INFORMATION.

5. IAOC BOUNDARY DESIGNATION LINES ABUTTING THE PROPERTY BOUNDARY SHALL BE CONSIDERED SYNONYMOUS WITH THE PROPERTY BOUNDARY.

6. BORINGS LOCATED WITHIN A WETLAND AREA ARE COMPARED TO THE LSSL, ER-L AND ER-M SCREENING LEVELS. BORINGS LOCATED WITHIN A TRANSITION AREA ARE COMPARED TO THE LSSL, ER-L, ER-M, RDCSRS AND NRDCSRS. BORINGS LOCATED OUTSIDE OF WETLAND AND TRANSITION AREAS ARE COMPARED TO THE RDCSRS AND NRDCSRS.

7. IF MORE THAN ONE APPLICABLE SRS OR ESC IS EXCEEDED, THE HIGHLIGHTING SHOWN IS FOR THE STANDARD/CRITERIA WITH THE HIGHEST VALUE.

REFERENCES:
1. MAP, WATER BODY LIMITS, AND LOI WETLANDS BOUNDARY DERIVED FROM FIGURE ENTITLED " WETLAND DELINEATION SURVEY, BAYWAY REFINERY, CITY OF LINDEN, UNION COUNTY, NEW JERSEY", PREPARED BY KELLER & KIRKPATRICK INC., DATED 9-3-15, LAST UPDATED 6-9-16.

2. BASE MAP TOPOGRAPHIC FEATURES TAKEN FROM A MAP PREPARED BY ATLANTIS AERIAL SURVEY CO., INC. FROM PHOTOGRAPHY DATED OCTOBER 3, 2003.

HORIZONTAL DATUM:NAVD 1983
VERTICAL DATUM:NGVD 1929
DISTANCE MEASUREMENTS ARE EXPRESSED IN U.S. FEET.

3. PROPERTY BOUNDARY DERIVED FROM METES AND BOUNDS TAKEN FROM SURVEY, PREPARED BY KELLER & KIRKPATRICK INC., DATED 3-1-93, LAST UPDATED 4-5-93.

4. LIMITS OF WETLANDS, TRANSITION AREAS, AND STATE OPEN WATERS AS PRESENTED IN THE JULY 2016 LETTER OF INTERPRETATION (LOI) APPROVED BY THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP) DIVISION OF LAND USE REGULATION (DLUR) ON SEPTEMBER 21, 2016. (DLUR FILE NO.: 2009-14-0002.4 FWW 150001).

120 60 0 120 Feet

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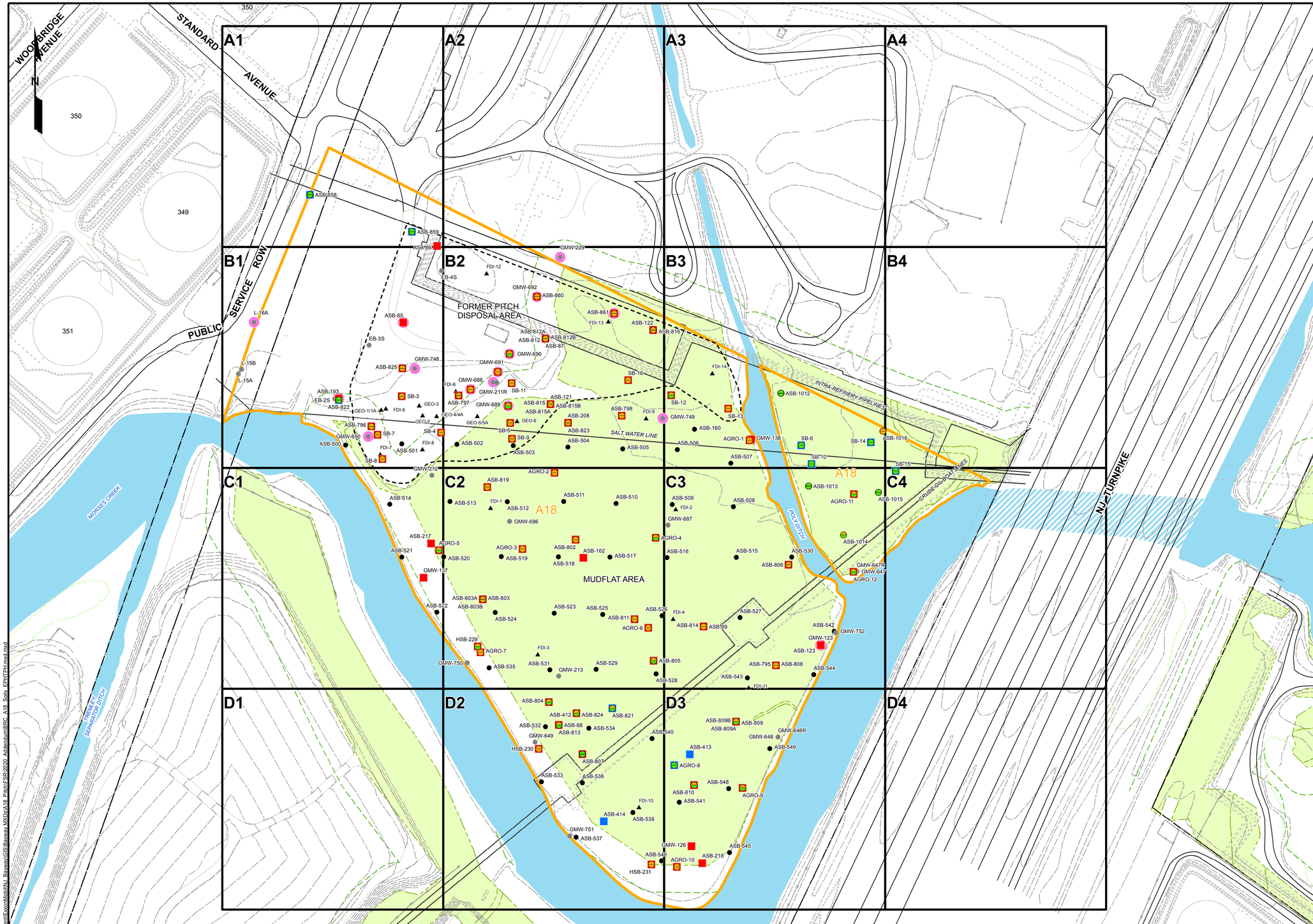
PROJECT NO.	20203020
DRAWN:	2/20/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_Soils_Pest.mxd

SUMMARY OF PESTICIDE EXCEEDANCES IN SOIL
NOVEMBER 9, 1993 to SEPTEMBER 21, 2018
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
1D

\\agroupstore01\GIS_Projects\Client\ExxonMobil\NJ_Bayway\GIS\Bayway.MXD\A18_Pitch\Soils\BRC_A18_Soils_Pest.mxd



LEGEND

- PREVIOUS SOIL BORING LOCATION, TEMPORARY WELL OR EXISTING MONITORING WELL - NOT SAMPLED FOR PARAMETER SHOWN
- OVERBURDEN MONITORING WELL
- IAOC BOUNDARY
- FORMER PITCH DISPOSAL AREA BOUNDARY
- UTILITY POLE
- TANK LOCATION AND DESIGNATION
- FENCE
- ABOVEGROUND PIPING
- CRUDE OIL BOAT LINES, INTRA-REFINERY PIPELINES AND SALT WATER LINE
- PROPERTY BOUNDARY
- OPEN WATER (SEE NOTE 6)
- INFERRED OPEN WATER
- WETLAND TRANSITION (INTERMEDIATE)
- ORDINARY AND INTERMEDIATE RESOURCE WETLANDS (SEE REFERENCE 1 & 4)
- HISTORICAL LNAPL DETECTION
- GEOTECHNICAL BORING

TOP HALF = NJDEP CATEGORY 2 DEFAULT PRODUCT LIMIT (8,000 MG/KG)

BOTTOM HALF = EPH PRODUCT CEILING LIMIT (30,000 MG/KG)

- EXCEEDANCE
- NJDEP CATEGORY 2 DEFAULT PRODUCT LIMIT EXCEEDANCE
- NO EXCEEDANCE

NJDEP TPH PRODUCT CRITERION (10,000 MG/KG)

- EXCEEDANCE
- NO EXCEEDANCE

NOTES:

1. SOIL ANALYTICAL DATA POSTED ONLY FOR ANALYTES THAT EXCEED THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP) SOIL REMEDIATION STANDARD AND SCREENING LEVELS.

2. IN ACCORDANCE WITH THE NJDEP SRP GUIDANCE, THE IMPACT TO GROUND WATER PATHWAY IN SOIL ONLY PERTAINS TO THE UNSATURATED ZONE. IMPACT TO GROUND WATER SOILS SCREENING LEVELS DO NOT APPLY AS ALL SAMPLES ARE WITHIN THE SATURATED ZONE IN IAOC A18.

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2. BASE MAP TOPOGRAPHIC FEATURES TAKEN FROM A MAP PREPARED BY ATLANTIS AERIAL SURVEY CO., INC. FROM PHOTOGRAPHY DATED OCTOBER 3, 2003.

HORIZONTAL DATUM:NAVD 1983
VERTICAL DATUM:NGVD 1929
DISTANCE MEASUREMENTS ARE EXPRESSED IN U.S. FEET.

3. PROPERTY BOUNDARY DERIVED FROM METES AND BOUNDS TAKEN FROM SURVEY, PREPARED BY KELLER & KIRKPATRICK INC., DATED 3-1-93, LAST UPDATED 4-5-93.

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PROJECT NO.	20203020
DRAWN:	3/6/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_Soils_EPHTPH.mxd

SUMMARY OF EPH & TPH EXCEEDANCES IN SOIL
NOVEMBER 9, 1993 to NOVEMBER 9, 2016
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
1E

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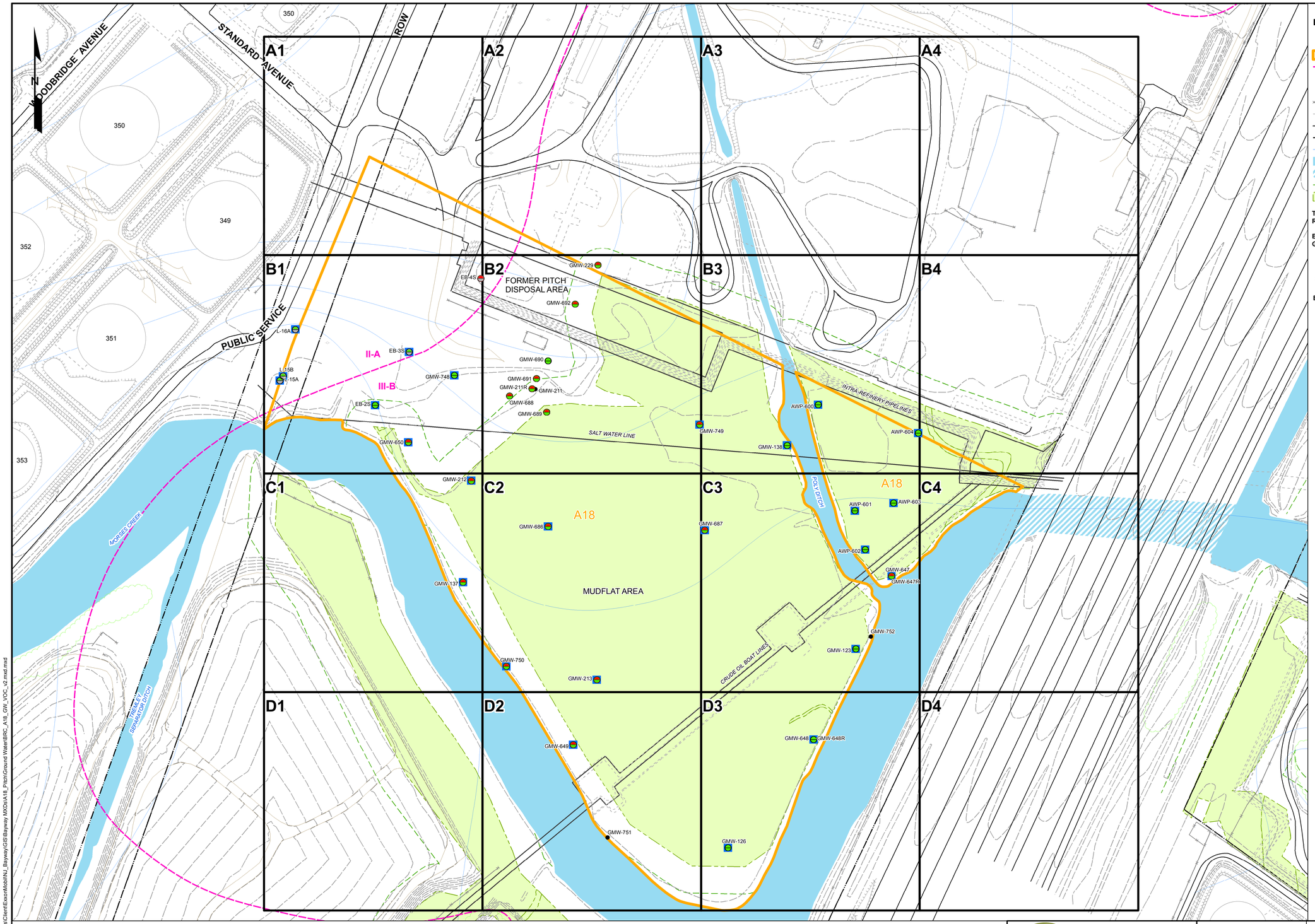

Legend

- PREVIOUS SOIL BORING LOCATION, TEMPORARY WELL OR EXISTING MONITORING WELL - NOT SAMPLED FOR PARAMETER SHOWN
- IAOC BOUNDARY
- CLASS II-A / CLASS III-B GWQC BOUNDARY
- UTILITY POLE
- TANK LOCATION AND
- FENCE
- ABOVEGROUND PIPING
- CRUDE OIL BOAT LINES, INTRA-REFINERY PIPELINES AND SALT WATER LINE
- PROPERTY BOUNDARY
- GROUND WATER CONTOURS (ELEVATION IN FEET ABOVE MEAN SEA
- OPEN WATER (SEE NOTE 5)
- INFERRED OPEN WATER
- WETLAND TRANSITION (INTERMEDIATE)
- ORDINARY AND INTERMEDIATE RESOURCE WETLANDS (SEE REFERENCE 1 &

TOP HALF = RESULTS COMPARED TO NJDEP CLASS II-A GROUND WATER REMEDIATION STANDARDS (GWRS)

BOTTOM HALF = RESULTS COMPARED TO APPROVED SITE-SPECIFIC CLASS III-B GROUND WATER QUALITY CRITERIA (GWQC)

- EXCEEDANCE
- NO EXCEEDANCES
- CLASS III-B GWQC NOT APPLICABLE

ECOLOGICAL SCREENING CRITERIA (ESC) FOR SALINE WATER

- EXCEEDANCE
- NO EXCEEDANCE

NOTES:

1. GROUND WATER RESULTS FROM THE MONITORING WELLS LOCATED WITHIN 200 FEET OF THE SURFACE WATER BODIES WERE COMPARED TO THE NJDEP ECOLOGICAL SCREENING CRITERIA (ESC) FOR SURFACE WATER AND PRESENTED IN THE ECOLOGICAL REMEDIAL INVESTIGATION WORKPLAN, BAYWAY REFINERY, LINDEN, NEW JERSEY DATED SEPTEMBER 30, 2012 (ADDENDA APPROVED BY NJDEP APRIL 13, 2013 AND SEPTEMBER 25, 2013). BASED ON THE ECOLOGICAL EVALUATION, THE GROUND WATER TO SURFACE WATER PATHWAY IN IAOC A18 / ECOLOGICAL EXPOSURE ZONES (EEZS) 2A AND 11 IS NOT A CONCERN.

2. WATER BODY LIMITS ARE TIDALLY INFLUENCED AND SUBJECT TO VARIATION. ALSO, WETLANDS OUTSIDE OF SOME PROPERTY BOUNDARIES WERE NOT ACCESSIBLE AND NOT DEFINED.

3. SLIGHT ADJUSTMENTS WERE MADE TO IAOC BOUNDARIES TO REFLECT TAX MAPS, METES AND BOUNDS DESCRIPTION OF THE PROPERTY, AND MORE ACCURATELY MIRRORED GEOREFERENCED INFORMATION.

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VERTICAL DATUM:NGVD 1929
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5. GROUND WATER ELEVATIONS FROM 8/19/15 SYNOPTIC GAUGING EVENT. INTERIOR SLOU AND BEDROCK WELLS WERE NOT GAUGED DURING THIS EVENT.

120 60 0 120 Feet

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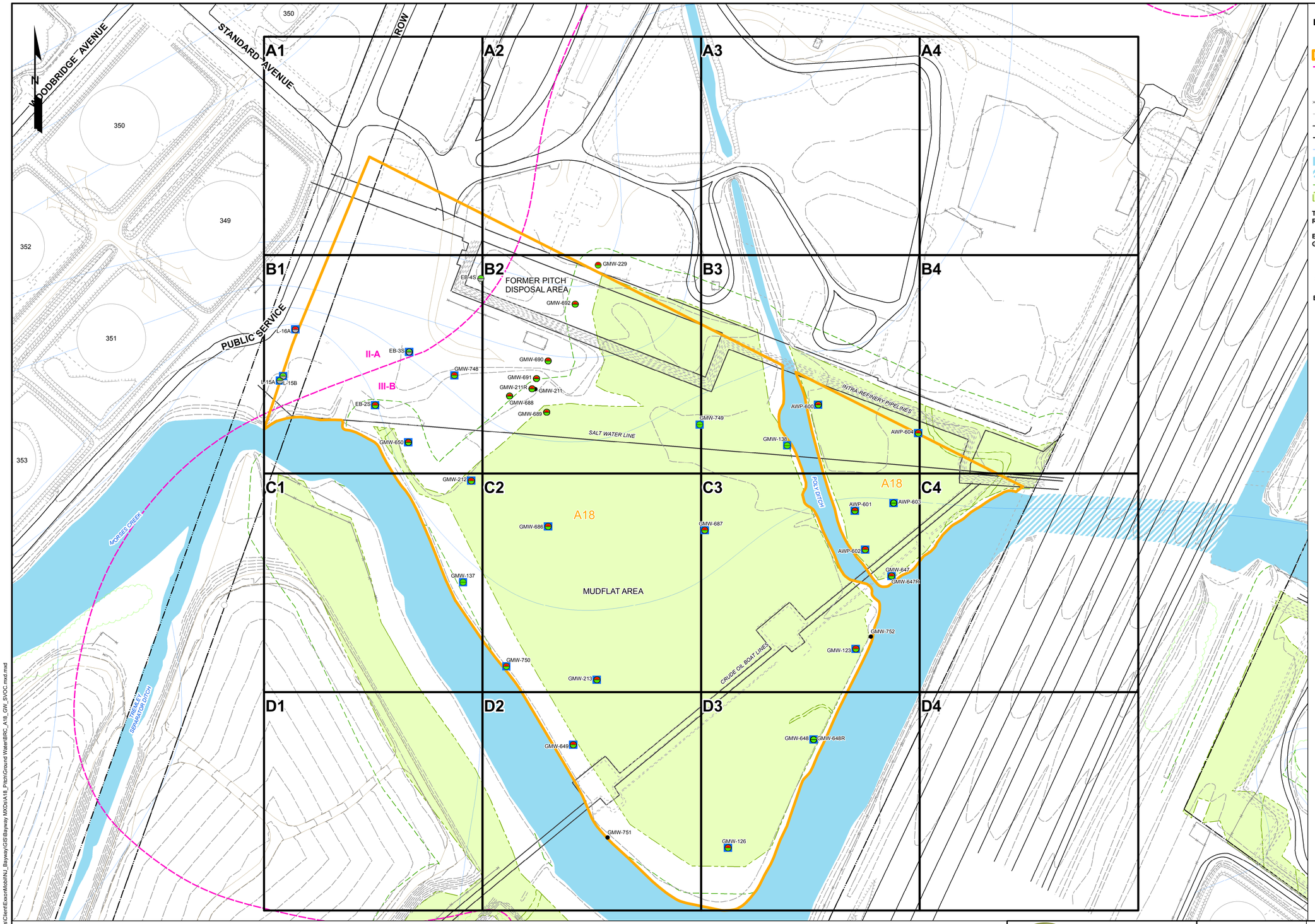
PROJECT NO.	20203020
DRAWN:	2/20/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_GW_VOC_v2.mxd

SUMMARY OF VOC EXCEEDANCES IN GROUND WATER
JUNE 25, 1992 to AUGUST 29, 2019
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
2A

\\argosstor01\GIS_Projects\Client\ExxonMobil\NJ_Bayway\GIS\Bayway MXDs\A18_Pitch\Ground Water\BRC_A18_GW_VOC_v2.mxd.mxd



Legend

- PREVIOUS SOIL BORING LOCATION, TEMPORARY WELL OR EXISTING MONITORING WELL - NOT SAMPLED FOR PARAMETER SHOWN
- IAOC BOUNDARY
- CLASS II-A / CLASS III-B GWQC BOUNDARY
- UTILITY POLE
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- EXCEEDANCE
- NO EXCEEDANCES
- CLASS III-B GWQC NOT APPLICABLE

ECOLOGICAL SCREENING CRITERIA (ESC) FOR SALINE WATER

- EXCEEDANCE
- NO EXCEEDANCE

NOTES:

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2. WATER BODY LIMITS ARE TIDALLY INFLUENCED AND SUBJECT TO VARIATION. ALSO, WETLANDS OUTSIDE OF SOME PROPERTY BOUNDARIES WERE NOT ACCESSIBLE AND NOT DEFINED.

3. SLIGHT ADJUSTMENTS WERE MADE TO IAOC BOUNDARIES TO REFLECT TAX MAPS, METES AND BOUNDS DESCRIPTION OF THE PROPERTY, AND MORE ACCURATELY MIRRORED GEOREFERENCED INFORMATION.

4. IAOC BOUNDARY DESIGNATION LINES ABUTTING THE PROPERTY BOUNDARY SHALL BE CONSIDERED SYNONYMOUS WITH THE PROPERTY BOUNDARY.

REFERENCES:
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VERTICAL DATUM:NGVD 1929
DISTANCE MEASUREMENTS ARE EXPRESSED IN U.S. FEET.

3. PROPERTY BOUNDARY DERIVED FROM METES AND BOUNDS TAKEN FROM SURVEY, PREPARED BY KELLER & KIRKPATRICK INC., DATED 3-1-93, LAST UPDATED 4-5-93.

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5. GROUND WATER ELEVATIONS FROM 8/19/15 SYNOPTIC GAUGING EVENT. INTERIOR SLOU AND BEDROCK WELLS WERE NOT GAUGED DURING THIS EVENT.

120 60 0 120 Feet

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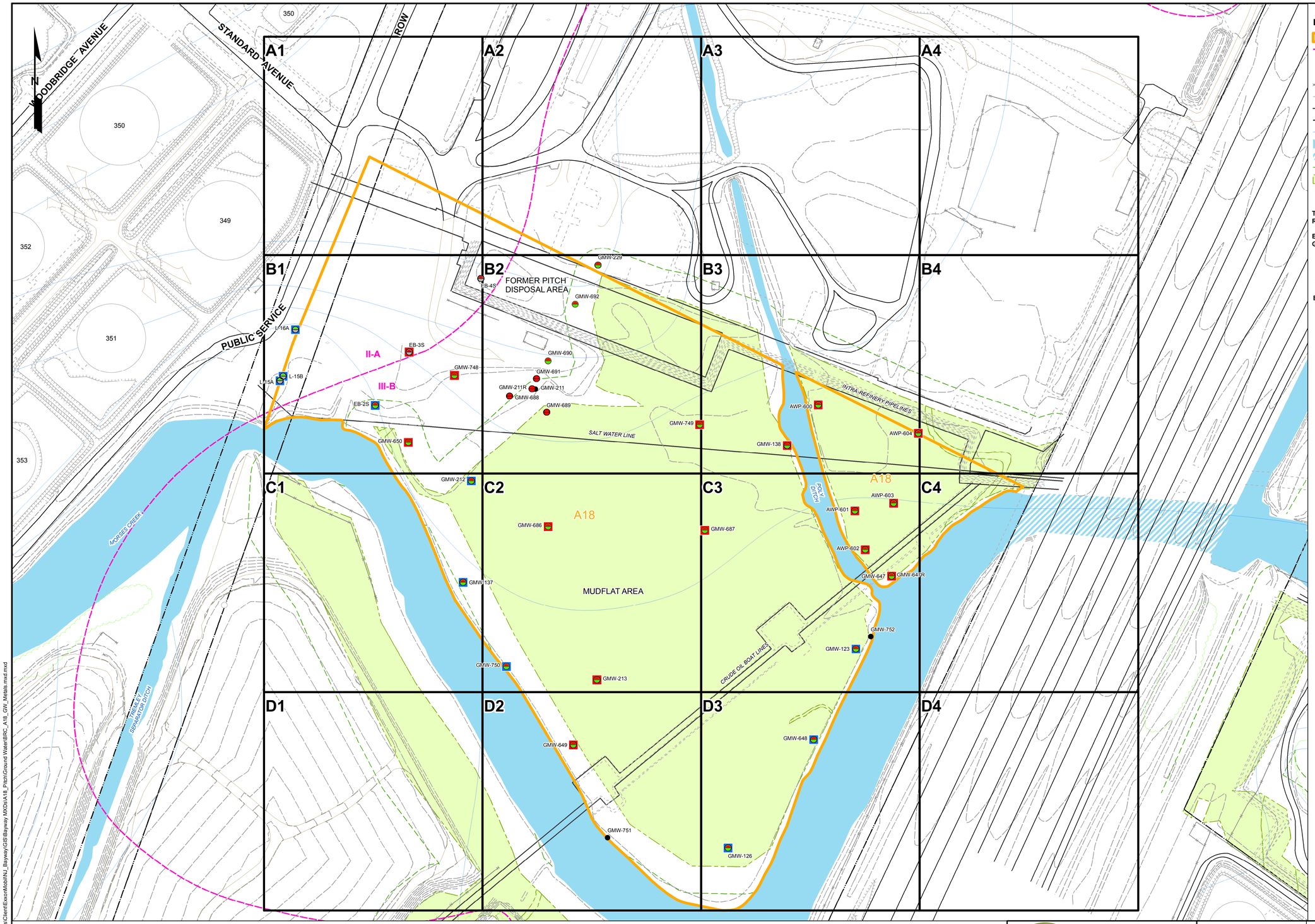
PROJECT NO.	20203020
DRAWN:	2/25/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_GW_SVOC.mxd

SUMMARY OF SVOC EXCEEDANCES IN GROUND WATER
JUNE 25, 1992 to AUGUST 29, 2019
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
2B

\\argosstor01\GIS_Projects\Client\ExxonMobil\NJ_Bayway\GIS\Bayway MXDs\A18_Pitch\Ground Water\BRC_A18_GW_SVOC.mxd.mxd



Legend

- IAOC BOUNDARY
- CLASS II-A / CLASS III-B GWQC BOUNDARY
- UTILITY POLE
- TANK LOCATION AND
- FENCE
- ABOVEGROUND PIPING
- CRUDE OIL BOAT LINES, INTRA-REFINERY PIPELINES AND SALT WATER
- PROPERTY BOUNDARY
- GROUND WATER CONTOURS (ELEVATION IN FEET ABOVE MEAN SEA
- OPEN WATER (SEE NOTE 5)
- INFERRED OPEN WATER
- WETLAND TRANSITION (INTERMEDIATE)
- ORDINARY AND INTERMEDIATE RESOURCE WETLANDS (SEE REFERENCE 1 &

TOP HALF = RESULTS COMPARED TO NJDEP CLASS II-A GROUND WATER REMEDIATION STANDARDS (GWRS)

BOTTOM HALF = RESULTS COMPARED TO APPROVED SITE-SPECIFIC CLASS III-B GROUND WATER QUALITY CRITERIA (GWQC)

- EXCEEDANCE
- NO EXCEEDANCES
- CLASS III-B GWQC NOT APPLICABLE

ECOLOGICAL SCREENING CRITERIA (ESC) FOR SALINE WATER

- EXCEEDANCE
- NO EXCEEDANCE

NOTES:

1. GROUND WATER RESULTS FROM THE MONITORING WELLS LOCATED WITHIN 200 FEET OF THE SURFACE WATER BODIES WERE COMPARED TO THE NJDEP ECOLOGICAL SCREENING CRITERIA (ESC) FOR SURFACE WATER AND PRESENTED IN THE ECOLOGICAL REMEDIAL INVESTIGATION WORKPLAN, BAYWAY REFINERY, LINDEN, NEW JERSEY DATED SEPTEMBER 30, 2012 (ADDENDA APPROVED BY NJDEP APRIL 13, 2013 AND SEPTEMBER 25, 2013). BASED ON THE ECOLOGICAL EVALUATION, THE GROUND WATER TO SURFACE WATER PATHWAY IN IAOC A18 / ECOLOGICAL EXPOSURE ZONES (EEZS) 2A AND 11 IS NOT A CONCERN.

2. WATER BODY LIMITS ARE TIDALLY INFLUENCED AND SUBJECT TO VARIATION. ALSO, WETLANDS OUTSIDE OF SOME PROPERTY BOUNDARIES WERE NOT ACCESSIBLE AND NOT DEFINED.

3. SLIGHT ADJUSTMENTS WERE MADE TO IAOC BOUNDARIES TO REFLECT TAX MAPS, METES AND BOUNDS DESCRIPTION OF THE PROPERTY, AND MORE ACCURATELY MIRRORED GEOREFERENCED INFORMATION.

4. IAOC BOUNDARY DESIGNATION LINES ABUTTING THE PROPERTY BOUNDARY SHALL BE CONSIDERED SYNONYMOUS WITH THE PROPERTY BOUNDARY.

REFERENCES:

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2. BASE MAP TOPOGRAPHIC FEATURES TAKEN FROM A MAP PREPARED BY ATLANTIS AERIAL SURVEY CO., INC. FROM PHOTOGRAPHY DATED OCTOBER 3, 2003.

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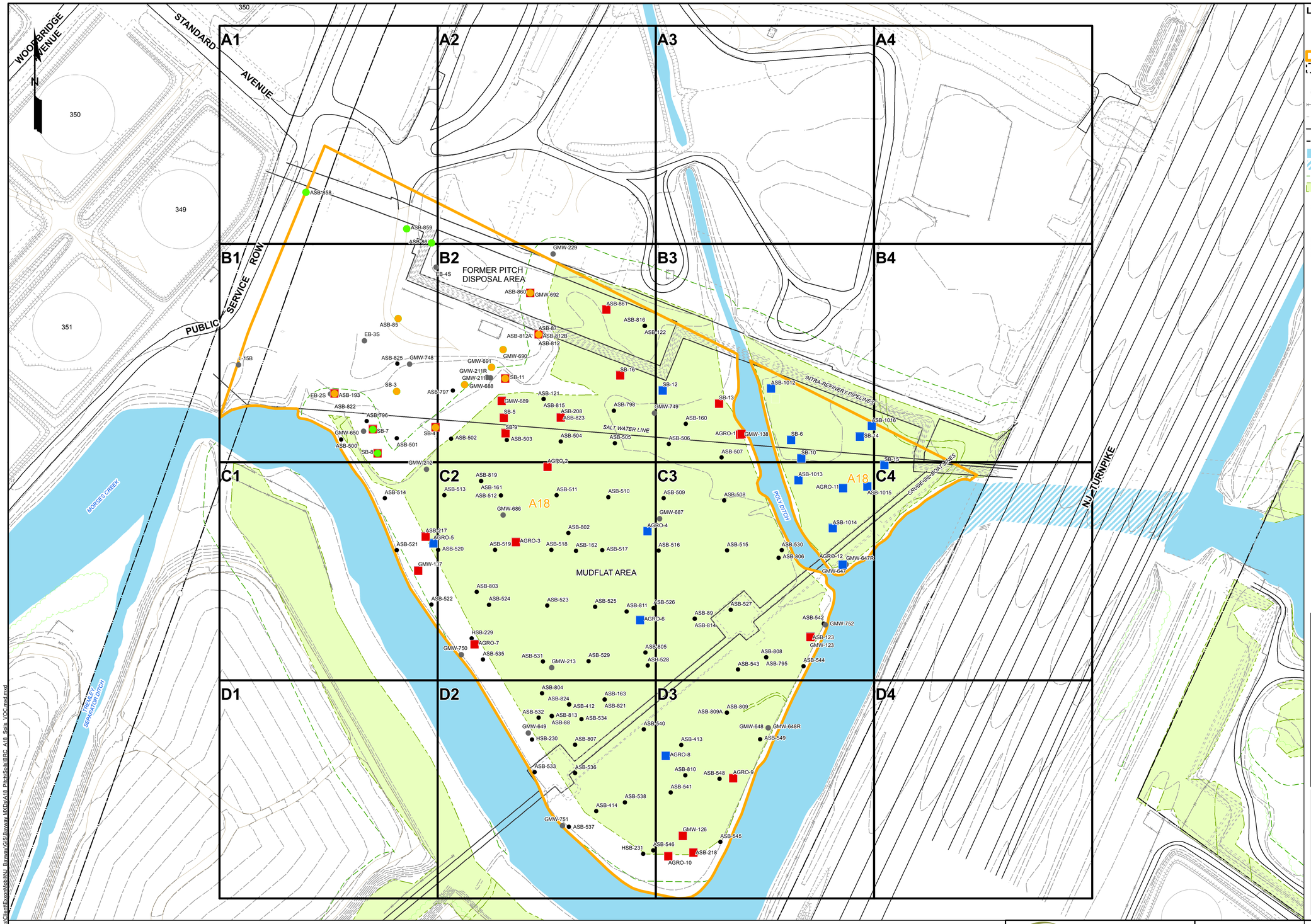
PROJECT NO.	20203020
DRAWN:	2/26/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_GW_Metals.mxd

SUMMARY OF METALS EXCEEDANCES IN GROUND WATER
APRIL 2, 1996 to NOVEMBER 22, 2019
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
2C

\\argosstor01\GIS_Projects\Client\ExxonMobil\NJ_Bayway\GIS\Bayway MXDs\A18_Pitch\Ground Water\BRC_A18_GW_Metals.mxd



LEGEND

- PREVIOUS SOIL BORING LOCATION, TEMPORARY WELL OR EXISTING MONITORING WELL - NOT SAMPLED FOR PARAMETER SHOWN
- OVERBURDEN MONITORING WELL
- IAOC BOUNDARY
- FORMER PITCH DISPOSAL AREA BOUNDARY
- UTILITY POLE
- TANK LOCATION AND DESIGNATION
- FENCE
- ABOVEGROUND PIPING
- CRUDE OIL BOAT LINES, INTRA-REFINERY PIPELINES AND SALT WATER LINE
- PROPERTY BOUNDARY
- OPEN WATER (SEE NOTE 6)
- INFERRED OPEN WATER
- WETLAND TRANSITION (INTERMEDIATE)
- ORDINARY AND INTERMEDIATE RESOURCE WETLANDS (SEE REFERENCE 1 & 4)

RDCSRS/NRDCSRS = RESIDENTIAL/NON-RESIDENTIAL DIRECT CONTACT SOIL REMEDIATION STANDARDS (SEPTEMBER 2017)

- EXCEEDANCE
- NO EXCEEDANCES

LSSL / ER-L / ER-M = LOWER ECOLOGICAL SOIL SCREENING LEVEL / NJDEP SALINE ESTUARY SEDIMENT CRITERIA (LOW) / NJDEP SALINE ESTUARY SEDIMENT CRITERIA (MEDIUM) (MARCH 2009)

- EXCEEDANCE
- NO EXCEEDANCES

NOTES:

1. SOIL ANALYTICAL DATA POSTED ONLY FOR ANALYTES THAT EXCEED THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION (NJDEP) SOIL REMEDIATION STANDARD AND SCREENING LEVELS.

2. IN ACCORDANCE WITH THE NJDEP SRP GUIDANCE, THE IMPACT TO GROUND WATER PATHWAY IN SOIL ONLY PERTAINS TO THE UNSATURATED ZONE. IMPACT TO GROUND WATER SOILS SCREENING LEVELS DO NOT APPLY AS ALL SAMPLES ARE WITHIN THE SATURATED ZONE IN IAOC A18.

3. WATER BODY LIMITS ARE TIDALLY INFLUENCED AND SUBJECT TO VARIATION. ALSO, WETLANDS OUTSIDE OF SOME PROPERTY BOUNDARIES WERE NOT ACCESSIBLE AND NOT DEFINED.

4. SLIGHT ADJUSTMENTS WERE MADE TO IAOC BOUNDARIES TO REFLECT TAX MAPS, METES AND BOUNDS DESCRIPTION OF THE PROPERTY, AND MORE ACCURATELY MIRRORED GEOREFERENCED INFORMATION.

5. IAOC BOUNDARY DESIGNATION LINES ABUTTING THE PROPERTY BOUNDARY SHALL BE CONSIDERED SYNONYMOUS WITH THE PROPERTY BOUNDARY.

6. BORINGS LOCATED WITHIN A WETLAND AREA ARE COMPARED TO THE LSSL, ER-L AND ER-M SCREENING LEVELS. BORINGS LOCATED WITHIN A TRANSITION AREA ARE COMPARED TO THE LSSL, ER-L, ER-M, RDCSRS AND NRDCSRS. BORINGS LOCATED OUTSIDE OF WETLAND AND TRANSITION AREAS ARE COMPARED TO THE RDCSRS AND NRDCSRS.

7. IF MORE THAN ONE APPLICABLE SRS OR ESC IS EXCEEDED, THE HIGHLIGHTING SHOWN IS FOR THE STANDARD/CRITERIA WITH THE HIGHEST VALUE.

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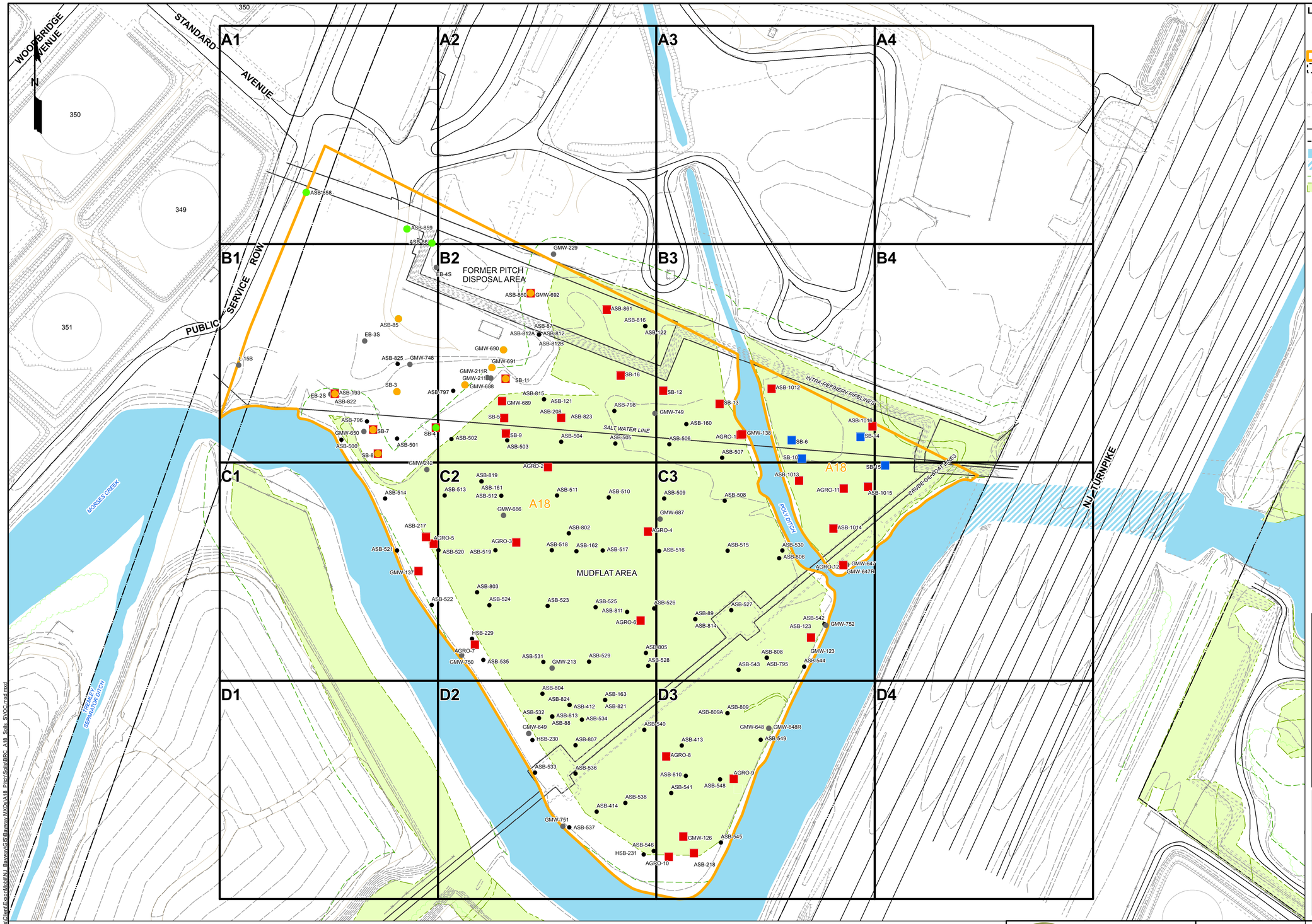
PROJECT NO.	20203020
DRAWN:	2/20/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_Soils_VOC.mxd

SUMMARY OF VOC EXCEEDANCES IN SOIL
NOVEMBER 9, 1993 to SEPTEMBER 21, 2018
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
1A

\\azpostgis01\GIS_Projects\Client\Exxon\Mobil\NJ_Bayway\MXDs\A18_Pitch\Soils\BRC_A18_Soils_VOC.mxd



LEGEND

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- EXCEEDANCE
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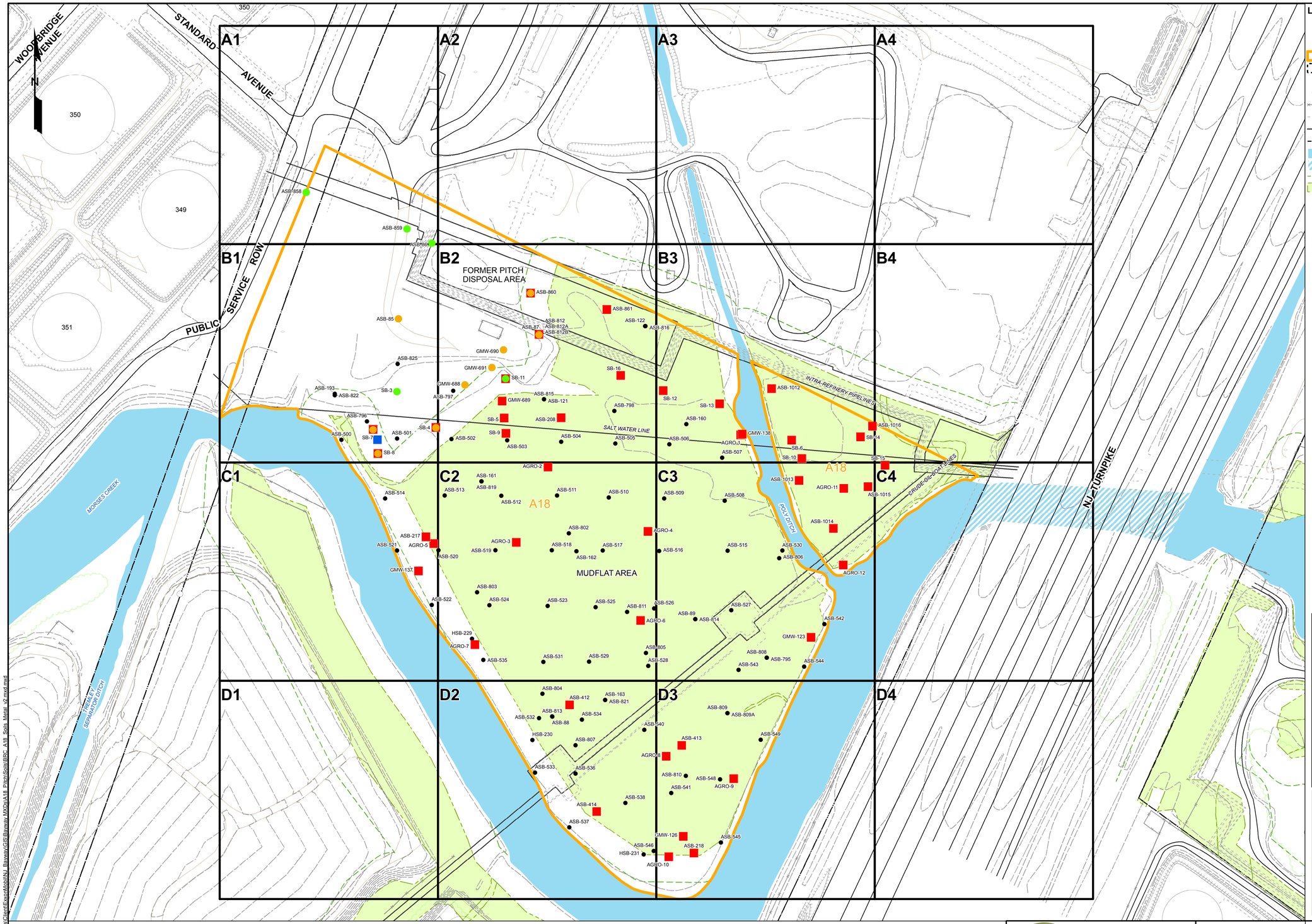
PROJECT NO.	20203020
DRAWN:	2/20/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_Soils_SVOC.mxd

SUMMARY OF SVOC EXCEEDANCES IN SOIL
NOVEMBER 9, 1993 to SEPTEMBER 21, 2018
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
1B

\\azmisstorp01\GIS_Projects\Client\Exxon\Mobil\NJ_Bayway\GIS\Bayway.MXD\A18_PitchSoil\BRC_A18_Soils_SVOC.mxd.mxd



LEGEND

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PROJECT NO.	20203020
DRAWN:	2/25/2020
DRAWN BY:	S. WILLIAMS
CHECKED BY:	D. HUTNICK
FILE NAME:	BRC_A18_Soils_Metal_v2.mxd

SUMMARY OF METALS EXCEEDANCES IN SOIL
NOVEMBER 9, 1993 to SEPTEMBER 21, 2018
IAOC A18

BAYWAY REFINERY COMPLEX
LINDEN, NEW JERSEY

FIGURE
1C

\\azmisstor01\GIS_Projects\Client\Exxon\Mobil\NJ_Bayway\GIS\Bayway MXDs\A18_PitchSoils\BRC_A18_Soils_Metal_v2.mxd.mxd

APPENDIX A

NJDEP Correspondence

- **NJDEP comments on the Revised Feasibility Study Report dated April 30, 2019.**
- **Summary of the June 18, 2019 meeting between representatives of ExxonMobil, Phillips 66, the LSRP, Arcadis, Kleinfelder and the NJDEP SRP and BEERA dated July 25, 2019.**
- **Electronic correspondence from the NJDEP Case Manager in response to the July 25, 2019 submittal, dated August 14, 2019.**
- **Response to the NJDEP's April 30, 2019 comments on the RFSR dated August 15, 2019.**

NJDEP comments on the Revised Feasibility Study Report dated April 30, 2019.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Case Management
Mail Code 401-05F
P.O. Box 420
Trenton, New Jersey 08625-0420
Telephone: 609-633-1455

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. McCABE
Commissioner

April 30, 2019

Maureen Forlenza
ExxonMobil Environmental and Property Solutions Company
1400 Park Ave., Building 7
Linden, NJ 07036

RE: Bayway Refinery – Revised Feasibility Study Report, IAOC A18 Pitch Area, dated August 31, 2018
1400 Park Ave.
Linden, Union
PI #: 008282
Activity Number: RPC000002

Dear Ms. Maureen Forlenza:

The New Jersey Department of Environmental Protection (Department) has completed a review of the Revised Feasibility Study Report (RFSR) for Investigative Area of Concern (IAOC) A18 Pitch Area dated August 31, 2018, submitted pursuant to the Administrative Consent Order (ACO), the Site Remediation Reform Act (N.J.S.A.58:10C-1 et seq.), the Administrative Requirements for the Remediation of Contaminated Sites (N.J.A.C 7:26C), and the Technical Requirements for Site Remediation at N.J.A.C. 7:26E.

The Department has completed its review of your submittal and identified the following comments:

General Comments

1. Section 4.3 Recommended Remedial Alternative for IAOC A18 (page 67) states, "…perimeter sheet pile wall installation and impermeable cap installation is the recommended remedial alternative for IAOC A18." The Department does not concur with the recommended alternative. This alternative is not protective of the environment, leaving behind extremely elevated levels of contaminants on the site, eliminating the resource and violating the "no net fill" policy.

2. The recommended remedial alternative of perimeter sheet pile wall installation and impermeable cap installation will cover several acres of wetlands and transition areas. The only proposed remedy for this loss of wetlands is to perform a wetland vegetation pilot study. Contingency plans, such as wetlands creation and/or wetlands banking should

be included in this report or an addendum to account for the possibility of failure of the pilot studies.

3. Please submit all the previous data for the site. The figures submitted only displayed 2015 through 2016 data. Please revise the figures to display all sampling data collected on this IAOC.

4. No cost analysis has been submitted for any of the alternatives. Please include a cost analysis for each alternative.

5. Section 1.1 Purpose and Scope, second paragraph (page 6) states, "The portion of IAOC A18 east of the Poly Ditch is constrained by the Poly Ditch, Morses Creek, the Salt Water Line (SWL), and Boat Lines (Figure 3). This area was not investigated previously, as it was thought to not be impacted due to:
   a. The presence of the Poly Ditch prior to 1940 (as shown in historical aerial photographs); and
   b. Construction of the pipelines and initiation of disposal practices of the Pitch Material in the 1940s (Geraghty & Miller 1993)."

   The Poly Ditch is part of a different IAOC and needs to be investigated with the rest of the Environmentally Sensitive Natural Resources (ESNRs) in its assigned IAOC. The statements above do not provide sufficient information indicating the Poly Ditch has not been impacted by the site's operations. Investigating this area is the only way to reduce uncertainty. This statement will need to be redacted or eliminated from the report, because it is not part of this IAOC.

Specific Comments

6. For the human exposure and wetlands transition areas, the Department acknowledges that multiple infrastructure appurtenances will impede the remediation of EPH free product and residual product at some locations. However, for those areas that are not impeded by infrastructure appurtenances, further evaluation is necessary to treat or remove EPH free product and residual product pursuant to N.J.A.C. 7:26E-5.1(e). Containment such as Capping and Perimeter Containment should be considered only where removal or treatment are not practicable. The Department recommends that ExxonMobil consider the removal and treatment options where removal and treatment are practicable, and that ExxonMobil differentiate these areas from the areas impeded by infrastructure appurtenances.

7. ExxonMobil should develop a comprehensive map of historical TPH and EPH soil and sediment data for IAOC A18 including the vertical extents of TPH greater than 10,000 mg/kg and EPH greater than 17,000 mg/kg. ExxonMobil should include information from the geotechnical soil borings logs (Appendix F) because the logs identify the presence of pitch, and from the descriptions in the boring logs of Appendix B (e.g., "residual oil" at a depth of 11 to 12 feet in ASB-861, "PITCH MATERIAL" in GMW-686, etc.). The locations of Historical LNAPL locations (Figure 7) should also be included and identified on the comprehensive TPH/EPH map. The infrastructure

appurtenances and sizes are not identical on all figures (e.g., Figure 5D versus Figure 12). ExxonMobil should include all infrastructure appurtenances and standardize the horizontal dimensions to be consistent between maps, especially maps where remediation evaluations are included.

8. The Department specifies that 30,000 mg/kg is the ceiling concentration for Capping activities for soil (maximum ceiling number in the EPH calculator, when using the grain size). The elevated levels above 30,000 mg/kg EPH shall be removed to comply with N.J.A.C. 7:26E-5.1(e). The removal of high concentration of free product was not evaluated in the report. If it is not practicable, a technical impracticability report shall be submitted as indicated in the Protocol for Addressing Extractable Petroleum Hydrocarbon guidance document.

9. Please provide a full vertical and horizontal delineation of the pitch material where EPH elevations are greater than 30,000 mg/kg.

10. Section 3.1.4 Potential Vapor Generation Evaluation discusses an evaluation of background VOC concentrations in the former Pitch Area. An air sample was taken in December 2015 and total VOCs and benzene were detected; these results were considered representative of background conditions in the Pitch Area. A more current air sample should be collected to appropriately represent background conditions under current conditions.

    It is proposed to use the results of the potential vapor generation evaluation along with exposure limits set by OSHA to develop vapor mitigation levels for future intrusive activities. However, many of OSHA's PELs are outdated and inadequate for ensuring protection of worker health because most of OSHA's PELs were issued shortly after adoption of the Occupational Safety and Health Act in 1970 and have not been updated since that time. OSHA recommends that employers consider using alternative occupational exposure limits because the Agency believes that exposures above some of these alternative occupational exposure limits may be hazardous to workers, even when the exposure levels are in compliance with the relevant PELs. It may be more appropriate to use NJDEP Vapor Intrusion Screening Levels to develop mitigation levels. The development of these mitigation levels should be discussed jointly with USEPA and the Department.

Please submit an Addendum to the Revised Feasibility Study Report, IAOC A18 Pitch Area and a Technical Impracticability report within 90 days from the date of this correspondence.

Thank you for your cooperation in this matter. If you have any questions, call Charles Zielinski at (609)292-0848, or email at Charles.Zielinski@dep.nj.gov.

Sincerely,

Lynn Vogel, PG, CHMM
ES3, Case Manager
Bureau of Case Management

cc: Charles Zielinski, NJDEP
Alan Straus, USEPA via electronic mail
Gina Ferreira, USEPA via electronic mail
Iman Olguin-Lira, NJDEP via electronic mail
John Ruhl, NJDEP via electronic mail
Allan Motter, NJDEP via electronic mail
Deborah LaMond, Phillips 66 via electronic mail
Michael Renzulli, LSRP via electronic mail
Paul Lucuski, Kleinfelder via electronic mail

Summary of the June 18, 2019 meeting between representatives of ExxonMobil, Phillips 66, the LSRP, Arcadis, Kleinfelder and the NJDEP SRP and BEERA dated July 25, 2019.

SENT VIA ELECTRONIC MAIL

July 25, 2019

Mr. Charles E. Zielinski
State of New Jersey
Department of Environmental Protection
Site Remediation Program
Bureau of Case Management
Mail Code 401-05F
PO Box 420
Trenton, NJ 08625-0420

Re: June 18, 2019 Meeting Notes

Project Overview, Status Update and
Response to NJDEP's Comments on the *Revised Feasibility Study Report*

Bayway Refinery Complex
Park Avenue and Brunswick Avenue
Block 520, Lot 6
City of Linden, Union County, New Jersey
NJDEP SRP Program Interest (PI) No.: 008282
NJDEP DLUR File No.: 2009-04-0001.1 FWW 150001 FWW 140001

Dear Mr. Zielinski:

Thank you very much for coordinating a meeting with representatives of ExxonMobil Environmental and Property Solutions (ExxonMobil), Phillips 66 (P66), the Licensed Site Remediation Professional (LSRP), Preferred Design Consultant – Arcadis (PDC), Kleinfelder, Inc. (Kleinfelder) and the New Jersey Department of Environmental Protection (NJDEP) on June 18, 2019. The objective of the meeting was to provide a project overview and status update and review the NJDEP's comments on the *Revised Feasibility Study Repor*t (RFSR) for Investigative Area of Concern (IAOC) A18 (Pitch Area) at the Bayway Refinery Complex (BRC) in Linden, New Jersey.

Below is a brief summary of our meeting. If this summary does not agree with your notes, please advise in writing.

The June 18, 2019 meeting was attended by the participants listed below:

NJDEP

- Charles Zielinski – Site Remediation Program (SRP), Case Manager
- Allan Motter – Bureau of Environmental Evaluation and Risk Assessment (BEERA), Supervisor
- John Ruhl – BEERA, Technical Coordinator
- Iman Olguin-Lira – BEERA, Ecological Risk Assessor (via telephone)

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ExxonMobil, P66 and ExxonMobil's Consultants

- Maureen Forlenza – ExxonMobil
- Michael Renzulli – LSRP
- Deborah LaMond – P66
- Corey Averill – Arcadis
- Michael Meyerhoefer – Kleinfelder
- Justin Moses – Kleinfelder
- David Hutnick – Kleinfelder
- Paul Lucuski – Kleinfelder

Project Overview

Kleinfelder provided an overview of IAOC A18, its location within the BRC and challenges to investigation and remediation efforts within this IAOC.

IAOC A18 Description

Kleinfelder provided an overview of IAOC A18 including details of the following areas and key refinery infrastructure:

- Former Pitch Disposal Area
- Mudflat Area
- Peninsula Area
- Morses Creek
- Poly Ditch
- Former East Retention Basin ([ERB], also referred to as the East Separator)
- Heat Exchanger Cleaning (HEC) pad
- Salt Water Line (SWL)
- Crude Oil Boat Lines
- Out-of-service Inter-Refinery Pipeline (IRPL) and multiple intra-refinery pipelines

Details of these areas and site features are included in the August 31, 2018 *Revised Feasibility Study Report* (RFSR).

Accessibility and Constructability Challenges

Kleinfelder noted several challenges to accessibility and constructability related to refinery infrastructure and site conditions which impact investigation and remediation activities as noted below.

- Active refinery infrastructure
    - SWL – The SWL is a 60-inch diameter bell-and-spigot cast iron pipeline that was constructed in approximately 1955. The SWL is supported on timber piles, some of which have been reinforced with concrete pile caps. The SWL is located in the northern portion of IAOC A18 and extends from east to west through the Former Pitch Disposal Area, the Mudflat Area and the Peninsula east of the Poly Ditch. Personnel can access the area to the south of the SWL via a scaffold that crosses over the line. Motorized equipment cannot access the area to the south of the SWL from the north. Currently, light-weight motorized equipment can access the

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area to the south of the SWL via a barge in Morses Creek. On the peninsula east of the Poly Ditch, personnel can access the area to the north of the SWL via elevated walkways constructed over the IRPL at the northern boundary of IAOC A18. Personnel must access the area on the peninsula east of the Poly Ditch south of the SWL via a boat launched from the eastern side of Morses Creek adjacent to the New Jersey Turnpike.

In addition to the access challenge presented by the SWL, ground-intrusive work in the vicinity of the SWL is limited by several factors.

- Based on modeling performed by Kleinfelder, an unsupported 8-foot deep excavation near the SWL is not feasible due to potential slope instability. The wooden piles are sensitive to lateral displacements and displacements as small as 1 inch may result in overstressing of the piles, which could result in failure of the SWL.

- Construction activities such as sheet pile installation or operation of construction equipment near the SWL can generate vibration which can potentially affect the timber piles. Vibration monitoring has been conducted via seismographs installed along the alignment of the SWL throughout Pilot Program activities (details of the Pilot Program are included in a later section). Thresholds specified in the SWL Monitoring Plan for the Pilot Program have not been exceeded during construction activities, but seismic monitoring will be required for future construction activities near the SWL. Exceedances of the thresholds may require work to be stopped and/or additional controls implemented.

- P66 has previously required a 40-foot buffer around the SWL (20 feet on either side of the SWL). Excavation activities are currently prohibited within this buffer area.

The SWL is a critical piece of refinery infrastructure and operations. A breach in this line would not only result in a disruption to refinery operations but would also likely result in loss of life for workers in this area. Protecting the SWL, in some instances by avoiding work in the area, is a top priority.

o Crude Oil Boat Lines – Two 30-inch diameter and two 24-inch diameter steel pipelines that transfer crude oil between the Waterfront Area to the east of IAOC A18 and the Tremley Tank Field which is located to the southwest of IAOC A18. The Crude Oil Boat Lines are supported on timber piles and are elevated approximately 3 to 5 feet above ground surface. The Crude Oil Boat Lines extend northeast to southwest across the Mudflat Area and Peninsula east of the Poly Ditch. Personnel can access the area to the southeast of the Crude Oil Boat Lines by crossing the scaffold over the SWL and walking under the Crude Oil Boat Lines. Motorized equipment cannot access the area to the southeast of the Crude Oil Boat Lines from the northeast. Currently, light-weight motorized equipment can access the area to the southeast of the Crude Oil Boat Lines via a barge in Morses Creek. Access to the peninsula east of the Poly Ditch is described above in the SWL section.

Like the SWL, P66 has required a 40-foot buffer around the Crude Oil Boat Lines

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(20 feet on either side of the Crude Oil Boat Lines). Excavation activities are currently prohibited within this buffer area.

To date, vibration monitoring has not been conducted on the Crude Oil Boat Lines because vibration-generating construction activities have not been conducted in proximity to these lines. Baseline vibration monitoring and monitoring during construction activities will be conducted at a later date. The Crude Oil Boat Lines are critical refinery infrastructure. A breach in the lines would result in a disruption to refinery operations, a release to the environment and potential injury or loss of life for workers in this area. Every effort is being made to ensure that the Crude Oil Boat Lines are protected during investigation and remediation activities.

- The intra-refinery pipelines are located on metal pipe racks extending northwest to southeast at the northern boundary of IAOC A18, adjacent to the butane/propane caverns area (IAOC A17). The active pipelines carry various liquids and gases throughout the production units in the BRC. Pitch material has been observed beneath the intra-refinery pipelines and within the rectangular area formed by the various pipelines. Access to this rectangular area is restricted by the pipelines. Personnel can access this area via elevated walkways from the butane/propane caverns area (IAOC A17) to the north, but motorized equipment cannot access this area.

  Like the SWL and Crude Oil Boat Lines, P66 has required a 40-foot buffer around the IRPL (20 feet on either side). Excavation activities are currently prohibited within this buffer area.

  To date, vibration monitoring has not been conducted on the IRPL because vibration-generating construction activities have not been conducted in proximity to these lines. Baseline vibration monitoring and monitoring during construction activities will be conducted at a later date. The IRPL is a key piece of refinery infrastructure. A breach in the lines would potentially result in a disruption to refinery operations, a release to the environment and potentially injury or loss of life for workers in this area. Every effort is being made to ensure that the IRPL is protected during investigation and remediation activities.

- Site conditions

  - Morses Creek is a tidal water body from No. 1 Dam to the confluence with the Arthur Kill. No. 1 Dam is the head of tide for the BRC. Upstream of No. 1 Dam including adjacent to IAOC A18, Morses Creek is tidally influenced, but is not considered a tidal water body. As the tidal elevation rises, surface water discharge from Morses Creek at No. 1 Dam is restricted influencing the surface water elevation of Morses Creek. Surface water inundates the Mudflat Area surface twice a day during half of the lunar cycle during the periods of restricted surface water flow. The approximate high-water line and photographs of the Mudflat Area during periods of surface water inundation were shown during the meeting. The maximum surface water depth observed in the Mudflat Area is approximately 16 inches.

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- The portions of the Former Pitch Disposal Area and Mudflat Area north of the SWL are currently accessible to equipment such as drill rigs and excavators via the temporary access road that has been constructed for the ongoing Pilot Program activities. Prior to construction of this road, there was limited means of accessing these areas with motorized equipment due to the soft surface materials and highly compressible subsurface. Limited equipment operations have been conducted in the Mudflat Area south of the SWL as access to this area must be obtained via a barge in Morses Creek.

- Both the Former Pitch Disposal Area and Mudflat Area are underlain by a meadow mat layer which is highly compressible and unable to support most motorized equipment such as drill rigs. The Pitch material is a relatively soft asphalt-like material that becomes softer during the warmer months of the year. Pitch material is less compressible than the meadow mat layer and is generally displaced outward rather than compressing when a load is applied to the surface. Additionally, Mudflat Area soils are soft and have typically not been able to support motorized equipment without structural support elements such as swamp mats, even during periods of the lunar cycle when the Mudflat surface is not inundated with surface water. Based on equipment trials during the Pilot Program, the largest equipment that can be supported on the Mudflat Area with swamp mats is approximately 6,000 to 8,000 pounds.

Previous Meetings with the NJDEP and Previous Regulatory Submittals

A timeline of previous meetings between the NJDEP, ExxonMobil, the LSRP and ExxonMobil's consultants, as well as regulatory submittals and approvals for IAOC A18 was presented. These include:

- 05/04/2014 – Supplemental Site-Wide Remedial Investigation Report (SSWRIR) Submittal
- 07/24/2014 – FSR Submittal
- 01/29/2015 – PDI Workplan Submittal
- 07/27/2015 – PDI Workplan Approval
- 09/21/2015 – SSWRIR Approval
- 04/22/2016 – Supplemental PDI Workplan Submittal via in-person meeting with the NJDEP
- 04/26/2016 – Supplemental PDI Workplan Approval
- 10/25/2017 – Supplemental PDI Summary Meeting
- 01/24/2018 – Pre-Application Meeting w/ NJDEP Division of Land Use Regulation (DLUR)
- 03/23/2018 – Remediation Strategy Road Map, Rev. 5 Submittal
- 08/31/2018 – RFSR Submittal
- 12/10/2018 – Remediation Strategy Road Map, Rev. 5 Approval
- 04/30/2019 – NJDEP's comments on RFSR
- 06/18/2019 – Meeting to review NJDEP's comments on RFSR

A copy of the minutes from the January 24, 2018 Pre-application meeting with the NJDEP DLUR is available as **Attachment 1**.

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RFSR Overview

A review of the key points of the August 31, 2018 RFSR was presented. These key points include:

- Regulatory background of IAOC A18
  - The regulatory background of the BRC and IAOC A18 were presented in the RFSR, but not reviewed during the meeting.
- PDI and supplemental PDI activities and results
  - Results of the PDI and supplemental PDI activities were presented in the RFSR, but not reviewed during the meeting.
- Remedial alternatives analysis
  - Details of the remedial alternatives analysis were presented in the RFSR, but not reviewed during the meeting.
- Proposed remedial actions for IAOC A18
  - A perimeter barrier wall for hydraulic containment;
  - An impermeable cap to prevent direct contact to impacted material; and
  - Potential limited excavation to facilitate installation of the perimeter barrier wall and impermeable cap.
- Description of remedial design data gaps identified in RFSR remedial alternatives analysis
  - These design data gaps are to be addressed prior to the preparation of a Remedial Action Workplan (RAW) and Conceptual Design.
- Pilot Program developed to address remedial design data gaps
  - The construction phase of the Pilot Program is currently ongoing and should be concluded in the next 6 to 8 weeks.
  - The monitoring phase of the Pilot Program will continue into 2020.

Review of NJDEP's Comments on the RFSR and ExxonMobil's Preliminary Responses

Each of the NJDEP's comments on the August 31, 2018 RFSR were reviewed. ExxonMobil's preliminary responses to the comments were presented and discussed with the meeting attendees. A formal response to comment letter will be submitted to NJDEP by August 15, 2019. Below is a summary of the comments, preliminary responses and discussions.

ExxonMobil and LSRP indicated that the NJDEP's comments were unexpected based on previous engagement with NJDEP on this IAOC.

- **NJDEP Comment # 1** – *Section 4.3 Recommended Remedial Alternative of IAOC A18 states, '…perimeter sheet pile wall installation and impermeable cap installation is the recommended alternative for IAOC A18'. This alternative is not protective of the environment, leaving behind extremely elevated levels of contaminants on the site, eliminating the resource and violating the "no net fill" policy.*

  - **ExxonMobil's response** - The proposed remedial action is protective of the environment, using a containment approach consistent with the NJDEP-approved Remediation Strategy Road Map. The feasibility of enhancing the resource to improve the function and value of the wetland is being evaluated through an on-going pilot program. The NJDEP DLUR indicated during a permit pre-application meeting on January 24, 2018 that a net fill of the Mudflat Area with a hardship exception could be considered. A key design parameter of sustainable vegetative growth is elevation. A key component of the pilot program is to establish the optimal elevation for wetland vegetative growth. Floodway modeling of the Poly Ditch and

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Morses Creek is ongoing to understand the flood impacts related to fill within the Mudflat Area.

- **Follow-up discussion** – Iman Olguin-Lira commented that she was concerned about changing the Mudflat Area from a wetland to an upland area by placing up to 2 feet of fill material on the ground surface. Kleinfelder clarified that the placement of 2 feet of fill material is not expected to result in an elevation change of 2 feet. Because the subsurface materials are highly compressible, the addition of fill material will result in an elevation change less than the thickness of the fill material placed. The potential compression/consolidation was modeled during the PDI activities and is currently being measured and evaluated as part of the Pilot Program. Kleinfelder also discussed the January 24, 2018 pre-application meeting with the NJDEP DLUR in which representatives of the NJDEP DLUR stated that evaluating the potential for wetland construction or enhancement during the Pilot Program would be acceptable. Lastly, it was noted that determining the least amount of fill material required for sustaining vegetation is a key objective of the pilot program.

- **NJDEP Comment # 2** – *The recommended remedial alternative of perimeter sheet pile wall installation and impermeable cap installation will cover several acres of wetlands and transition areas. The only proposed remedy for this loss of wetlands is to perform a wetland vegetation pilot study. Contingency plans, such as wetlands creation and/or wetlands banking should be included in this report or an addendum to account for the possibility of failure of the pilot studies.*

  - **ExxonMobil's response** - The wetland vegetation pilot study is ongoing to address data gaps for enhancing the Mudflat Area as a vegetated wetland. Wetlands creation at an alternative location and/or wetlands banking would be included in a future regulatory deliverable (2H2020) if the results of the pilot study indicate that enhancement of the Mudflat Area as a vegetated wetland is not viable or a NJDEP DLUR hardship exception for fill within the floodway cannot be obtained.

  - **Follow-up Discussion** – Iman Olguin-Lira asked if ExxonMobil is aware of a wetland mitigation bank parcel of approximately 9 acres that is currently available. ExxonMobil and Kleinfelder stated that the availability of a parcel of a specific size would have to be determined closer to when it would actually be needed as wetland mitigation bank parcels are typically purchased quickly after becoming available. It is unlikely that any 9-acre parcel available at the time of the meeting would be available at the time the remedial actions would be implemented for IAOC A18. The preferred course of action for IAOC A18 is to enhance the function and value of the existing wetland, or to replace it in-kind as part of the remedial action.

    Iman followed-up by stating that this comment on the RFSR was made over her concern that the change of elevation in the Mudflat Area would result in this area ceasing to function as a wetland. Kleinfelder stated that the elevation required to support wetland vegetation is currently being evaluated as part of the ongoing Pilot Program, and the intent of the proposed remedial action is not to convert any areas that are currently classified as wetlands to upland areas. Remedial actions that will result in changes to areas currently classified as wetlands are subject to the review and approval of the NJDEP DLUR Mitigation Unit prior to implementation.

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- **NJDEP Comment # 3** – *Please submit all the previous data for the site. The figures submitted only displayed 2015 through 2016 data. Please revise the figures to display all sampling data collected on this IAOC*.

    - **ExxonMobil's response** – Historical site data has been submitted to the NJDEP in previous reports, including the FSR. Additional data collected for the site will be presented in a future regulatory deliverable (2H2020).

    - No follow-up discussion

- **NJDEP Comment # 4** – *No cost analysis has been submitted for any of the alternatives. Please include a cost analysis for each alternative.*

    - **ExxonMobil's response** – A cost estimate will be included in a future regulatory deliverable (2H2020).

    - No follow-up discussion.

- **NJDEP Comment # 5** – *Section 1.1 Purpose and Scope, second paragraph states, "The portion of IAOC A18 east of the Poly Ditch is constrained by the Poly Ditch, Morses Creek, the Salt Water Line and Boat Lines. This area was not investigated previously, as it was thought to not be impacted due to:*

        - *The presence of the Poly Ditch prior to 1940 (as shown in historical aerial photographs); and*
        - *Construction of the pipelines and initiation of disposal practices of the Pitch Material in the 1940s (Geraghty & Miller, 1993)."*

    The Poly Ditch is part of a different IAOC and needs to be investigated with the rest of the Environmentally Sensitive Natural Resources (ENSRs) in its assigned IAOC. The statements above do not provide sufficient information indicating the Poly Ditch has not been impacted by the site's operations. Investigating this area is the only way to reduce uncertainty. This statement will need to be redacted or eliminated from the report, because it is not part of this IAOC.

    - **ExxonMobil's response** – The statement in Section 1.1 pertains to the peninsula to the east of the Poly Ditch, which is included in IAOC A18, but not the Poly Ditch itself, which flows through IAOC A18. The area to the east of the Poly Ditch was first investigated during the PDI activities as presented in the RFSR. Further investigation of the area to the east of the Poly Ditch was conducted during the Pilot Program. Details of the investigation of this area will be included in a future regulatory deliverable (2H2020). The Poly Ditch is included as part of the final Consent Judgment and the remedy for the Poly Ditch will be implemented with the rest of the ENSRs in its assigned IAOC.

    - No follow-up discussion

- **NJDEP Comment # 6** – *For the human exposure and wetlands transition areas, the Department acknowledges that multiple infrastructure appurtenances will impede the remediation of EPH free product and residual product at some locations. However, for those areas that are not impeded by infrastructure appurtenances, further evaluation is necessary to treat or remove EPH free product and residual product pursuant to N.J.A.C.*

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7:26E-5.1(e). Containment such as capping and perimeter containment should be considered only where removal or treatment are not practicable. The Department recommends that ExxonMobil consider removal and treatment options where removal and treatment are practicable, and that ExxonMobil differentiate these areas from the areas impeded by infrastructure appurtenances.

- **ExxonMobil's response** – ExxonMobil has considered removal and treatment options where it is technically feasible as presented in the July 2014 FSR. Additionally, the August 2018 RFSR proposed potential limited excavation and offsite disposal of Pitch material and/or Mudflat Area soils as required to:
  - Accommodate grading and installation of impermeable capping materials;
  - Remove Pitch material that is contacting the SWL to allow installation of impermeable capping materials under the SWL; and
  - Maintain required post-construction grades to support the growth of wetland vegetation planted on clean fill placed over the impermeable cap.

  The removal areas are identified on figures included in the RFSR. Final areas where removal of Pitch material is proposed will be presented in a future regulatory submittal (2H2020).

- **Follow-up discussion** – Alan Motter stated that technical implacability (TI) would need to be demonstrated if ExxonMobil plans to leave areas of free product in-place rather than removing. Kleinfelder asked if a TI discussion can be included as part of the RAW or if it needs to be submitted as a separate document. John Ruhl stated that it could be submitted as part of the RAW, if applicable.

- **NJDEP Comment # 7** – *ExxonMobil should develop a comprehensive map of historical TPH and EPH soil and sediment data for IAOC A18 including the vertical extents of TPH greater than 10,000 mg/kg and EPH greater than 17,000 mg/kg. ExxonMobil should include information from the geotechnical soil boring logs (Appendix F) because the logs identify the presence of pitch, and from the descriptions in the boring logs of Appendix B (e.g., "residual oil" at a depth of 11 to 12 feet in ASB-861, "PITCH MATERIAL" in GMW-686, etc.). The locations of Historical LNAPL locations (Figure 7) should also be included and identified on the comprehensive TPH/EPH map. The infrastructure appurtenances and sized are not identical on all figures (e.g. Figure 5D versus Figure 12). ExxonMobil should include all infrastructure appurtenances and standardize the horizontal dimensions to be consistent between maps, especially maps where remediation evaluations are included.*

  - **ExxonMobil's response** - A comprehensive TPH/EPH map will be included in a future regulatory deliverable (2H2020). Future regulatory submittals will also include figures that use standardized horizontal dimensions for various site features.

  - No follow-up discussion.

- **NJDEP Comment # 8** - *The Department specifies that 30,000 mg/kg is the ceiling concentration for Capping activities for soil (maximum ceiling number in the EPH calculator, when using the grain size). The elevated levels above 30,000 mg/kg EPH shall be removed to comply with N.J.A.C. 7:26E-5.1(e). The removal of high concentration of free product was not evaluated in the report. If it is not practicable, a technical*

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impracticability report shall be submitted as indicated in the Protocol for Addressing Extractable Petroleum Hydrocarbon guidance document.

- **ExxonMobil's response** - As shown on figures included in the FSR and RFSR, EPH concentrations exceed 30,000 mg/kg throughout the Former Pitch Disposal Area, Mudflat Area and peninsula area east of the Poly Ditch in IAOC A18. Similar remedial actions have been implemented for separate phase material at other IAOCs at the BRC consistent with the NJDEP approved Remediation Strategy Road Map because these remedial actions are protective of potential receptors and the environment. It is not practicable to remove all soil with EPH concentrations above 30,000 mg/kg due to active refinery infrastructure and other constructability factors. Therefore, a TI analysis will be prepared and included in a future regulatory deliverable (2H2020), if applicable.

- No follow-up discussion.

- **NJDEP Comment # 9** - *Please provide a full vertical and horizontal delineation of the pitch material where EPH elevations are greater than 30,000 mg/kg.*

  - **ExxonMobil's response** - A comprehensive TPH/EPH map will be included in a future regulatory deliverable (2H2020).

  - No follow-up discussion.

- **NJDEP Comment # 10** - *Section 3.1.4 Potential Vapor Generation Evaluation discusses an evaluation of background VOC concentrations in the former Pitch Area. An air sample was taken in December 2015 and total VOCs and benzene were detected; these results were considered representative of background conditions in the Pitch Area. A more current air sample should be collected to appropriately represent background conditions under current conditions.*

  It is proposed to use the results of the potential vapor generation evaluation along with exposure limits set by OSHA to develop vapor mitigation levels for future intrusive activities. However, many of OSHA PELs are outdated and inadequate for ensuring protection of worker health because most of OSHA's PELs were issued shortly after adoption of the Occupational Safety and Health Act in 1970 and have not been updated since that time. OSHA recommends that employers consider using alternative occupational exposure limits because the Agency believes that exposures above some of these alternative occupational exposure limits may be hazardous to workers, even when the exposure limits are in compliance with the relevant PELs. It may be more appropriate to use NJDEP Vapor Intrusion Screening Levels to develop mitigation levels. The development of these mitigation levels should be discussed jointly with USEPA and the Department.

  - **ExxonMobil's response** - Appropriate worker safety action levels will be included in the site-specific Health and Safety Plan and will meet applicable regulations and company standards.

  - No follow-up discussion

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Review of the IAOC A18 Pilot Program Objectives, Scope of Work and Status

The objectives, scope of work and status of the Pilot Program, which is being conducted to address remedial design data gaps, was presented. The objectives of the Pilot Program are as follows:

- Address remedial design data gaps prior to the preparation of a RAW and Conceptual Design;
- Refine the constructability evaluation included in the RFSR and evaluate site-specific implementation logistics related to:
    - Equipment access;
    - Equipment stability and maneuverability;
    - Soft surface and highly compressible subsurface;
    - Water inundation; and
    - Odor generation/migration;
- Collect data to support regulatory acceptance/approval for the selected remedial actions; and
- Evaluate long-term effectiveness and sustainability of the selected remedy considering P66's ongoing operations.

The various modules of the Pilot Program and their status as of June 18, 2019 were:

- Site Preparation/Mobilization – Complete
- Environmental Monitoring – Complete
- Flood Berm Removal – Complete
- Road Construction and Equipment Accessibility – Complete
- Upland Geotechnical Pilot Study – Complete
- Alternate Perimeter Wall Pilot Study – Complete
- Dewatering/Stabilization Pilot Study – Complete
- SWL Monitoring – In Progress
- Jet Grout Pilot Study – In Progress
- Eastern Peninsula Pilot Study – In Progress
- Upland Hydrogeological Pilot Study – In Progress
- Sunshade Bridge Removal – In Progress
- Edge of Mudflat Geotechnical Pilot Study – In Progress
- Wetland Vegetation Pilot Study – In Progress
- Alternative Cap/Liner Pilot Study – In Progress
- Former Pitch Disposal Area Cap Cell Pilot Study – In Progress
- Mudflat Area Cap Cell Pilot Study – In Progress
- Additional Geotechnical Borings – To be Completed
- Test Pit in Vegetated Area East of Boat Lines – To be Completed
- Center of Mudflat Trench – To be Completed
- Summer Test Pits – To be Completed

Project Progression

The anticipated schedule for future activities and deliverables was presented as follows:

- Written response to NJDEP's comments – 2H2019
- Complete Pilot Program construction activities – 2H2019

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- Complete Pilot program monitoring activities – 1H2020
- Remedial Action Work Plan (including 30% design) – 2H2020
- Contractor procurement and permitting – 1H2021
- RA implementation – 2H2021

Follow-up Telephone Conversation – June 19, 2019

On June 19, 2019, Charles Zielinski, the NJDEP SRP Case Manager, contacted Michael Renzulli, LSRP, to discuss the results and actions from the June 18, 2019 meeting. Charles Zielinski indicated that he will be the primary contact for TI consideration and review, if applicable. Charles Zielinski indicated that the data presented to date, including the presentation from the June 18, 2019 status meeting, demonstrates the technical challenges of the IAOC and supports the remedy selection proposed in the RFSR. A formal response to NJDEP's comments on the RFSR, will be submitted to NJDEP by August 15, 2019.

Closing

Thank you again for meeting to discuss this matter. A written response to the NJDEP's comments on the RFSR is anticipated to be submitted by August 15, 2019.

If you have any additional questions, please contact Michael Meyerhoefer of Kleinfelder at mmeyerhoefer@kleinfelder.com or 631-671-7597.

Sincerely,
Kleinfelder, Inc

David C. Hutnick
Environmental Scientist

Michael Meyerhoefer
Senior Project Manager

Electronic Copy:

Charles Zielinski – NJDEP SRP Case Manager
Allan Motter – NJDEP BEERA Supervisor
John Ruhl – NJDEP BEERA Technical Coordinator
Iman Olguin-Lira – NJDEP BEERA Ecological Risk Assessor
Maureen Forlenza, ExxonMobil
John Groneck, ExxonMobil
Michael Renzulli, LSRP
Deborah LaMond, P66
Corey Averill, Arcadis
Justin Moses, Kleinfelder
David Hutnick, Kleinfelder
Paul Lucuski, Kleinfelder
Project File

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Attachment 1

Minutes from the January 24, 2018 Pre-application meeting with the NJDEP DLUR

SENT VIA ELECTRONIC MAIL AND MAIL

February 23, 2018

Ms. Katherine Nolan
New Jersey Department of Environmental Protection
Office of Permit Coordination and Environmental Review
P.O. Box 420, Mail Code 401-07J
Trenton, New Jersey 08625

Re: January 24 Pre-Application Conference Notes
Remedial Activities, Pitch Area (IAOC A18)
Bayway Refinery Complex
Park Avenue and Brunswick Avenue
Block 520, Lot 6
City of Linden, Union County, New Jersey
NJDEP SRP Program Interest (PI) No.: 008282
NJDEP DLUR File No.: 2009-04-0001.1 FWW 150001 FWW 140001

Dear Ms. Nolan:

Thank you very much for coordinating a meeting with representatives of ExxonMobil Environmental Services Company (ExxonMobil), Phillips 66 (P66), the Licensed Site Remediation Professional (LSRP) and Kleinfelder, Inc. on January 24, 2018, for a Pre-Application Conference to discuss permits required for Investigative Area of Concern (IAOC) A18 conceptual remedial actions to be completed at the Bayway Refinery Complex (BRC) in Linden, New Jersey.

Below is a brief summary of our meeting, as requested. If this summary does not agree with your notes, please advise in writing.

Conference Participants

The January 24, 2018 Pre-Application Conference was attended by the participants listed below:

New Jersey Department of Environmental Protection (NJDEP)

Michelle Sebestyen – Permit Coordination and Environmental Review
Cheryl Rohrbacher – Permit Coordination and Environmental Review
Robert Hall – Surface Water Permitting
Susan Lockwood – Division of Land Use Regulation Mitigation Unit
Peter DeMeo – Division of Land Use Regulation
Gary Nickerson – Office of Dredging and Sediment Technology
Kenneth Komar – Water Allocation
Charles Zielinski – Site Remediation Program
Melisse Carasia Auriti – Bureau of Surface Water Permitting

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ExxonMobil, Phillips 66 and ExxonMobil's Consultants

Maureen Forlenza – ExxonMobil
Deborah LaMond – P66
Justin Moses – Kleinfelder
Michael Meyerhoefer – Kleinfelder
Nicole Joy – Kleinfelder
Michael Renzulli – MR-LSRP

Conference Synopsis

Project Overview

Kleinfelder provided an overview of IAOC A18, which is split into two distinct areas of concern:

- Former Pitch Disposal Area
- Mudflat Area

IAOC A18 Description

IAOC A18 totals approximately 16 acres. It is bound by Morses Creek on its east, south, and west boundaries, and by the butane and propane caverns (IAOC A17) to the north. IAOC A18 includes the Former Pitch Disposal Area; the Mudflat Area; the former East Retention Basin (ERB, also referred to as the East Separator), which was filled in during 2016; the Heat Exchanger Cleaning (HEC) pad, which is no longer used for its intended purpose but is regularly used for materials storage; aboveground pipelines carrying crude oil (Boat Lines); and aboveground refinery pipelines including the out-of-service Inter-Refinery Pipeline (IRPL), multiple intra-refinery pipelines, high-pressure steam pipelines, and a cooling water pipeline (Salt Water Line [SWL]). The Boat Lines span the Mudflat Area and are two active 30-inch-diameter pipes supported by timber pilings that transfer crude oil from the waterfront area to the Tremley Tankfield, located south of IAOC A18. The SWL spans the Former Pitch Disposal and Mudflat Areas and is a 60-inch-diameter cast iron bell and spigot pipe supported by timber pilings constructed circa 1947 with selected repair sections constructed as recently as 2007. The SWL supplies non-contact cooling water from the Arthur Kill to BRC processing units at a rate up to 160,000 gallons per minute.

Former Pitch Disposal Area and Mudflat Description

The Former Pitch Disposal Area is an approximately 4-acre area within IAOC A18. Pitch material is underlain by meadow mat (very compressible organic material) at depths ranging from between 4 and 8 to approximately 14 feet below ground surface (bgs). The pitch material consists of a low volatility, dark, viscous material (similar in composition to asphalt), containing a high percent of inert materials (typically >80% solids content), formed as a residue in the batch distillation of petroleum. Pitch material has been vertically delineated from 0 feet bgs to approximately 8 feet bgs.

The Mudflat Area is an approximately 12-acre area within IAOC A18 consisting of a mudflat that is transected by the poly ditch (operational ditch used by the refinery to discharge non-contact cooling water) and Boat Lines. The Mudflat Area becomes inundated by surface water from Morses Creek twice per day for half the lunar cycle. Water inundation occurs during high tide in the Arthur Kill, which causes water from Morses Creek to back up at Number 1 Dam. The mudflat

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material consists of former dredge spoils from Morses Creek and is underlain by meadow mat at depths ranging from approximately 4 to 14 feet bgs. The mudflat is currently classified as intermediate wetlands, but vegetative growth only occurs in some locations, which are at higher elevations.

The project is in the conceptual phase, and this meeting was held to obtain feedback in support of the preparation of a revised Feasibility Study Report. As part of the conceptual project development, Kleinfelder is developing potential soil and groundwater remedial actions within IAOC A18. A pilot program is currently being developed to evaluate full-scale remedial action alternatives including: excavation, capping, barrier wall installation and constructed wetland enhancement. Future meetings with refined remedial approaches will be requested, at the appropriate time, to solicit NJDEP feedback.

Kleinfelder noted a number of accessibility and constructability challenges, which will impact design. ExxonMobil noted that this area is tidally influenced, but not tidal.

Discussion

Water Allocation (Kenneth Komar)

- The BRC currently has various remediation projects underway and others planned for the near future. Due to these various current and future projects, the Bureau has recommended to the applicant that they obtain either a Water Allocation Permit or Water Use Registration that would cover the various extraction and dewatering wells onsite. The applicant submitted to the Bureau, a summary of all onsite groundwater diversions, and identified their intent to file for a Water Allocation Permit on November 30, 2017.
- After reviewing the scope of the IAOC-A18 project, it appears that some dewatering may occur as part of this project. It is recommended that the applicant include this project, as well as all future planned remediation projects, as part of any application submitted to the Bureau.

Bureau of Surface Water Permitting (Robert Hall and Melisse Carasia Auriti)

- A permit will be needed for any construction dewatering that may be discharged to surface water.
- Provided that the discharge is not contaminated, the appropriate discharge permit will be the B7 Short-term De Minimis Discharge General Permit (see http://www.state.nj.us/dep/dwq/pdf/b7-rfa-checklist.pdf). This is determined by running a pollutant scan, as described in the application checklist, where the data can be collected up to a year in advance of the discharge.
- If, however, the analytical results demonstrate levels greater than the standards (Appendix A) as specified in the de minimis permit (see http://www.state.nj.us/dep/dwq/pdf /b7-deminimis-final-permit-5-20-15.pdf), the appropriate New Jersey Pollutant Discharge Elimination System discharge to surface water permit will be the BGR General Groundwater Remediation Cleanup Permit (see http://www.state.nj.us/dep/dwq/pdf/sw-gp-chklst.pdf).

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- The BGR permit can generally be processed in less than 30 days, although a treatment works approval may be needed for any treatment. Contact information is listed on the checklists.
- Discharging to the P66 wastewater treatment plant may be possible as it is likely designed to accept water impacted by industrial contaminants.
- If the discharge is petroleum related, a B4B general permit would be applicable instead of the BGR.

Office of Dredging and Sediment Technology (Gary Nickerson), Division of Land Use Regulation (Peter DeMeo) and Mitigation Unit (Susan Lockwood)

The proposed concepts may require the following permits and plans:

- Freshwater Wetlands General Permit 4
- Flood Hazard Area Verification
- Flood Hazard Area Individual Permit and possible Hardship Exception
- Stormwater Management Plan
- Mitigation Plan

Mitigation (Susan Lockwood)

- The mitigation unit will be working and consulting with the Division of Land Use Regulation to review land use permit applications and the mitigation plan.
- There will need to be a net balance at the site. If X acres are impacted, then X acres will need to be restored.

The detailed discussion of specific requirements is summarized below:

Mr. Nickerson asked Ms. Lockwood what mitigation would be required for this project. Ms. Lockwood stated that if the project area is restored to current condition, then mitigation would not be required. Since this area is currently not vegetated, restoration would include putting back what is removed at a ratio of one-to-one and stabilization, which may require some vegetation. Enhancement of this area may be possible, but the challenge will be determining functional plantings that can survive in this area. Kleinfelder stated that during the pilot program, test cells will be constructed to see what vegetative species can grow. Ms. Lockwood also emphasized understanding the hydrology and surface water inundation of this area to find suitable species to plant. It was also mentioned that enhancement of a contaminated area is considered an “attractive nuisance,” so clean material should be utilized for restoration.

Flood Hazard Area (Peter DeMeo)

Mr. DeMeo raised the need to determine the depth of fill necessary to prevent vegetative uptake of contamination and for compressibility/constructability within the Flood Hazard Area (FHA) in advance of application.

Mr. DeMeo stated that the FHA along Morses Creek is identified in the FEMA Flood Insurance Rate Map and that top of bank is the floodway. The drainage area of the Poly Ditch needs to be calculated to determine if this is a regulated water. If the drainage area is less than 50 acres, the ditch is not regulated and will not have a floodway. If the drainage area is more than 50 acres,

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and if net fill is proposed for the project, then a HEC-RAS analysis, like the one performed for the Tremley Ditch, would be necessary to determine where the floodway is located. If the project is proposing only to excavate and fill to existing elevation (no net change), then a review of the Poly Ditch floodway and HEC-RAS analysis will not be necessary. The area is very flat, and the USGS Quadrangle map is not useful in determining the drainage area. Mr. DeMeo recommended getting site topography and calculating the drainage area.

Mr. DeMeo confirmed that the property owner is P66 and there are no easements that would be impacted by this project. Kleinfelder raised that construction access might be an issue in this area and that bridges may be necessary. Mr. DeMeo asked where these bridges would be anchored and noted evaluating the hydraulic impact. ExxonMobil stated that flow restriction is not allowable per the property owner, and the bridges would be floating style (pontoon). Mr. DeMeo asked how long the bridges will be in place, and Kleinfelder stated that construction would last for approximately three-quarters of a year. Mr. DeMeo noted that if in place longer than six months, the bridge would be considered a permanent structure and would need to be evaluated.

Mr. Renzulli clarified if ground surface needs to be raised 12 to 18 inches higher than existing conditions, that this would be acceptable. Mr. DeMeo stated that if outside of the floodway, then this is not a concern, since this is a tidal FHA, and there is no upper limit on filling within a tidal FHA. If this were a fluvial FHA, then this would not be the case.

Stormwater Management (Peter DeMeo)

The project will need to be evaluated for water quality, quantity and recharge. Recharge is not anticipated for this project due to the wet condition. For quantity, changes to land cover and hydrograph will need to be evaluated, and the proposed hydrograph cannot be made more severe. Eighty percent total suspended solid removal will be required if more than one-quarter acre of new impervious surface will be proposed. If a road is permeable, then no treatment will be necessary. ExxonMobil clarified that dense-graded aggregate is impervious and gravel is pervious. Due to heavy construction equipment and truck traffic, gravel roads may not be possible. If treatment is necessary, Mr. DeMeo suggested evaluating treatment somewhere else on site. If construction will last more than six months, then the construction phase will also need to be evaluated for stormwater management. ExxonMobil asked if there is any way to get a waiver on this requirement. Mr. DeMeo responded that a hardship exception may be feasible depending on the arguments presented. He also suggested an alternative could be to block off vehicular access to an impervious area on site. ExxonMobil also raised that if a best management practice design were implemented, a permit may be necessary for only a temporary measure.

ExxonMobil asked the question if TSS mitigation was performed in another area on-site and was removed after construction was complete, if this would be acceptable by NJDEP. Mr. DeMeo made the comment that NJDEP would prefer the mitigation measure be left in place because of its environmental benefits but ExxonMobil would not be legally obligated.

Mr. DeMeo stated that the proposed revisions to the stormwater management rules are in internal legal review and recommended a review on the status and impacts of these rules closer to the design and permitting phase. The proposed revisions to the stormwater management rules are not available for review at this time.

<u>Additional Comments</u>

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Other comments were submitted by parties not able to attend the meeting, as listed below:

New Jersey Division of Fish and Wildlife (Kelly Davis)

Threatened and Endangered Species

- Habitat patches associated with this remediation proposal are valued as foraging habitat for a number of wading birds including State listed Black and Yellow-crowned Night-herons. Due to the existence of extensive alternative areas locally available for foraging the Division of Fish and Wildlife Endangered and Non-Game Species Program (ENSP) would not expect any long-term adverse impacts to these species from this project.
- Habitat patches associated with this remediation proposal are also valued for Bald Eagle foraging and a nest. Conditions supplied in previous permits, supplied with permit readiness checklists, would continue to apply. If it is determined that the nest is no longer occupied, consultation with ENSP/DLUR Threatened and Endangered Unit might determine means to minimize or mitigate for this condition.
    - Conditions applied in previous permits related to Bald Eagle have been lifted based on evaluation by the Division of Fish and Wildlife. The conditions were lifted in correspondence provided by NJDEP on April 7, 2015.

Fisheries

- A time restriction from May 1 through July 31 would be recommended on any in-water and/or sediment-generating activities associated with the project in order to protect warm-water fish nest building and spawning activities.
- Coffer dams installed prior to, or outside of, a recommended timing restriction might allow the applicant to work during the timing restriction. If a barrier wall acts similar to a coffer, it may be sufficient.
- Due to Number 1 Dam, this waterway would not be considered anadromous.

Any questions or concerns regarding fish and wildlife should be directed to Mr. Kelly Davis at (908) 236-2118 or Kelly.Davis@dep.nj.gov.

State Historic Preservation Office (Jesse West-Rosenthal)

- Based upon the documentation submitted, there are no buildings, structures, sites, objects, or historic districts that are listed on, or that have been identified as eligible for listing on, the New Jersey or National Registers of Historic Places on or adjacent to the project location. Although the project setting is sensitive for archaeological sites, based upon a review of information on file at the Historic Preservation Office (HPO), the project only has a low potential for archaeological remains. Consequently, the HPO does not recommend further consideration prior to permit issuance.
- If additional consultation with the HPO is needed for this undertaking, please reference the HPO project number 18-0376 in any future calls, emails, submissions or written correspondence to help expedite your review and response. Any questions can be directed to Jesse West-Rosenthal at (609) 984-6019.

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Bureau of Nonpoint Pollution Control (Eleanor Krukowski)

Construction projects that disturb 1 acre or more of land, or are part of a larger common plan of development that is greater than 1 acre, are required to obtain coverage under the Stormwater Construction General Permit (5G3). Applicants must first obtain certification of their soil erosion and sediment control plan (251 plan) from their local soil conservation district (SCD) office. Upon certification, the district office will provide the applicant with two codes (SCD certification code and 251 identification code) for use in the NJDEP online portal system application. Applicants must then become a registered user for the NJDEP online system and complete the application for the Stormwater Construction General Authorization. Upon completion of the application, the applicant will receive a temporary authorization, which can be used to start construction immediately, if necessary. Within three to five business days, the permittee contact identified in the application will receive an email including the application summary and final authorization. Further questions on this can be directed to Eleanor Krukowski at (609) 633-7021.

Air Quality Permitting Program (Quddus Qayyum)

It is recommended that N.J.A.C. 7:27-8.2 be reviewed to determine air permit applicability for all operations at this site, including the need to file for a new air permit(s) or to make changes to any existing air permit(s). Any questions should be directed to Quddus Qayyum at (609) 633-7021.

Bureau of Tidelands Management (Marty Mosen)

- The applicant was advised to follow up with the Bureau of Tidelands Management to determine if a tidelands license or grant will be required for proposed project. (Note: P66 is reviewing this requirement.)
- A tidelands license may be required for mitigation activities.
- Land use permits will need to be obtained before the Bureau of Tidelands Management can issue license.
- Tidelands inquiries should be directed to Marty Mosen at (609) 633-7900 or Martin.Mosen@dep.nj.gov.

Michelle Sebestyen concluded the meeting by requesting that Katie Nolan be copied on all correspondence as the project progresses.

Closing

Thank you again for meeting to discuss this project. We will schedule supplemental meetings as conceptual remedies are refined to solicit additional NJDEP feedback. Additionally, pre-application meetings with the Division of Land Use Regulation will be scheduled to review the conceptual design and confirm permitting and stormwater engineering requirements.

If we have other questions, we will contact the conference attendees for further clarification on permitting requirements, as needed, and will copy you on all permit applications. Please contact Nicole Joy of Kleinfelder at njoy@kleinfelder.com or 609-454-4564 if you have any questions or require further information.

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Sincerely,
Kleinfelder, Inc

Nicole E. Joy

Nicole Joy
Senior Staff Engineer

Hard Copy:
- Alan Straus, USEPA
- Charles Zielinski, NJDEP Case Manager
- Project File

Electronic Copy:
- Michael Renzulli, LSRP
- Deborah LaMond, P66
- John Groneck, ExxonMobil
- Maureen Forlenza, ExxonMobil
- Justin Moses, Kleinfelder
- Michael Meyerhoefer, Kleinfelder
- Michelle Sebestyen, NJDEP – OPCER
- Cheryl Rohrbacher, NJDEP – OPCER
- Robert Hall, NJDEP– BSWP
- Susan Lockwood – NJDEP DLUR Mitigation Unit
- Peter DeMeo, NJDEP – DLUR
- Christian Zografos, NJDEP – DLUR
- Gary Nickerson, NJDEP – ODST
- Kenneth Komar, NJDEP – Water Allocation
- Melisse Carasia Auriti, NJDEP – BSWP
- Eleanor Krukowski, NJDEP – BNPC
- Kelly Davis, NJDEP – F&W
- Quddus Qayyum, NJDEP – Air Permitting
- Jesse West-Rosenthal, NJDEP – SHPO
- Marty Mosen, NJDEP – BTM

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Electronic correspondence from the NJDEP Case Manager in response to the July 25, 2019 submittal, dated August 14, 2019.

David Hutnick

From: Zielinski, Charles <Charles.Zielinski@dep.nj.gov>
Sent: Wednesday, August 14, 2019 1:20 PM
To: Michael Meyerhoefer
Cc: Ruhl, John; Motter, Allan; Olguin-Lira, Iman; Forlenza, Maureen P; mike@renzullilsrp.com; Lamond, Deborah; Paul Lucuski; Kozlowski, Nicole; David Hutnick
Subject: RE: June 18, 2019 - ExxonMobil Bayway Pitch IAOC Meeting - Project Overview, Status Update and Response to NJDEP's Comments on the Revised Feasibility Study Report

Hi Mike,
The Department has reviewed the meeting notes from the June 18, 2019 Bayway Pitch IAOC meeting, and has the following comments to be reflected in revised meeting notes:

1. Follow-up Telephone Conversation – June 19, 2019: Per the follow-up telephone conversation, it was also stated that ExxonMobil must have a New Jersey licensed engineer certify (sign and seal) the technical impracticability statement/report for the entire IAOC, or any portion thereof where ExxonMobil is claiming Technical Impracticability.

2. Also, the Technical Impracticability and Pilot Study reports are supporting documents to the Revised Feasibility Study Report, and necessary to demonstrate the technical challenges of the Pitch IAOC. The data presented to date, including the presentation from the June 18, 2019 meeting, did demonstrate the technical challenges. However, the Department cannot concur the technical challenges are sufficient to support the RFSR proposed remedy selection without the Technical Impracticability and Pilot Study reports. These supporting documents will need to be submitted and reviewed by the Department.

Thank you,
Charlie

Charles E. Zielinski
State of New Jersey
Department of Environmental Protection
Site Remediation Program
Bureau of Case Management
Mail Code 401-05F
PO Box 420
Trenton, NJ 08625-0420
Tel: (609) 292-0848

New Jersey DEPARTMENT of ENVIRONMENTAL PROTECTION

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From: Michael Meyerhoefer <MMeyerhoefer@kleinfelder.com>
Sent: Thursday, July 25, 2019 1:43 PM
To: Zielinski, Charles <Charles.Zielinski@dep.nj.gov>
Cc: Ruhl, John <John.Ruhl@dep.nj.gov>; Motter, Allan <Allan.Motter@dep.nj.gov>; Olguin-Lira, Iman <Iman.Olguin-Lira@dep.nj.gov>; Forlenza, Maureen P <maureen.p.forlenza@exxonmobil.com>; Groneck, John E <john.e.groneck@exxonmobil.com>; mike@renzullilsrp.com; Lamond, Deborah <Deborah.Lamond@p66.com>; corey.averill@arcadis.com; Justin Moses <JMoses@kleinfelder.com>; David Hutnick <DHutnick@kleinfelder.com>; Paul Lucuski <PLucuski@kleinfelder.com>
Subject: [EXTERNAL] June 18, 2019 - ExxonMobil Bayway Pitch IAOC Meeting - Project Overview, Status Update and Response to NJDEP's Comments on the Revised Feasibility Study Report

Charlie,
I have attached the meeting notes prepared for the above referenced meeting. Thanks for taking the time and coordinating the meeting. We will provide you with a written response to the NJDEP's comments on the Revised Feasibility Study Report by August 15, 2019.

Please let us know if you have questions or would like to discuss in more detail.

Thanks,
Mike

Michael J. Meyerhoefer
Project Manager III

1200 Veterans Memorial Highway, Suite 300
Hauppauge, NY 11788
d| 631.787.8352
o| 631.218.0612
m| 631.671.7597

This email may contain confidential information. If you have received this email–including any attachments–in error, please notify the sender promptly and delete the email and any attachments from all of your systems.

Response to the NJDEP's April 30, 2019 comments on the RFSR dated August 15, 2019.

Michael Renzulli - LSRP

71 Potts Road, Robbinsville, NJ 08691
Office/Fax: 609-249-2699
Mobile: 609-744-7445
E-mail: mike@renzullilsrp.com

August 15, 2019

Mr. Charles Zielinski
New Jersey Department of Environmental Protection
Bureau of Case Management
P.O. Box 420. Mail Code 401-05F
401 East State Street
Trenton, NJ 08625

RE: Bayway Refinery Complex Site Remediation
Response to NJDEP's Comments
***Revised Feasibility Study Report* letter dated April 30, 2019**
Investigative Area of Concern (IAOC) A18 (Pitch)
Administrative Consent Order (ACO), Effective 11/27/1991
SRP PI#008282

Dear Mr. Zielinski:

Attached is one hard copy (original) and one electronic copy of the response to the Department's April 30, 2019 letter commenting on the Revised Feasibility Study Report (RFSR) for investigative area of concern (IAOC) A18 (Pitch Area) located within the Bayway Refinery Complex (BRC). The original Feasibility Study Report (FSR) for IAOC A18 was submitted to the Department in 2014 and was followed by a pre-design investigation (PDI) workplan in 2015. The attached correspondence summarizes the details of the presentation made by ExxonMobil at the Department's office on June 18, 2019.

As the listed Licensed Site Remediation Professional (LSRP) for the BRC, I have reviewed the attached document and I find the responses to be consistent with the discussion on June 18, 2019. It is my understanding that ExxonMobil will be submitting both a Technical Impracticability and Pilot Study report soon in support of the RFSR. Upon submittal, it is my hope that the Department can provide an expedited review and approval of the proposed remedy. Upon approval, a Remedial Action Workplan will be prepared and submitted to the Department.

Please contact me at (609) 249-2699 should you have any questions.

Best regards,

Michael Renzulli - LSRP

Michael Renzulli

Michael J. Renzulli, P.G., LSRP

Enclosure

Cc: M. Forlenza – ExxonMobil Environmental and Property Solutions Company
P. Lucuski - Kleinfelder

ExxonMobil Environmental
and Property Solutions Company
Park & Brunswick Avenue
Building 7 – Site Remediation
Linden, New Jersey 07036
703.963.7132 Telephone

Maureen P. Forlenza
Bayway Team Lead Project Manager

ExxonMobil

Date: August 14, 2019

Mr. Mike Renzulli, PG, LSRP
Michael Renzulli - LSRP
71 Potts Road
Robbinsville, New Jersey 08691

Re: Bayway Refinery Complex Site Remediation:
Response to NJDEP's Comments
***Revised Feasibility Study Report* letter dated April 30, 2019**
Investigative Area of Concern A18 (Pitch)

SRP PI# 008282

Dear Mr. Renzulli:

Please find the attached correspondence providing responses to the New Jersey Department of Environmental Protection's comments to the August 30, 2018 Revised Feasibility Study Report (RFSR) prepared for Investigative Area of Concern (IAOC) A18 (Pitch). This response letter has been prepared on behalf of ExxonMobil Environmental and Property Solutions Company by Kleinfelder.

The correspondence is consistent with the details presented to NJDEP during the June 18, 2019 project status meeting that was held at the NJDEP's offices in Trenton, NJ.

Based on the NJDEP's e-mail correspondence dated August 14, 2019, the next steps will be to prepare a Pilot Study Completion Report and Technical Impracticability Report to support the RFSR. We will request a meeting with NJDEP to summarize the project details to the Technical Impracticability Report's reviewers and request an expedited review and approval of the proposed remedy to keep the project progressing forward. Upon approval of the RFSR, a Remedial Action Work Plan will be prepared and submitted to NJDEP.

Please contact me at (703) 963-7132 if you have any questions.

Sincerely,

Maureen Forlenza
Bayway Team Lead Project Manager

MPF/Enclosure

cc: B. Conetta – USEPA
D. LaMond – Phillips 66 (electronically)
R. Snyder – GHD (electronically)

August 14, 2019

Ms. Maureen Forlenza
Bayway Team Lead Project Manager
1900 East Linden Avenue
Building 28A
Linden, New Jersey 07036

Re: Response to NJDEP's Comments
***Revised Feasibility Study Report* letter dated April 30, 2019**

Bayway Refinery Complex
Park Avenue and Brunswick Avenue
Block 520, Lot 6
City of Linden, Union County, New Jersey
NJDEP SRP Program Interest (PI) No.: 008282
NJDEP DLUR File No.: 2009-04-0001.1 FWW 150001 FWW 140001

Dear Ms. Forlenza:

ExxonMobil Environmental and Property Solutions Company (ExxonMobil) received the above-referenced letter on April 30, 2019 via electronic mail. On June 18, 2019, a meeting between representatives of ExxonMobil, Phillips 66 (P66), the Licensed Site Remediation Professional (LSRP), Preferred Design Consultant – Arcadis (PDC), Kleinfelder, Inc. (Kleinfelder) and the New Jersey Department of Environmental Protection (NJDEP) Site Remediation Program (SRP) and Bureau of Environmental Evaluation and Risk Assessment (BEERA) was held to review the NJDEP's comments on the *Revised Feasibility Study Repor*t (RFSR) for Investigative Area of Concern (IAOC) A18 (Pitch Area) at the Bayway Refinery Complex (BRC) in Linden, New Jersey.

A summary of the meeting was submitted to the NJDEP on July 25, 2019.

Below is a response to each of the comments in the NJDEP's April 30, 2019 letter.

<u>NJDEP's Comments on the RFSR and Responses</u>

- **NJDEP Comment # 1** – *Section 4.3 Recommended Remedial Alternative of IAOC A18 states, '…perimeter sheet pile wall installation and impermeable cap installation is the recommended alternative for IAOC A18'. This alternative is not protective of the environment, leaving behind extremely elevated levels of contaminants on the site, eliminating the resource and violating the "no net fill" policy.*

    - **Response** - The proposed remedial action is protective of the environment, using a containment approach as implemented at other IAOCs at the BRC in accordance with the NJDEP-approved *Remediation Strategy Road Map* (Kleinfelder, 2018). The feasibility of enhancing the resource to improve the function and value of the wetland (which is largely devoid of vegetation) is being evaluated through an on-going pilot study. The NJDEP Division of Land Use Regulation (DLUR) indicated during a permit pre-application meeting on January 24, 2018 that a net fill of the

Mudflat Area could be considered through the application for a hardship exception. A copy of the meeting minutes from the January 24, 2018 permit meeting were provided to NJDEP SRP in the July 25, 2019 correspondence.

As indicated above, the mudflat is largely devoid of vegetation, with the exception being those areas with a higher surface elevation. As a result, it is believed that the surface elevation of the mudflat is a controlling factor in establishing and sustaining vegetative growth on the mudflat. As a result, a key component of the pilot study is to establish the optimal elevation required for wetland vegetative growth. Because the subsurface materials in IAOC A18 are highly compressible, the addition of fill material will result in an elevation change, which is anticipated to be less than the thickness of the fill material placed. The potential consolidation of the existing subsurface and fill materials was modeled during the pre-design investigation (PDI) activities and is currently being measured and evaluated as part of the ongoing pilot study. Another objective of the study is to determine the least amount of fill material required to obtain the optimal elevation to sustain vegetative growth.

Lastly, floodway modeling of the Poly Ditch and Morses Creek is also ongoing to understand the potential flood impacts related to the placement of fill material and changes to the surface elevation of the Mudflat Area.

- **NJDEP Comment # 2** – *The recommended remedial alternative of perimeter sheet pile wall installation and impermeable cap installation will cover several acres of wetlands and transition areas. The only proposed remedy for this loss of wetlands is to perform a wetland vegetation pilot study. Contingency plans, such as wetlands creation and/or wetlands banking should be included in this report or an addendum to account for the possibility of failure of the pilot studies.*

    - **Response** – As noted above, the wetland vegetation pilot study is intended to address data gaps for enhancing the Mudflat Area as a vegetated wetland. The wetland vegetation pilot study itself is not the proposed remedy for potential loss of wetlands. The preferred course of action for IAOC A18 is to enhance the function and value of the existing wetland, or to replace it in-kind as part of the remedial action. If necessary, wetland creation at an alternative location and/or wetland banking would be included in a Remedial Action Workplan (which is scheduled to be submitted in the second half of 2020) if the results of the pilot study indicate that enhancement of the Mudflat Area as a vegetated wetland is not viable or a NJDEP DLUR hardship exception for placement of fill material within the floodway cannot be obtained.

      The elevation required to support wetland vegetation is currently being evaluated as part of the ongoing pilot study, and the intent of the proposed remedial action is not to convert areas that are currently classified as wetlands to upland areas. Rather (as noted above), the majority of the mudflat is currently devoid of vegetation. Therefore, the intent of placing any fill materials over the mudflat would be to improve or enhance the function of the mudflat as a wetland resource. Finally, remedial actions that may result in changes to areas currently classified as wetlands are subject to the review and approval of the NJDEP DLUR Mitigation Unit prior to implementation.

- **NJDEP Comment # 3** – *Please submit all the previous data for the site. The figures submitted only displayed 2015 through 2016 data. Please revise the figures to display all sampling data collected on this IAOC*.

    - **Response** – Historical site data has been submitted to the NJDEP in previous reports, including the *Feasibility Study Report for the Pitch Area: Investigative Area of Concern – IAOC A18* [FSR, (TRC, 2014)]. Historical data will be presented in the forthcoming Remedial Action Workplan, along with data collected during PDI and Pilot Program activities.

- **NJDEP Comment # 4** – *No cost analysis has been submitted for any of the alternatives. Please include a cost analysis for each alternative.*

    - **Response** – A cost estimate will be included in the Remedial Action Workplan.

- **NJDEP Comment # 5** – *Section 1.1 Purpose and Scope, second paragraph states, "The portion of IAOC A18 east of the Poly Ditch is constrained by the Poly Ditch, Morses Creek, the Salt Water Line and Boat Lines. This area was not investigated previously, as it was thought to not be impacted due to:*

        - *The presence of the Poly Ditch prior to 1940 (as shown in historical aerial photographs); and*
        - *Construction of the pipelines and initiation of disposal practices of the Pitch Material in the 1940s (Geraghty & Miller, 1993)."*

    The Poly Ditch is part of a different IAOC and needs to be investigated with the rest of the Environmentally Sensitive Natural Resources (ENSRs) in its assigned IAOC. The statements above do not provide sufficient information indicating the Poly Ditch has not been impacted by the site's operations. Investigating this area is the only way to reduce uncertainty. This statement will need to be redacted or eliminated from the report, because it is not part of this IAOC.

    - **Response** – The statement above from Section 1.1 of the RFSR pertains to the peninsula area to the east of the Poly Ditch, which is included in IAOC A18, but not the Poly Ditch itself which flows through IAOC A18. The area to the east of the Poly Ditch was first investigated during the PDI activities (2015 through 2016). Data from these investigation activities was presented in the RFSR. Additional investigation of the area to the east of the Poly Ditch was conducted during the Pilot Program (2018 through 2019). Details of the investigation of this area conducted during the Pilot Program will be included in the Remedial Action Workplan. The Poly Ditch is included as part of the final Consent Judgment and the remedy for the Poly Ditch will be implemented with the rest of the ENSRs in its assigned IAOC.

- **NJDEP Comment # 6** – *For the human exposure and wetlands transition areas, the Department acknowledges that multiple infrastructure appurtenances will impede the remediation of EPH free product and residual product at some locations. However, for those areas that are not impeded by infrastructure appurtenances, further evaluation is necessary to treat or remove EPH free product and residual product pursuant to N.J.A.C. 7:26E-5.1(e). Containment such as capping and perimeter containment should be considered only where removal or treatment are not practicable. The Department recommends that ExxonMobil consider removal and treatment options where removal and treatment are practicable, and that ExxonMobil differentiate these areas from the areas impeded by infrastructure appurtenances.*

    - **Response** – ExxonMobil has considered removal and treatment options as presented in the July 2014 FSR. Additionally, the August 2018 RFSR proposed potential limited excavation and offsite disposal of pitch material and/or Mudflat Area soils as required to:

        - Accommodate grading and installation of impermeable capping materials;
        - Remove Pitch material that is contacting the salt water line (SWL) to allow installation of impermeable capping materials under the SWL; and
        - Maintain required post-construction grades to support the growth of wetland vegetation planted in clean fill materials placed over the impermeable cap.

        The removal areas are identified on figures included in the RFSR. Final areas where removal of pitch material and mudflat area soils is proposed will be presented in the Remedial Action Workplan.

- **NJDEP Comment # 7** – *ExxonMobil should develop a comprehensive map of historical total petroleum hydrocarbon (TPH) and extractable petroleum hydrocarbon (EPH) soil and sediment data for IAOC A18 including the vertical extents of TPH greater than 10,000 milligrams per kilogram (mg/kg) and EPH greater than 17,000 mg/kg. ExxonMobil should include information from the geotechnical soil boring logs (Appendix F) because the logs identify the presence of pitch, and from the descriptions in the boring logs of Appendix B (e.g., "residual oil" at a depth of 11 to 12 feet in ASB-861, "PITCH MATERIAL" in GMW-686, etc.). The locations of Historical LNAPL locations (Figure 7) should also be included and identified on the comprehensive TPH/EPH map. The infrastructure appurtenances and sized are not identical on all figures (e.g. Figure 5D versus Figure 12). ExxonMobil should include all infrastructure appurtenances and standardize the horizontal dimensions to be consistent between maps, especially maps where remediation evaluations are included.*

    - **Response** - A comprehensive TPH/EPH map and geotechnical soil boring logs details will be included in the Remedial Action Workplan. Future regulatory submittals will also include figures that use standardized horizontal dimensions for various site features.

- **NJDEP Comment # 8** - *The Department specifies that 30,000 mg/kg is the ceiling concentration for Capping activities for soil (maximum ceiling number in the EPH calculator, when using the grain size). The elevated levels above 30,000 mg/kg EPH shall be removed to comply with N.J.A.C. 7:26E-5.1(e). The removal of high concentration[s] of free product was not evaluated in the report. If it is not practicable, a technical impracticability report shall be submitted as indicated in the Protocol for Addressing Extractable Petroleum Hydrocarbon guidance document.*

    - **Response** - As shown on figures included in the FSR and RFSR, EPH concentrations exceed 30,000 mg/kg throughout the Former Pitch Disposal Area, Mudflat Area and peninsula area east of the Poly Ditch in IAOC A18. The NDDEP has approved the implementation of similar containment remedial actions to address separate phase material at other IAOCs at the BRC, consistent with the NJDEP-approved *Remediation Strategy Road Map* (Kleinfelder, 2018), as those remedial actions were protective of potential receptors and the environment.

      Moreover, it is not practicable to remove all soil with EPH concentrations above 30,000 mg/kg in IAOC A18 due to multiple constructability factors including the following:

      - Extensive active refinery infrastructure

        <u>SWL</u> – The SWL is a 60-inch diameter bell-and-spigot cast iron pipeline that was constructed in approximately 1955. The SWL is supported on timber piles, some of which have been reinforced with concrete pile caps. The SWL is located in the northern portion of IAOC A18 and extends from east to west through the Former Pitch Disposal Area, the Mudflat Area and the peninsula east of the Poly Ditch. Personnel can access the area to the south of the SWL via a scaffold that crosses over the line. Motorized equipment cannot access the area to the south of the SWL from the north. During the pilot study, lightweight motorized equipment accessed the area to the south of the SWL via a barge in Morses Creek. On the peninsula east of the Poly Ditch, personnel can access the area to the north of the SWL via elevated walkways constructed over the intra-refinery pipelines at the northern boundary of IAOC A18. Personnel must access the area on the peninsula east of the Poly Ditch south of the SWL via a boat launched from the eastern side of Morses Creek adjacent to the New Jersey Turnpike.

        In addition to the accessibility challenges presented by the SWL, ground-intrusive work in the vicinity of the SWL is limited by several factors.

        - Based on modeling performed by Kleinfelder, an unsupported 8-foot deep excavation (which is the maximum estimate depth of the pitch material) is not feasible near the SWL due to potential slope instability. The wooden piles are sensitive to lateral displacement and displacements as small as 1 inch could result in overstressing of the piles and potential failure of the SWL.

        - Construction activities such as sheet pile installation or

operation of construction equipment near the SWL can generate vibration which can potentially affect the timber piles. Vibration monitoring has been conducted via seismographs installed along the alignment of the SWL throughout Pilot Program activities. Thresholds specified in the SWL Monitoring Plan for the Pilot Program have not been exceeded during construction activities. However, seismic monitoring will be required during any future construction activities near the SWL and any vibrations in excess of the thresholds could jeopardize the integrity of the pipeline and would require work to be stopped and/or additional controls implemented.

- P66 has previously required a 40-foot buffer centered on the SWL (20 feet on either side of the SWL). Excavation activities are prohibited within this buffer area.

- The SWL is a critical piece of refinery infrastructure and operations. A breach in this line would not only disrupt refinery operations but would also likely result in loss of life for any workers in this area.

Crude Oil Boat Lines – Two 30-inch diameter and two 24-inch diameter steel pipelines traverse the mudflat area and peninsula east of the Poly Ditch from the northeast to southwest. These pipelines transfer crude oil between the Waterfront Area to the east of IAOC A18 and the Tremley Tank Field which is located to the southwest of IAOC A18. The Crude Oil Boat Lines are supported on timber piles and are elevated approximately 3 to 5 feet above ground surface. Personnel can access the area to the southeast of the Crude Oil Boat Lines by crossing the scaffold over the SWL and walking under the Crude Oil Boat Lines. Motorized equipment cannot access the area to the southeast of the Crude Oil Boat Lines from the northeast. During the pilot study, lightweight motorized equipment accessed the area to the southeast of the Crude Oil Boat Lines via a barge in Morses Creek. Access to the peninsula east of the Poly Ditch is as described above in the SWL section.

Like the SWL, P66 has required a 40-foot buffer centered on the Crude Oil Boat Lines (20 feet on either side of the center line of the Crude Oil Boat Lines). Excavation activities are prohibited within this buffer area.

To date, vibration monitoring has not been conducted on the Crude Oil Boat Lines because vibration-generating construction activities have not been conducted in proximity to these lines. However, baseline vibration monitoring and monitoring during construction activities will be conducted at a later date. Similar to the SWL, the Crude Oil Boat Lines are critical refinery infrastructure. A breach in the lines would result in a disruption to refinery operations, a release to the environment and potential injury or loss of life for workers in this area.

Intra-refinery pipelines – The intra-refinery pipelines are located on metal pipe racks extending northwest to southeast at the northern boundary of IAOC A18, adjacent to the butane/propane caverns area (IAOC A17). These active pipelines carry various liquids and gases throughout the production units in the BRC. Pitch material has been observed beneath the intra-refinery pipelines and within the rectangular area located between these pipelines. Access to this rectangular area is restricted by the pipelines. Personnel can access this area via elevated walkways from the butane/propane caverns area (IAOC A17) to the north, but motorized equipment cannot access this area.

Like the SWL and Crude Oil Boat Lines, P66 has required a 40-foot buffer centered on the intra-refinery pipelines (20 feet on either side). Excavation activities are prohibited within this buffer area.

To date, vibration monitoring has not been conducted on the intra-refinery pipelines because vibration-generating construction activities have not been conducted in proximity to these lines. Baseline vibration monitoring and monitoring during construction activities will be conducted at a later date. As with the other pipelines in this IAOC, the intra-refinery pipelines are a key piece of refinery infrastructure. A breach in the lines would potentially result in a disruption to refinery operations, a release to the environment and potentially injury or loss of life for workers in this area.

- Site conditions

Surface Water Bodies – There are two significant surface water bodies adjacent to or within IAOC A18 – Morses Creek and the Poly Ditch. Morses Creek forms the southwestern, southern and southeastern boundaries of IAOC A18. The Poly Ditch, which is an operational ditch used by the BRC to discharge non-contact cooling water, flows from northwest to southeast and enters Morses Creek at the eastern side of IAOC A18. The Poly Ditch transects IAOC A18 and restricts access to the peninsula at the eastern side of the IAOC.

Morses Creek is a tidal water body from No. 1 Dam to the confluence with the Arthur Kill. No. 1 Dam is the head of tide for the BRC. Upstream of No. 1 Dam including adjacent to IAOC A18, Morses Creek and the Poly Ditch are tidally influenced, but are not considered tidal water bodies. Specifically, as the tidal elevation rises, surface water discharge from Morses Creek at No. 1 Dam is restricted, which in turn influences the surface water elevation of Morses Creek and the Poly Ditch. Surface water inundates the Mudflat Area at depths up to 16 inches twice a day during half of the lunar cycle. The approximate high-water line and photographs of the Mudflat Area during periods of surface water inundation were shown during the June 18, 2019 meeting. Such periodic inundation would present several safety, logistical and constructability challenges associated significant excavation of pitch material and/or Mudflat Area soils.

Accessibility – Portions of the Former Pitch Disposal Area and Mudflat Area north of the SWL are currently accessible to equipment such as drill rigs

and excavators via the temporary access road that has been constructed for the ongoing Pilot Program activities. Prior to construction of this road, there was limited means of accessing these areas with motorized equipment due to the soft surface and highly compressible subsurface materials. Limited equipment operations have been conducted in the Mudflat Area south of the SWL as access to this area must be obtained via a barge in Morses Creek.

Surface/Subsurface Conditions – Both the Former Pitch Disposal Area and Mudflat Area are underlain by a meadow mat layer which is highly compressible and unable to support most motorized equipment. The pitch material is a relatively soft asphalt-like material that becomes softer during the warmer months of the year. Pitch material is less compressible than the meadow mat layer and is generally displaced outward rather than compressing when a load is applied to the surface. Additionally, Mudflat Area soils are soft and have typically been unable to support motorized equipment without structural support elements such as swamp mats, even during periods of the lunar cycle when the Mudflat surface is not inundated with surface water. Based on equipment trials during the Pilot Program, the largest equipment that can be supported on the Mudflat Area with swamp mats is approximately 6,000 to 8,000 pounds.

The above details illustrate the impracticability of selecting a remedial approach that includes the *"removal of high concentration of free product".* These factors were considered when completing the remedial alternatives evaluation and remedial selection.

- **NJDEP Comment # 9** - *Please provide a full vertical and horizontal delineation of the pitch material where EPH elevations are greater than 30,000 mg/kg.*
    - **Response** - See response to NJDEP Comment #7.
- **NJDEP Comment # 10** - *Section 3.1.4 Potential Vapor Generation Evaluation discusses an evaluation of background VOC concentrations in the former Pitch Area. An air sample was taken in December 2015 and total VOCs and benzene were detected; these results were considered representative of background conditions in the Pitch Area. A more current air sample should be collected to appropriately represent background conditions under current conditions.*

  It is proposed to use the results of the potential vapor generation evaluation along with exposure limits set by OSHA to develop vapor mitigation levels for future intrusive activities. However, many of OSHA PELs are outdated and inadequate for ensuring protection of worker health because most of OSHA's PELs were issued shortly after adoption of the Occupational Safety and Health Act in 1970 and have not been updated since that time. OSHA recommends that employers consider using alternative occupational exposure limits because the Agency believes that exposures above some of these alternative occupational exposure limits may be hazardous to workers, even when the exposure limits are in compliance with the relevant PELs. It may be more appropriate to use NJDEP Vapor Intrusion Screening Levels to develop mitigation levels. The development of these mitigation levels should be discussed jointly with USEPA and the Department.

- **Response** - Appropriate worker safety action levels that meet the applicable regulations and company standards will be included in the site-specific Health and Safety Plan.

Based on the e-mail correspondence received from the NJDEP on August 14, 2019, the next steps will be to prepare a Pilot Program Completion Report and Technical Impracticability Report. We will review and provide a schedule for delivery of these reports. Before submitting the Technical Impracticability Report, we will request a meeting with the NJDEP's reviewers to provide background and a project status update. Additionally, we will request an expedited review and approval of the proposed remedy in order to continue to progress the project.

If you have any additional questions, please contact Michael Meyerhoefer of Kleinfelder at mmeyerhoefer@kleinfelder.com or 631-671-7597.

Sincerely,
Kleinfelder, Inc.

David C. Hutnick
Environmental Scientist

Michael Meyerhoefer
Senior Project Manager

Electronic Copy:

John Groneck, ExxonMobil
Michael Renzulli, LSRP
Deborah LaMond, P66
Corey Averill, Arcadis
Justin Moses, Kleinfelder
Project File

APPENDIX B

Boring Logs

DAN RAVIV ASSOCIATES, INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-211
WELL PERMIT NUMBER

PROJECT NAME: ExxonMobil-Pitch Area
LOCATION: Linden, New Jersey
PROJECT NO.: 2141D
CONTRACTOR: CT&E

SAMPLER TYPE/DIA.: N/A
DEPTH TO BEDROCK: N/A
TOTAL DEPTH DRILLED: 8'
TYPE OF WELL: Monitoring
DRILLING METHOD: Solid Stem Auger
BIT TYPE: N/A

START DATE: 11/26/2002
FINISH DATE: 11/26/2002
DRILLER: Dave Marshall
LOGGED BY: Jason Foplano

DEPTH FROM SURFACE (FEET)	DRILLING RATE (MIN/5 feet)		PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							2' Stickup from ground surface with screw cap
1							
2							
3							
4							
5							
6							
7							
8							
9							Bottom of Boring and Well at 8'
10							
11							Well Construction Details
12							0 to 3': 2" diameter PVC casing
							3 to 8': 2" diameter 20-slot PVC screen
							0 to 1.5': bentonite
							1.5 to 8': No. 1 sand pack

CASING TYPE/DIAMETER (IN.)
INNER: PVC/2" OUTER: –

STATIC WATER LEVEL: 4.3 (11/27/02) feet below surface
DEPTH WATER ENCOUNTERED: – feet below surface

SCREENED OR OPEN INTERVAL: 3-8
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: – feet above mean sea level
GROUND SURFACE ELEVATION: – feet above mean sea level

DAN RAVIV ASSOCIATES, INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER

GMW-212

WELL PERMIT NUMBER

PROJECT NAME: ExxonMobil-Pitch Area

LOCATION: Linden, New Jersey

PROJECT NO.: 2141D

CONTRACTOR: CT&E

SAMPLER TYPE/DIA.: N/A

DEPTH TO BEDROCK: N/A

TOTAL DEPTH DRILLED: 12'

TYPE OF WELL: Monitoring

DRILLING METHOD: Solid Stem Auger

BIT TYPE: N/A

START DATE: 11/26/2002

FINISH DATE: 11/26/2002

DRILLER: Dave Marshall

LOGGED BY: Jason Fopiano

DEPTH FROM SURFACE (FEET)	DRILLING RATE (MIN/5 feet)		PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							2.5' Stickup from ground surface with screw cap
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							Bottom of Well at 9.5'
11							
12							End of Boring at 12'

Well Construction Details

0 to 4.5': 2" diameter PVC casing

4.5 to 9.5': 2" diameter 20-slot PVC screen

0 to 1.5': bentonite

1.5 to 9.5': No. 1 sand pack

CASING TYPE/DIAMETER (IN.)

INNER: PVC/2" OUTER: –

STATIC WATER LEVEL: 0.6 (11/27/02) feet below surface

DEPTH WATER ENCOUNTERED: – feet below surface

SCREENED OR OPEN INTERVAL: 4.5-9.5 (FEET BELOW SURFACE)

MEASURING POINT ELEVATION: – feet above mean sea level

GROUND SURFACE ELEVATION: – feet above mean sea level

DAN RAVIV ASSOCIATES, INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6008

WELL LOG

WELL NUMBER

GMW-213

WELL PERMIT NUMBER

PROJECT NAME: ExxonMobil-Pitch Area

LOCATION: Linden, New Jersey

PROJECT NO.: 2141D

CONTRACTOR: CT&E

START DATE: 11/26/2002

FINISH DATE: 11/26/2002

DRILLER: Dave Marshall

LOGGED BY: Jason Fopiano

SAMPLER TYPE/DIA.: N/A

DEPTH TO BEDROCK: N/A

TOTAL DEPTH DRILLED: 12'

TYPE OF WELL: Monitoring

DRILLING METHOD: Solid Stem Auger

BIT TYPE: N/A

DEPTH FROM SURFACE (FEET)	DRILLING RATE (MIN/5 feet)		PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							2' Stickup from ground surface with screw cap
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							Bottom of Well at 10'
12							
							End of Boring at 12'

Well Construction Details

0 to 5': 2" diameter PVC casing

5 to 10': 2" diameter 20-slot PVC screen

0 to 2': bentonite

2 to 10': No. 1 sand pack

CASING TYPE/DIAMETER (IN.)

INNER: PVC/2" OUTER: –

STATIC WATER LEVEL: 2.7 (11/27/02) feet below surface

DEPTH WATER ENCOUNTERED: – feet below surface

SCREENED OR OPEN INTERVAL: 5-10 (FEET BELOW SURFACE)

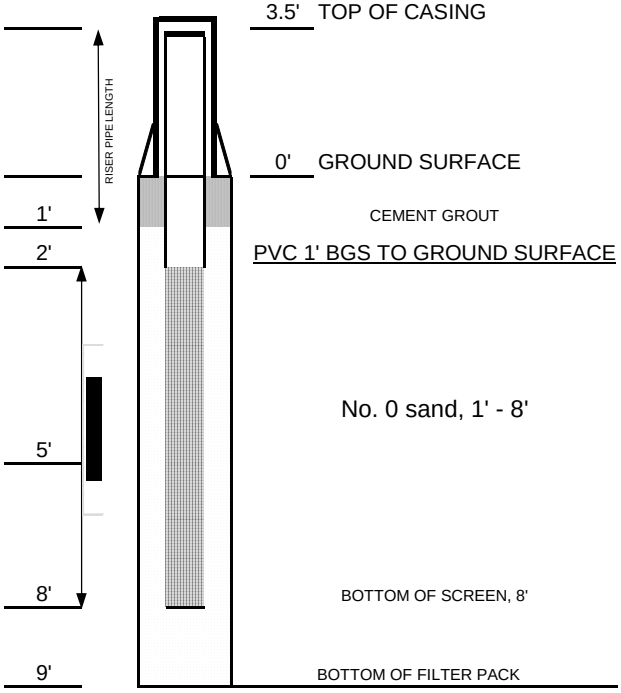
MEASURING POINT ELEVATION: – feet above mean sea level

GROUND SURFACE ELEVATION: – feet above mean sea level

WELL CONSTRUCTION DIAGRAM (ABOVE-GRADE)

PROJ. NAME: Pitch FS GMW-211R		WELL ID:	**GMW-211R**
PROJ. NO: 212836.00	DATE INSTALLED: 3/26/2014 INSTALLED BY: SGS		CHECKED BY:

ELEVATION (BENCHMARK: USGS)	DEPTH /HEIGHT RELATIVE TO GROUND SURFACE (FEET)



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 4-INCH STAINLESS STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: _____

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 4 IN. FROM 9 TO 0 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: 2 IN. FROM 8 TO 0 FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: BAIL

TIME DEVELOPING: 0.25 HOURS

WATER REMOVED: <5 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: Slightly cloudy

COLOR BEFORE: Gray

CLARITY AFTER: Slightly cloudy- clear

COLOR AFTER: Clearish gray

ODOR (IF PRESENT): Pitch area odor

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	8.00	T/PVC		
DTB AFTER DEVELOPING:	8.00	T/PVC		
SWL BEFORE DEVELOPING:	5.20	T/PVC		
SWL AFTER DEVELOPING:	7.80	T/PVC		
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 2402

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-647
WELL PERMIT NUMBER
E201206851

PROJECT NAME: Eco RI
PROJECT NO.: 200097
LOCATION: Bayway Refinery, Linden, New Jersey
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

START DATE: 06/19/13
FINISH DATE: 06/19/13
DRILLER: D. Dugan
LOGGED BY: Z. Oliver

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 3' bgs
2				No Samples Collected			0 to 8' - Black and brown SAND, some silt and clay
4							
6							
8							End of boring at 8'

Well Construction Details
0 to 3 ft. below surface - 2" diameter PVC riser
3 to 8 ft. below surface - 2" diameter 0.01 slot PVC screen
0 to 8 ft. below surface - No. 00 Sand

CASING TYPE/DIAMETER (IN.)
INNER: 4 OUTER: NA

STATIC WATER LEVEL: 2.31 (07/12/13) feet below surface
DEPTH WATER ENCOUNTERED: 6.83 feet below surface

SCREENED OR OPEN INTERVAL: 3 - 8
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 6.14 ft., msl
GROUND SURFACE ELEVATION: 3.90 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-648
WELL PERMIT NUMBER
E201206852

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

START DATE: 06/19/13
FINISH DATE: 06/19/13
DRILLER: D. Dugan
LOGGED BY: Z. Oliver

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 5' bgs
2, 4, 6, 8, 10				No Samples Collected			0 to 10' - Black and brown SILT, some clay and sand
							End of boring at 10' Well Construction Details 0 to 5 ft. below surface - 2" diameter PVC riser 5 to 10 ft. below surface - 2" diameter 0.01 slot PVC screen 0 to 10 ft. below surface - No. 00 Sand

CASING TYPE/DIAMETER (IN.)
INNER: 2 OUTER: 6

STATIC WATER LEVEL: 2.40 (08/01/12) feet below surface
DEPTH WATER ENCOUNTERED: 9.13 feet below surface

SCREENED OR OPEN INTERVAL: 5 - 10
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 6.50 ft., msl
GROUND SURFACE ELEVATION: 3.80 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

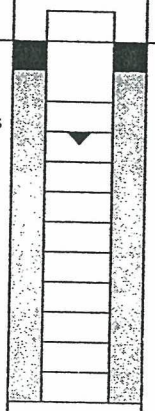
WELL NUMBER
GMW-649
WELL PERMIT NUMBER
E201206853

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: Not Encountered
TOTAL DEPTH DRILLED: 12 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

START DATE: 11/01/13
FINISH DATE: 11/01/13
DRILLER: William Petley
LOGGED BY: M. Bastidas

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 3' bgs
2				No Samples Collected			0 to 1' - Dark brown SILT, some medium to fine sand 1 to 9' - Impacted PEAT
4							
6							
8							
10							9 to 12' - Dark grey SILT, some clay
12							
							End of boring at 12'



Well Construction Details
0 to 2 ft. below surface - 2" diameter PVC riser
2 to 12 ft. below surface - 2" diameter 0.01 slot PVC screen
1 to 12 ft. below surface - No. 1 Sand
0 to 1 ft. below surface - cement grout

CASING TYPE/DIAMETER (IN.)
INNER: 2 OUTER: 6

STATIC WATER LEVEL: 0.36 (12/10/13) feet below surface
DEPTH WATER ENCOUNTERED: 1.50 feet below surface

SCREENED OR OPEN INTERVAL: 2 - 12
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 6.96 ft., msl
GROUND SURFACE ELEVATION: 4.00 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-650
WELL PERMIT NUMBER
E201206854

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

START DATE: **10/29/13**
FINISH DATE: **10/29/13**
DRILLER: **William Petley**
LOGGED BY: **M. Bastidas**

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: Not Encountered
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 3' bgs
			9.6				0 to 5' - Dark brown SILT, some medium to fine sand, layer of product
2			ND				
			ND	No Samples Collected			
4			ND				
			40.5				
6			ND				5 to 10' - Impacted PEAT
			ND				
8			ND				
			ND				
10			ND				10 ft. Dark grey SILT with some clay
							End of boring at 12'

Well Construction Details
0 to 5 ft. below surface - 2" diameter PVC riser
5 to 10 ft. below surface - 2" diameter 0.01 slot PVC screen
4 to 10 ft. below surface - No. 1 Sand
3 to 4 ft. below surface - cement grout

CASING TYPE/DIAMETER (IN.)
INNER: 2 OUTER: 6

STATIC WATER LEVEL: 6.05 (12/12/13) feet below surface
DEPTH WATER ENCOUNTERED: 1.50 feet below surface

SCREENED OR OPEN INTERVAL: 5 - 10
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 9.32 ft., msl
GROUND SURFACE ELEVATION: 6.70 ft., msl

Date Begin - End:	9/16/2016 - 10/06/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton/V. Golston	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT
Plunge:	-90 degrees	**Drilling Method:**	Air Knife/Vac/Direct Push
Weather:	70° Cloudy	**Borehole Diameter:**	3.5 in. O.D.

BORING LOG ASB-858

FIELD EXPLORATION

Surface Condition: Gravel Fill

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	FID (ppmv)	Graphical Log	Lithologic Description
								GRAVEL FILL
								TILL FILL: red brown
								QP STONE
	Air Knife/Air Vac				3.5			**Clayey SILT (MH)**: brown, odor, cobbles
5				46"	2.5			**Silty SAND (SM)**: strong brown, odor, moist
					8.6			
					20.6			
					34.4			**Clayey SILT (MH)**: strong brown green mottling
			ASB-858_ (7.0-7.5)		36.3			
					1.2			
					3.6			
					4.2			
					3.6			
					4.0			**Sandy SILT (ML)**: weak red, trace rock fragments
10	Geo-Probe/Direct Push			51"	8.1			**SAND with Silt (SW)**: olive gray, moist
					25.8			
			ASB-858_ (11.0-11.5)		68.8			**Clayey SILT with Gravel (MH)**: red brown
					9.2			
					5.5			
					5.2			
					4.1			
					3.2			
					1.1			
					0.1			
15				30"	1.0			**Sandy SILT (ML)**: red brown, moist, trace gravel
					6.6			
					4.8			
					2.2			
			ASB-858_ (17.0-17.5)		12.7			
					4.1			

The borehole was terminated at approximately 17.5 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.
The boring was backfilled with auger cuttings on October 06, 2016.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

BORING LOG ASB-858

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

BORING LOG ASB-859

Date Begin - End:	9/28/2016 - 10/06/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton/V. Golston	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT
Plunge:	-90 degrees	**Drilling Method:**	Air Knife/Vac/Direct Push
Weather:	70° Cloudy	**Borehole Diameter:**	3.5 in. O.D.

FIELD EXPLORATION

Surface Condition: Gravel Fill

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	FID (ppmv)	Graphical Log	Lithologic Description
								GRAVEL FILL
	Air Knife/Air Vac							**Clayey SILT (MH)**: red brown, cobbles
								bricks
								SILT (ML): brown, odor, gravel, cobbles
5								wood debris
▽					57			black tar-like material at 5'8"
								GLACIAL TILL: red brown, moist
	Geo-Probe/Direct Push			60"				**Clayey SILT (MH)**: dark brown, odor, moist, trace gravel
					1.0			
					1.7			
			ASB-859_ (9.5-10.0)		8.5			
10					3.6			
					6.2			
					5.4			
					2.4			**GLACIAL TILL**: red brown, (red brown clay)
					1.8			
					2.9			**SAND with Silt (SW)**: fine-grained, red brown
				46"	0.0			
					0.3			
					0.0			
					0.0			
15					0.0			
					0.0			
					0.0			
					0.0			**Weathered SHALE**: red brown
					0.2			
			ASB-859_ (17.5-18.0)		0.0			

The borehole was terminated at approximately 18 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 6 ft. below ground surface during drilling.
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.
The boring was backfilled with auger cuttings on October 06, 2016.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

BORING LOG ASB-859

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/05/2016 - 10/17/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617	**MONITORING WELL LOG ASB-860/GMW-692**
Logged By:	V. Golston	**Drill Crew:**	J. Lewis	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger	
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger	
Weather:	70° Sunny	**Borehole Diameter:**	8 in. O.D.	

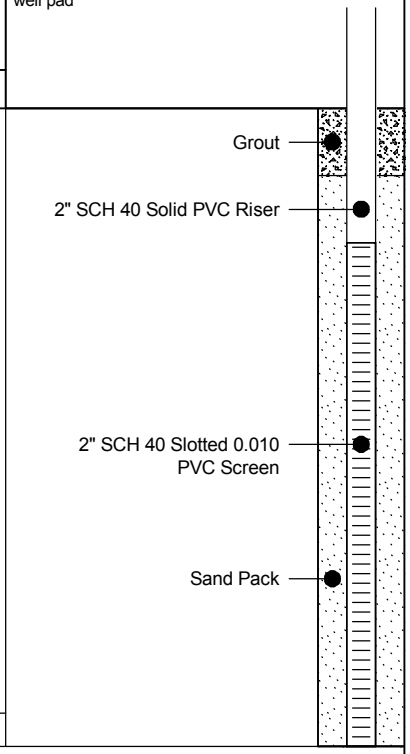
FIELD EXPLORATION

Surface Condition: Black Silt

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
	Hand Auger						**SILT (ML)**: coarse-grained, black, odor
					142		saturated, oil/tar
					168		black cinders, sheen
			ASB-860_ (3.0-3.5)		239		
					121		trace coarse sand, little organic material (plant roots), black cinders
5					64.7		
			ASB-860_ (6.0-6.5)		67.2		
							black oil covered silt and woven plant root material (hair-like)
					14.5		
							black oil covered silt, black cinders and meadow mat, tightly woven plant root material
			ASB-860_ (9.0-9.5)		17.7		
					4.9		**Clayey SILT (MH)**: red brown, with organic material (thick plant roots)
10							
15							

MONITORING WELL CONSTRUCTION

Completion Method:
Locking Stand Pipe - 2'9" feet above grade, 2x2 well pad



The borehole was terminated at approximately 9.5 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 1 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 1 ft. below ground surface after drilling completion.

GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.

KLEINFELDER
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PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

MONITORING WELL LOG
ASB-860/GMW-692
PERMIT NO.: E201612281

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
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gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/05/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	70° Sunny	**Borehole Diameter:**	4 in. O.D.

BORING LOG ASB-861

FIELD EXPLORATION

Surface Condition: Black Silt

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	FID (ppmv)	Graphical Log	Lithologic Description
								SILT (ML): black
								Silty CLAY (CL): black
					68.2			**SILT (ML)**: black, odor, saturated, organic material (thin roots)
					52			
			ASB-861_ (2.5-3.0)		60			**Clayey SILT (MH)**: black, odor, saturated, organic material (medium roots)
					64			
5					73			
	Hand Auger		ASB-861_ (5.5-6.0)		80			odor, tar like materical, little organic material (thin roots), sheen
					263			brown organic material (thin to medium roots)
10					110			**SILT (ML)**: black, organic material (thin to medium roots)
					1.7			**Clayey SILT (MH)**: brown, with gray clay, residual oil
			ASB-861_ (11.5-12.0)		5.7			
15								

The borehole was terminated at approximately 12 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.
The boring was backfilled with auger cuttings on October 05, 2016.

KLEINFELDER
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PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

BORING LOG ASB-861

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

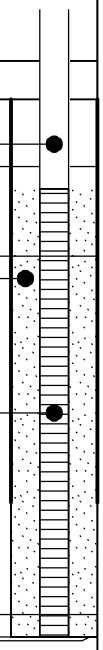
Date Begin - End:	11/18/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Sunny	**Auger Diameter:**	4 in. O.D.

BORING LOG GMW-686

FIELD EXPLORATION

Northing: 654027.10 (ft)
Easting: 570522.90 (ft)
Ground Surface Elevation (ft.): 4.06
Location Offset: At Stake
Surface Condition: Mud Flat

Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
						1.5		**Sandy SILT (ML)**: brown, moist
						51.9 98.9 67.2 15.1		**PITCH MATERIAL**: black, moist
0								**PEAT**: brown, moist to wet, organic material
	5	Hand Auger						
-5								
	10							
						1.5		**Lean CLAY (CL)**: gray, trace gravel
-10								
	15							
-15								
	20							
-20								
	25							
-25								



The exploration was terminated at approximately 12 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 3.5 ft. below ground surface during drilling.

GENERAL NOTES:
A 2 in. diameter PVC screen casing was installed to a depth of 12 ft.
The boring was not backfilled at time of drilling completion because a monitor well was installed.

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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	12/1/2015
REVISED:	-

BORING LOG GMW-686

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
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gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

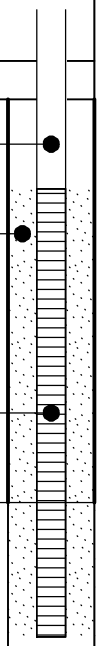
Date Begin - End:	11/18/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Sunny	**Auger Diameter:**	4 in. O.D.

BORING LOG GMW-687

FIELD EXPLORATION

Northing: 654021.40 (ft)
Easting: 570810.30 (ft)
Ground Surface Elevation (ft.): 3.96
Location Offset: At Stake
Surface Condition: Mud Flat

Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Auger				1.5		**SILT (ML)**: dark brown, moist organics and roots present
						3.2		
						5.1		
0								
	5					55.2		
-5								**PEAT**: brown
	10							
						1.5		**Lean CLAY (CL)**: gray, moist
-10								
	15							
-15								
	20							
-20								
	25							
-25								



The exploration was terminated at approximately 14 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 1 ft. below ground surface during drilling.
GENERAL NOTES:
A 2 in. diameter PVC screen pipe casing was installed to a depth of 12 ft.
The boring was not backfilled at time of drilling completion because a monitor well was installed.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	12/1/2015
REVISED:	-

BORING LOG GMW-687

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/10/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton/V. Golston	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger/Direct Push
Weather:	60° Sunny	**Borehole Diameter:**	8 in. O.D.

MONITORING WELL LOG GMW-688

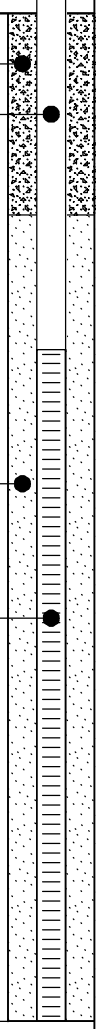
FIELD EXPLORATION

Surface Condition: Black tar material

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
	Air Knife/VacTruck			24"	1.0		**Sandy SILT (ML)**: reddish black
					239		**SILT (ML)**: black, odor, tar material
			GMW-688 (2.0-2.5)		364		thick woven plant root material
					256		
					108		
					40.7		
5				60"	36.2		
					8.4		
					10.2		
					9.0		
					8.5		**GLACIAL TILL**: dusky red, silty clay
					9.0		
					9.0		slight odor, sandy silt, little organic material (thin plant roots)
					8.8		
					10.9		
					10.0		
10	Direct Push			60"	9.8		**Sandy SILT (ML)**: dusky red
					4.8		
					0.9		**Silty CLAY (CL)**: dusky red
					1.2		
					0.3		
					0.3		
					0.3		
					0.3		**Sandy SILT (ML)**: dusky red
					0.3		**Weathered SHALE**
15			GMW-688_ (14.5-15.0)		0.2		

MONITORING WELL CONSTRUCTION

Completion Method:
Locking Stand Pipe - 2'9" feet above grade, 2x2 well pad



The borehole was terminated at approximately 15 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

MONITORING WELL LOG GMW-688
PERMIT NO.: E201611891

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/10/2016 - 10/13/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton/V. Golston	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger/Direct Push
Weather:	60° Sunny	**Borehole Diameter:**	8 in. O.D.

MONITORING WELL LOG GMW-689

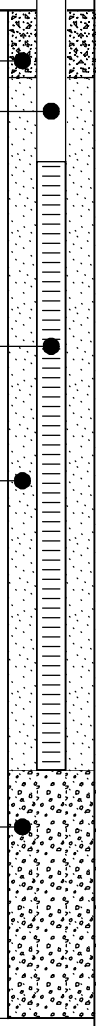
FIELD EXPLORATION

Surface Condition: Pitch

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
	Air Knife/VacTruck		GMW-689 (2.0-2.5)	24"	15.6		**Sandy SILT (ML)**: reddish black, odor, tar material
					237		
					219		
					132		
5	Geo-Probe/HSA			36"	57.6		**Silty CLAY (CL)**: reddish black, odor meadow mat, tighltly plant material
					110		
					150		
					45.5		
					20.4		
					11.4		
10				60"	0.0		greenish black
					0.0		
					0.0		
					0.0		**GLACIAL TILL**: dark reddish brown, sandy silt, thin plant roots
					0.0		
					0.0		
					0.0		
					0.0		
					0.0		weathered shale
15			GMW-689_ (14.5-15.0)		0.0		

MONITORING WELL CONSTRUCTION

Completion Method:
Locking Stand Pipe - 2'9" feet above grade, 2x2 well pad



The borehole was terminated at approximately 15 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.

KLEINFELDER
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PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

MONITORING WELL LOG GMW-689
PERMIT NO.: E201611892

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

MONITORING WELL LOG GMW-690

Date Begin - End:	9/30/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton/V. Golston	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger/Direct Push
Weather:	70° Cloudy	**Borehole Diameter:**	8 in. O.D.

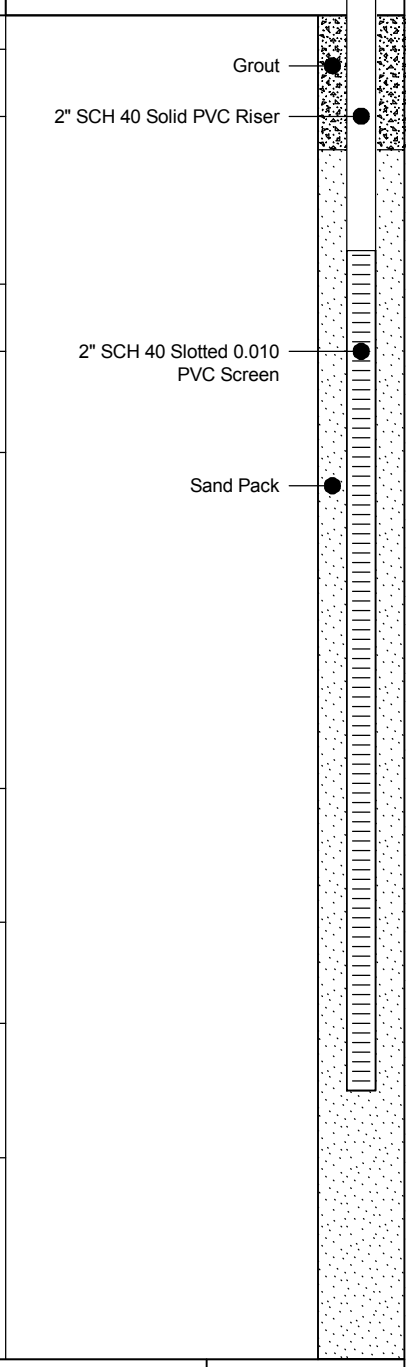
FIELD EXPLORATION

Surface Condition: Gravel Fill

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
	Air Knife/VacTruck						**GRAVEL FILL**
							SILT with Gravel (ML): brown, some cobbles
					3.5		
							Clayey SILT (MH): brown, odor, gravel, debris
					5.7		
					12		
▽					3.4		**CINDERS**: black, odor, wet, wood, debris
5				40"	15.8		**Sandy SILT (ML)**: dark grayish brown, some gravel
					14.8		
					10.6		**Clayey SILT (MH)**: dark grayish brown, moist
					7.5		
					202		
					153		
					72.9		
					186		dusky red, wet, trace organic material (thin plant roots)
					231		
10				53"	41.3		reddish black, odor, wet, trace gravel
					41.6		
			GMW-690_ (11.0-11.5)		267		
	Geo-Probe/HSA				223		**Silty CLAY (CL)**: black, odor, moist, organic material (thick plant roots, meadow mat, thick woven plant root)
					59.7		
					53.7		
					11.3		
					27.6		**GLACIAL TILL**: dark red, odor, moist, clayey silt, weathered shale
					12.01		
					13.9		
15				60"	0.3		**SILT with Gravel (ML)**: dark red, wet
					1.0		
					0.9		
					0.7		
					0.3		**Clayey SILT (MH)**: dark red, moist, trace gravel
					1.4		
					0.7		
					0.5		
			GMW-690_ (19.5_20.0)		0.7		
					0.6		

MONITORING WELL CONSTRUCTION

Completion Method:
Locking Stand Pipe - 2'9" feet above grade, 2x2 well pad



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PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

MONITORING WELL LOG GMW-690
PERMIT NO.: E201611893

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	9/30/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617	**MONITORING WELL LOG GMW-690**
Logged By:	A. Layton/V. Golston	**Drill Crew:**	J. Lewis	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT	
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger/Direct Push	
Weather:	70° Cloudy	**Borehole Diameter:**	8 in. O.D.	

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	FIELD EXPLORATION: Surface Condition: Gravel Fill / Lithologic Description	MONITORING WELL CONSTRUCTION
								Completion Method: Locking Stand Pipe - 2'9" feet above grade, 2x2 well pad
25							The borehole was terminated at approximately 20 ft. below ground surface.	
30								
35								

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 4 ft. below ground surface during drilling.
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.

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PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

MONITORING WELL LOG GMW-690
PERMIT NO.: E201611893

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:44 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/11/2016 - 10/13/2016	**Drilling Co.-Lic.#:**	SGS - #JD1617
Logged By:	A. Layton	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Geoprobe 7720DT
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger/Direct Push
Weather:	55° Sunny	**Borehole Diameter:**	8 in. O.D.

MONITORING WELL LOG GMW-691

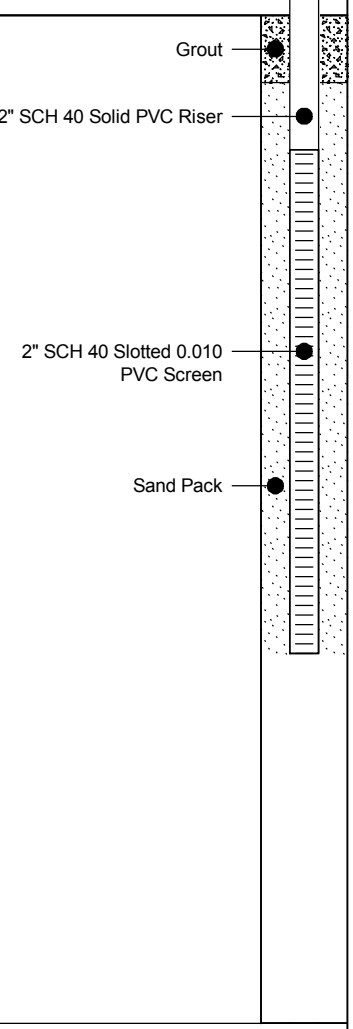
FIELD EXPLORATION

Surface Condition: Mudflat

Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
	Hand Auger			18"			**Clayey SILT (MH)**: reddish brown, odor
					0.0		
			GMW-691_ (2.5-3.0)		421		**SILT (ML)**: black, odor, tar material
					685		
					665		oily
5				44"	672		
					619		woven root material
					86.7		
					300		
	Direct Push				6.0		olive brown, odor, moist
					18.0		
10				60"	23.5		**GLACIAL TILL**: dusky red
					31		
					6.7		with weathered shale fragments
					2.3		
					1.2		
			GMW-691_ (14.5-15.0)		0.0		
15							

MONITORING WELL CONSTRUCTION

Completion Method:
Locking Stand Pipe - 2'9" feet above grade, 2x2 well pad



The borehole was terminated at approximately 15 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 4.5 ft. below ground surface during drilling.
Groundwater was observed at approximately 2.5 ft. below ground surface after drilling completion.

GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.

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PROJECT NO.:	20173380
DRAWN BY:	NML
CHECKED BY:	DH
DATE:	8/15/2017
REVISED:	-

MONITORING WELL LOG GMW-691
PERMIT NO.: E201611894

Bayway Refinery Complex
IAOC- A18 Pitch PDI
1400 Park Avenue
Linden, NJ

PLOTTED: 08/21/2017 08:45 AM BY: NLandry
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [_KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/05/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	S. Moore
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger / Geoprobe 7822DT
Plunge:	-90 degrees	**Drilling Method:**	H.A. / Direct Push Sleeves
Weather:	70° F, Sunny	**Auger Diameter:**	3.5 in. O.D.

BORING LOG SB-3 ENV

FIELD EXPLORATION

Northing: 654255.00 (ft)
Easting: 570328.50 (ft)
Surveyed Ground Surface Elevation (ft.): 6.92
Location Offset: ~2 feet N from Stake
Surface Condition: Pitch Material

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Auger		SB-3: 1-1.5		502		**ALLUVIUM:** **SILT with Gravel (ML)**: black, moist; **PITCH MATERIAL**: black
5				SB-3: 2.5-3		188		**PEAT**: black, hydrocarbon odor, moist
	5	Direct Push Sleeves			55"	110		
						0.8		**ALLUVIUM:** **SILT (ML)**: olive, moist, very soft
0						0.2		**TILL:** **Clayey SAND with Gravel (SC)**: red, moist, loose
	10				60"	0		**TILL:** **Sandy SILT (ML)**: red, moist, soft
-5						0		**TILL:** **Sandy Lean CLAY (CL)**: red, wet, soft
	15				42"	0		
-10								**Decomposed Rock:** **Clayey SAND with Gravel (SC)**: red, wet, medium dense
	20			SB-3: 19-19.5		0		
-15								
	25							
-20								
	30							
-25								

The exploration was terminated because of practical auger refusal at approximately 19.5 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 2.5 ft. below ground surface during drilling.
Groundwater was observed at approximately 2.5 ft. below ground surface after drilling completion.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on October 05, 2015.

KLEINFELDER
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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-3 ENV

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	11/18/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Cloudy	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-4

FIELD EXPLORATION

Northing: 654189.00 (ft)
Easting: 570399.70 (ft)
Surveyed Ground Surface Elevation (ft.): 5.25
Location Offset: At Stake
Surface Condition: Bare Earth

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
5		Hand Auger				1.5		**Sandy SILT (ML)**: dark brown, moist, trace gravel
			☒	SB-4: 1.5-2.0		116		**PITCH MATERIAL**: black, moist, hydrocarbon odor
						15.5		**Silty CLAY (CL-ML)**: reddish brown, moist
0 ▽	5					88.5		organic material
						10.4		**PEAT**: brown
						1.5		**Lean CLAY (CL)**: gray, moist
-5	10		☒	SB-4: 9.5-10		0.7		light brown
-10	15							
-15	20							
-20	25							

The exploration was terminated at approximately 10 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 5 ft. below ground surface during drilling.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on November 18, 2015.

KLEINFELDER
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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	12/1/2015
REVISED:	-

BORING LOG SB-4

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	10/05/2015 - 10/07/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger / Geoprobe 7822DT
Plunge:	-90 degrees	**Drilling Method:**	H.A. / Direct Push Sleeves
Weather:	65° F, Cloudy	**Auger Diameter:**	3.5 in. O.D.

BORING LOG SB-5 ENV

FIELD EXPLORATION

Northing: 654206.50 (ft)
Easting: 570524.90 (ft)
Surveyed Ground Surface Elevation (ft.): 4.25
Location Offset: ~2 feet N from Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Auger				124		**FILL:** **SILT (ML)**: black
								PEAT: black, hydrocarbon odor
0				SB-5: 4-4.5		381		**PITCH MATERIAL**: black
	5				17"	43.8		**PEAT**: black, hydrocarbon odor
						3.4		moist, with tar
-5								
	10	Direct Push Sleeves			53"	1.6		**ALLUVIUM:** **SILT (ML)**: gray and red, moist, very soft
						2.0		
						0.4		**TILL:** **Sandy Lean CLAY (CL)**: red, wet, soft
-10						2.0		
	15				59"	1.4		**TILL:** **Clayey SAND with Gravel (SC)**: red, wet, medium dense
						0		
-15						0		
	20							**Decomposed Rock:** **Clayey GRAVEL with Sand (GC)**: red, moist, medium dense
-20	25							
-25								

The exploration was terminated at approximately 22 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 3.5 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on October 07, 2015.

KLEINFELDER
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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-5 ENV

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	9/25/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	75° F, Sunny	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-6

FIELD EXPLORATION

Northing: 654165.90 (ft)
Easting: 571051.50 (ft)
Ground Surface Elevation (ft.): 3.81
Location Offset: At Stake
Surface Condition: Tidal Flat

Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
		Hand Auger				10.2		**PEAT**: black, wet
0						29.1		
	5		☒	SB-6-4.5-5				**SILT (ML)**: dark brown, wet
-5	10							
-10			☒	SB-6-14-14.5		2.5		**Lean CLAY (CL)**: gray, moist
	15							
-15	20							
-20	25							
-25								

The exploration was terminated at approximately 14.7 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 0 ft. below ground surface after drilling completion.

GENERAL NOTES:
The boring was backfilled with soil cuttings on September 25, 2015.

KLEINFELDER
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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-6

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	11/19/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Cloudy	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-7

FIELD EXPLORATION

Northing: 654185.10 (ft)
Easting: 570284.60 (ft)
Surveyed Ground Surface Elevation (ft.): 6.42
Location Offset: At Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
						16.5		**Sandy SILT with Gravel (ML)**: dark brown, moist
5								
∇						50.5		**PITCH MATERIAL**: black, moist, hydrocarbon odor
	5	Hand Auger				50.4		**ALLUVIUM:**
			☒	SB-7: 5.5-6.0		174		**SILT (ML)**: black, wet
0								**PEAT**: brown, organic material
						12.1		
						1.3		**Lean CLAY (CL)**: gray, moist
	10		☒	SB-7: 10.5-11.0		0.7		gray with tan
-5								
	15							
-10								
	20							
-15								
	25							
-20								

The exploration was terminated at approximately 11 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
∇ Groundwater was observed at approximately 3.5 ft. below ground surface during drilling.
GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on November 19, 2015.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	12/1/2015
REVISED:	-

BORING LOG SB-7

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	11/19/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Cloudy	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-8

FIELD EXPLORATION

Northing: 654141.20 (ft)
Easting: 570293.40 (ft)
Surveyed Ground Surface Elevation (ft.): 5.66
Location Offset: At Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
5								**Sandy SILT with Gravel (ML)**: dark brown, moist
						124		**PITCH MATERIAL**: black, moist
						64		**SILT (ML)**: black, moist
						98		
▽	5	Hand Auger				149		**PEAT**: brown, wet, organic material
0			☒	SB-8: 6.0-6.5		203		
						130		
						15.4		**Lean CLAY (CL)**: gray, moist
	10							gray with tan
-5			☒	SB-8: 10.5-11.0		3.7		
	15							
-10								
	20							
-15								
	25							
-20								

The exploration was terminated at approximately 11 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 5 ft. below ground surface during drilling.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on November 19, 2015.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	12/1/2015
REVISED:	-

BORING LOG SB-8

Bayway Refinery Complex
Linden, NJ

PLOTTED: 02/21/2018 08:32 AM BY: MHarwell
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_ENVIRONMENTAL LOG]

Date Begin - End:	11/18/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Sunny	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-9

FIELD EXPLORATION

Northing: 654177.90 (ft)
Easting: 570527.90 (ft)
Surveyed Ground Surface Elevation (ft.): 4.22
Location Offset: At Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
						62.3		**Sandy SILT (ML)**: dark brown, moist
			☒	SB-9: 1-5-2.0		161		**PITCH MATERIAL**: black, hydrocarbon odor
▽						82		**Lean CLAY (CL)**: black, wet, with organics
0	5							
-5	10					3.7		**PEAT**: brown, moist, wood pieces and organic material
						0.1		**Lean CLAY (CL)**: gray, moist
			☒	SB-9: 12.5-13.0		0.1		gray with reddish brown
-10	15							
-15	20							
-20	25							
-25								

The exploration was terminated at approximately 13 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 3 ft. below ground surface during drilling.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on November 18, 2015.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	12/1/2015
REVISED:	-

BORING LOG SB-9

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	9/18/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	80° F, Sunny	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-10

FIELD EXPLORATION

Northing: 654132.00 (ft)
Easting: 571070.20 (ft)
Ground Surface Elevation (ft.): 4.31
Location Offset: At Stake
Surface Condition: Grass

Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
						2.2		**~2 inches TOPSOIL**
						15.2		**Silty CLAY (CL-ML)**: black, wet
						36.1		**PEAT**: black, wet, hydrocarbon odor
						115		
0			☒	SB-10-4.0-4.5		183		
	5	Hand Auger						
						116		
						64.3		
-5								
	10							
						2.0		**Lean CLAY (CL)**: gray, moist
			☒	SB-10-13.5-14		15		
-10								
	15							
-15								
	20							
-20								
	25							
-25								

The exploration was terminated because of practical auger refusal at approximately 14 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with soil cuttings on September 18, 2015.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-10

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	10/05/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	S. Moore
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger / Geoprobe 7822DT
Plunge:	-90 degrees	**Drilling Method:**	H.A. / Direct Push Sleeves
Weather:	70° F, Sunny	**Auger Diameter:**	3.5 in. O.D.

BORING LOG SB-11 ENV

FIELD EXPLORATION

Northing: 654278.50 (ft)
Easting: 570527.40 (ft)
Surveyed Ground Surface Elevation (ft.): 6.08
Location Offset: ~2 feet N from Stake
Surface Condition: Grass & Reeds

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
5		Hand Auger						**ALLUVIUM:** **SILT (ML)**: black, moist
						8		**PEAT**: black, hydrocarbon odor
	5	Direct Push Sleeves			35"			
0						57		
								ALLUVIUM: **SILT (ML)**: brownish gray, moist, very soft
						47		**PEAT**: black, hydrocarbon stained
	10			SB-11: 9.5-10	37"			
-5								**TILL:** **Sandy Lean CLAY (CL)**: red, moist, soft to firm
				SB-11: 11.5-12		120		
						11.7		
	15				53"	3.4		
-10						1.6		
						0		
	20			SB-11: 20-20.5	23"	0		**Decomposed Rock:** **Clayey SAND with Gravel (SC)**: red, moist, medium dense
-15				SB-11: 9.5-10		687		
	25							
-20								

The exploration was terminated because of practical auger refusal at approximately 22 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 2 ft. below ground surface during drilling.
Groundwater was observed at approximately 2 ft. below ground surface after drilling completion.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on October 05, 2015.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-11 ENV

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	10/05/2015 - 10/08/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Sunny	**Auger Diameter:**	2 in. O.D.

BORING LOG SB-12

FIELD EXPLORATION

Northing: 654256.50 (ft)
Easting: 570816.10 (ft)
Surveyed Ground Surface Elevation (ft.): 4.98
Location Offset: At Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
								MUD, GRASS, REEDS
						0		**Silty SAND (SM)**: reddish brown, moist
						0		wet
						0.2		**Lean CLAY (CL)**: reddish black, moist, hydrocarbon odor, organic material
						2.6		**PEAT**
0	5					8.3		
		Hand Auger		SB-12: 6-6.5		17		**Silty CLAY with Sand (CL-ML)**: gray, moist
						11.2		**PEAT**: brown and gray, moist
						11.5		
-5	10					16.9		
						7.3		**Lean CLAY (CL)**: red, moist
						0.4		
				SB-12: 12-12.5				
-10	15							
-15	20							
-20	25							

The exploration was terminated because of practical auger refusal at approximately 12.5 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 2 ft. below ground surface during drilling.
Groundwater was observed at approximately 2 ft. below ground surface after drilling completion.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on October 08, 2015.

KLEINFELDER
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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-12

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	10/05/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	K. Butcher
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	60° F, Sunny	**Auger Diameter:**	2 in. O.D.

BORING LOG SB-13

FIELD EXPLORATION

Northing: 654232.40 (ft)
Easting: 570919.40 (ft)
Surveyed Ground Surface Elevation (ft.): 3.96
Location Offset: At Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
								PITCH MATERIAL: black, wet, hydrocarbon odor
			☒	SB-13: 1-1.5		40.4		
0								**PEAT**: black, wet, hydrocarbon odor
	5	Hand Auger						
-5						18.7		
	10					25		**SILT (ML)**: reddish brown, moist, organic peat
						6.2		**Silty CLAY (CL-ML)**: reddish brown, moist
						14.6		
			☒	SB-13: 13-13.5		3.2		**Lean CLAY (CL)**: moist
-10								
	15							
-15								
	20							
-20								
	25							
-25								

The exploration was terminated because of practical auger refusal at approximately 13.5 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0.5 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 0.5 ft. below ground surface after drilling completion.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on October 05, 2015.

KLEINFELDER
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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
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BORING LOG SB-13

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	9/25/2015	**Drilling Company:**	SGS Environmental Drilling	**BORING LOG SB-14**
Logged By:	A. Layton	**Drill Crew:**	J. Lewis	
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger	
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger	
Weather:	75° F, Sunny	**Auger Diameter:**	4 in. O.D.	

FIELD EXPLORATION

Northing: 654171.50 (ft)
Easting: 571177.50 (ft)
Ground Surface Elevation (ft.): 4.32
Location Offset: At Stake
Surface Condition: Tidal Flat

Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
						0		**SILT (ML)**: black, wet, organics present
								PEAT: black, wet, hydrocarbon odor
			☒	SB-14: 2.5-3		282		
0								
	5					176		
		Hand Auger						**SILT (ML)**: wet
-5								
	10							
-10						3.6		**Lean CLAY (CL)**: gray, moist
	15		☒	SB-14: 14.5-15				
-15								
	20							
-20								
	25							
-25								

The exploration was terminated at approximately 15.3 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
Groundwater was observed at approximately 0 ft. below ground surface after drilling completion.
GENERAL NOTES:
The boring was backfilled with soil cuttings on September 25, 2015.

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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
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BORING LOG SB-14

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	9/18/2015	**Drilling Company:**	SGS Environmental Drilling
Logged By:	A. Layton	**Drill Crew:**	J. Lewis
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	90° F, Sunny	**Auger Diameter:**	4 in. O.D.

BORING LOG SB-15

FIELD EXPLORATION

Northing: 654119.50 (ft)
Easting: 571222.40 (ft)
Ground Surface Elevation (ft.): 4.14
Location Offset: At Stake
Surface Condition: Grass

Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
						2.2		**GRASS**
								Silty CLAY (CL-ML): black, wet, hydrocarbon odor, organic peat
						157		dark brown
0				SB-15: 3.5-4				
	5	Hand Auger						
-5								
	10							
						184		**Lean CLAY (CL)**: gray
						41.2		
				SB-15: 13.5-14.0		0.2		
-10								
	15							
-15								
	20							
-20								
	25							
-25								

The exploration was terminated because of practical auger refusal at approximately 13.8 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with soil cuttings on September 18, 2015.

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PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-15

Bayway Refinery Complex
Linden, NJ

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Date Begin - End:	10/09/2015	**Drilling Company:**	SGS Environmental Drilling	**BORING LOG SB-16**
Logged By:	G. Dorn	**Drill Crew:**	K. Butcher / Atkins	
Hor.-Vert. Datum:	NAD83 - NGVD29	**Drilling Equipment:**	Hand Auger	
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger	
Weather:	60° F, Partly Cloudy	**Auger Diameter:**	2 in. O.D.	

FIELD EXPLORATION

Northing: 654283.90 (ft)
Easting: 570738.30 (ft)
Surveyed Ground Surface Elevation (ft.): 5.02
Location Offset: At Stake
Surface Condition: Mud Flat

Surveyed Elevation (feet)	Depth (feet)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Lithologic Description
								SILT (ML): wet
								Lean CLAY (CL): black, wet, hydrocarbon odor, pitch material
								PITCH MATERIAL: black, wet, hydrocarbon odor
								Lean CLAY (CL): red with black, hydrocarbon odor, pitch material
0	5	Hand Auger				77.8		**PEAT**: black, moist, hydrocarbon odor
						74.2		
						51.5		
-5	10							
								ALLUVIUM:
				SB-16:11-11.5		105		**Organic SILT (OH)**: black, moist
						10.2		
				SB-16: 12.5-13		9.4		**Lean CLAY (CL)**: reddish brown, moist
-10	15							
-15	20							
-20	25							

The exploration was terminated at approximately 13 ft. below ground surface.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
Groundwater was observed at approximately 0 ft. below ground surface after drilling completion.

GENERAL NOTES:
The exploration location and elevation were surveyed by Keller and Kirkpatrick.
The boring was backfilled with soil cuttings on October 09, 2015.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20153364
DRAWN BY:	NMG
CHECKED BY:	DEP
DATE:	11/11/2015
REVISED:	-

BORING LOG SB-16

Bayway Refinery Complex
Linden, NJ

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GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well ASB086 Project/No. Exxon Bayway / NJ0211.050 Page 1 of 1

Site Location Linden, NJ Drilling Started 11-09-93 Drilling Completed 11-09-93

Total Depth Drilled 10 feet Hole Diameter 7.5 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2' x 3" Sampling Interval Continuous feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor EDI Driller C. O'Shaunghnessy Helper B. Petley

Prepared By M. Breault Hammer Weight 140 lbs Hammer Drop 30 inches

	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	Initial FID scr
1335	0	2	1.5	16-18-17-20	0.5-1.0 (SC) Sand, fine to med; and traprock cobbles	(50p
					1.0-2.0 (CL) Silty Clay; some Gravel, fine to coarse,	
					black stains, reddish brown; dry to moist.	
	2	4	1.5	17-22-30-45	2.5-3.0 (CL) As above 1.0-2.0, moist.	>1000
					3.0-4.0 Black Sticky tar (Pitch) with	
					Pieces of wood and cinders at 3.0', trace black NAPL droplets	
	4	6	2.0	4-6-10-11	Pitch; trace layers of Silty Clay (saturated with NAPL liquid) and NAPL sheen.	>10
	6	8	2.0	NR	(ML) Silt, grey to brown, moist, saturated with	>100
					NAPL from 7.0 to 7.5	
	8	10	2.0	NR	(ML) 8.0-8.0 Silt; trace Sand, fine, wet, reddish	>100
					brown with heavy black stains and patches saturated	
					with NAPL	
					(ML) 9.0-10.0 Silt; some Gravel, reddish brown,	
					wet, becoming compact, trace sheen spots 9.0-9.3'	
					* Cuttings from 11.0' b/s are Reddish brown Glacial	
					Till as above 9.0-10.0, clean, moist.	
					Borehole grouted to surface on 11-09-93.	

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well ASB086 Project/No. Exxon Bayway / NJ 0211.050 Page 1 of 1

Site Location Linden, NJ Drilling Started 11-09-93 Drilling Completed 11-09-93

Total Depth Drilled 10 feet Hole Diameter 7.5 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2' x 3" Sampling Interval Continuous feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor EDI Driller C. O'Shaunghnessy Helper B. Petley

Prepared By M. Breault Hammer Weight 140 lbs. Hammer Drop 30 inches Initial FID sc

	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	
1210	0	2	1.7	14-15-21-23	(SC) Sand, fine to medium, green to orange, Cobbles	25 ppm
					of Sandy Concrete, dry to moist.	
	2	4	1.5	22-18-18-16	(SC) As above, trace black stain (band), moist,	200
					odor (solvent?); go to Level C	
	4	6	1.8	9-12-18-17	4.2-5.0 (SC) As above, moist	>1000
					5.0-5.8 Black sticky tar (Pitch?); and Clay	
					5.8-6.0 (CL) Silty Clay; and Gravel, coarse, red.	
	6	8	2.0	3-4-3-7	(ML) Silt; little Gravel fine to coarse subrounded,	>100
					Gray to Brown, trace OM, black Stains, wet, NAPL sheen	
	8	10	2.0	11-31-22-24	8.0-9.0 (ML) As above, wet	500
	FID sample only				9.0-10.0 (CL) Silty Clay; little Gravel, fine to coarse,	
					reddish brown, compact, moist.	
					Install 3' Drivepoint screen 7-10'	
					Groundwater sample collected for field GC analysis.	
					Borehole grouted on 11-09-93.	

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well ASB-087 Project/No. NJ0211.050 Page 1 of 1

Site Location Linden, NJ Drilling Started 2/15/94 Drilling Completed 2/15/94

Total Depth Drilled _____ feet Hole Diameter _____ inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2' x 3" Sampling Interval Continuous feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used NONE Drilling Method Hollow Stem Auger

Drilling Contractor EDI Driller C. O'Shaughnessy Helper B. Petty

Prepared By Michael Zeni Hammer Weight 140 lb Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	0.2	7-4-4-3	(Fill) Tar like Clayish, totally
				black staining, moist "Pitch"
				TOP 2" = SAND TOPSOIL.
2	4	1.2	3-3-4-3	Same as Above Heavy Stain
				moist. Pliable like hot Asphalt
				(Cooling Roofing Tar) - leaves Distinct
				Tar like Residue on Everything
4	6	0.0	1-1-1-1	
6	8	0.2	2-1-1-1	(Mat) Medow Mat clean, moist
				* Stand pipe.

G&M Form 03 6-86 Southprint 89-1257

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well 156-98 Project/No. Exxon Bayway / NJ0211.050 Page 1 of 1

Site Location Linden, NJ Drilling Started 2-22-94 Drilling Completed 2-22-94

Total Depth Drilled 6 feet Hole Diameter 3 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2 feet x 3 inches Sampling Interval Continuous feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum Mean Sea Level

Drilling Fluid Used None Drilling Method ~~Hollow Stem Auger~~

Drilling Contractor Environmental Drilling Inc. Driller C. O'Shaughnessy Helper B. Petley

Prepared By Michael Breault Hammer Weight 140lbs. Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	Initial FID screen
~~1430~~ 1500 0	2	0.1	8-3 3-3	(MH/CL) ~~Brown~~ Silt and Clay; trace Sand,	80
				wood pieces, brown, loose, saturated, trace sheen.	
				Drove second 0-2' spoon for more recovery	
2	4	0.1	WR	(MM) Root material and sediment, brown &	NR
				green, wet, wood pieces, "clean", methane smell	
4	6	0	WR	(MM) As above	NR

GAM Form 03-6-86 Sourpoint 89-1257

GERAGHTY & MILLER, INC.
Environmental Services

SAMPLE/CORE LOG

Boring/Well A SB-89 Project/No. Exxon Bayway / NJ0211.050 Page 1 of 1

Site Location Linden, NJ Drilling Started 2-22-94 Drilling Completed 2-22-94

Total Depth Drilled 6 feet Hole Diameter 3 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2 feet x 3 inches Sampling Interval Continuous feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum Mean Sea Level

Drilling Fluid Used None Drilling Method ~~Hollow Stem Auger~~

Drilling Contractor Environmental Drilling Inc. Driller C. O'Shaughnessy Helper B. Petley

Prepared By Michael Breault Hammer Weight 140 lbs. Hammer Drop 30 inches

	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Blows/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	Initial FID scan
1430	0	2	2.0	WH	(CL-OL) Silt and Clay; little OM, brown, trace black stains, trace chunks of clay on outside of spoon, moist to wet.	NR
	2	4	0.0	WH	(CL-OL) As above, moist to wet.	NR
	4	6	0.1	WH	(OL) trace clay and fresh OM, moist to wet.	NR

G&M Form 03 6-85 Southprint 89-1257

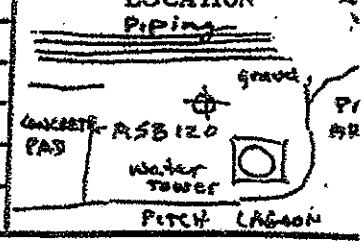
Arthur D Little

Soil Boring Log

Boring No.	ASB 120
Client	Exxon
Project	Bayway RI
Case No.	57620

Date Start	8/15/96	Contractor	CTE Drilling
Date Complete	8/15/96	Drill Method	Drove Spoons
Hole Diameter	3"	Type Of Rig	ATV-B53
Casing Size	–	Location	Unit A - Pitch Area
Boring Depth	18'	Geologist	K. Palaia / K. Gallinelli
Sampling Method	3" ø Split Spoons Driven w/ 300 lb hammer		

LOCATION



Scale in Feet	SAMPLE Type and number	Interval (Feet)	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0.0	ASB120B0 RISK VOC TCL/TPH TAL 1110	0-2	18"	12 16 8 8	IS 110 HS 245	0-6" [SM] dk yel brn (10 YR 4/2), silty SAND, some angular gravel, FILL material (brick), poorly sorted, mod dense, slight petroleum odor, no staining 6-18" [SM] dusky brn (5 YR 2/2), silty SAND, same as above
2.0	1115	2-4	24"	9 5 4 3	IS 1050 HS >3200	0-14" [SM] silty SAND - same as above, more brick FILL material 14-24" olive black (5Y 2/1), PITCH with little angular gravel, dry - pasty, very strong petroleum odor, visible brn/blck staining
4.0	1120	4-6	20"	5 3 2 2	IS 1467 HS >3200	0-4" PITCH - same as above 4-6" [SM] dk yel brn (10 YR 2/2), silty SAND, tr. subrounded gravel, dry, loose, petro. odor 6-8" [ML] dk yel brn (10 YR 4/2), clayey SILT, tr. orse sand, very plastic, minor black petro. stains 8-14" PITCH - same as above 14-20" [ML] clayey SILT - same as 6-8"
6.0	MAX ASB120B8 VOC TCL/TPH TAL 1125	6-8	20"	4 5 4 2	IS 970 HS >3200	0-10" PITCH - same as above, visible black staining 10-14" [ML] clayey SILT, brown petroleum staining at 12-14", same as above (14-20") 14-16" PITCH
8.0	1130	8-10	16"	4 4 3 3	IS 460 HS >3200	0-16" [ML] clayey SILT, same as above except moist, very strong petroleum odor, and staining (blck/brn) throughout
10.0	1135	10-12	24"	4 8 6 6	IS 1523 HS >3200	0-6" [ML] clayey SILT - same as above (0-16") 6-24" PITCH, with black/brn fn SAND, and some silt and clay.
12.0						
13.0						

Book #1, page 128

Arthur D Little	Soil Boring Log	Boring No. ASB-121 Client Exxon Project Bayway RI Case No. 57620

Date Start 9/5/96	Contractor CTE Drilling	LOCATION
Date Complete 9/5/96	Drill Method TRI POD w/3" S.S.	
Hole Diameter 3"	Type Of Rig TRI POD	
Casing Size NA	Location UNIT B/Pitch AREA	
Boring Depth 10'	Geologist T. Goldthwaite / C. Mazzer	
Sampling Method 3" S.S. w/140 lb hammer		

Scale in Feet	SAMPLE Type and number	Interval (Feet)	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0	1500 ASB121B4 TCL TAL TPH	0-2	6"	1/1' 1/1'	IS 63 HS 1834	0-3", 10YR4/2, Dark yellowish brown, [SM] silty sand. 3-6", N1, Black, sediment emulsion. Petroleum odors.
2 3		2-4	0"	WOR	IS - HS -	- EMPTY SPOON -
4 5	1505 ASB121B6 TCL TAL TPH	4-6	3"	WOR	IS 16 HS 1453	0-3", 5Y3/2, olive gray, organics [PT] w/heavy petroleum residue throughout. wet. soft.
6 7		6-8	18"	WOR	IS 42 HS 1145	0-7", same as above. 7-18", N4, med. dark gray, organic [OL] silt w/low plasticity. wet. soft.
8 9	1510 ASB121B8 TCL TAL TPH	8-10	18"	WOR	IS 0.0 HS 196	0-6", same as (6-8) & 7-18". 6-18", 5YR5/6, light brown, organic [OL] silt w/some sand, grades to a [OH] organic clay w/some sand.
10 11 12						- END OF BORING -

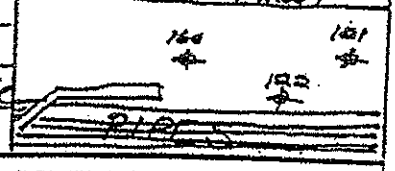
WOR → weight of rods.

Arthur D Little

Soil Boring Log

Boring No. ASB-122
Client Exxon
Project Bayway RI
Case No. 57620

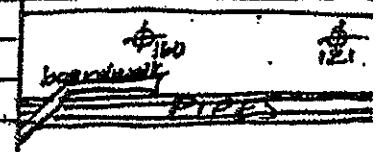
Date Start 9/6/96	Contractor CTE Drilling		
Date Complete 9/6/96	Drill Method Tripod, 3" Split Spoon		
Hole Diameter 3"	Type Of Rig Tripod		
Casing Size NA	Location Pitch Area, Unit A		
Boring Depth	Geologist C Mayer, T Goldthwaite		
Sampling Method			



Scale in Feet	SAMPLE Type and number	Interval (Feet)	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0		0-2'	0"		NA	No recovery
1						
2		2-4	14"		IS=1020 HS=213	0-4" Sediment/Emulsion, black on outter .5" + brownish black 5YR 3/1 on side core. [PT] Trace peat Very soft, dense, moist, strong HC odor, HC staining 4-14" [PT] with sediment emulsion, black, dense, moist, strong HC odor + staining
3						
4	MPX MS/MSD TPH TAL TCL	4-6'	14"		IS=130 HS=2816	0-10" Sediment emulsion, black, thick tarrlike texture, Patch of peaty silt from 4-6" covered w/ emulsion moist, dense, soft, strong HC odor + staining 10-14" [SC] Clayey sand, light brown 5YR 5/6, no odor, soft, dense, well sorted, no staining
5						
6	9:50	6-8	18"		IS=7.5 HS=33	0-12" Fallin 12-18" [SC] same as above.
7						
8	VERT TCL TAL TPH	8-10	24"		IS=14 HS=145	0-2" Fallin 2-12" [SC] Same as above 12-16" [CL] Silty CLAY, grayish brown 5YR 3/2, stiff, moist, HC stained, black emulsion in small patches 16-24" [CL] Silty CLAY, light brown, stiff, dry, low plasticity trace peat, no odor + staining.
9						
10	1010				Bottom of Borehole	

Arthur D Little	Soil Boring Log	Boring No. ASB-160 Client Exxon Project Bayway RI Case No. 57620

Date Start 9/5/96	Contractor CTE Drilling	Morses Creek LOCATION
Date Complete 9/5/96	Drill Method TRIPOD W/ 3" S.S.	Salt Water Main
Hole Diameter 3"	Type Of Rig TRIPOD	
Casing Size NA	Location UNIT B/Ditch Area	
Boring Depth 10'	Geologist T. Southwaite / C. Mayer	
Sampling Method 3" S.S. w/ 140lb. hammer		



Scale in Feet	SAMPLE Type and number	Interval (Feet)	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0						
1		0-2	0"	WOR	IS - HS -	- EMPTY SPOON -
2	1310 ASB160B4 VOC TCL TAL TPH	2-4	6"	WOR	IS HS	0-6", N1, BLACK, sediment emulsion * Bottom of spoon had olive gray organics [PT]
4						
5		4-6	0"	WOR	IS - HS -	- EMPTY SPOON -
6						
7		6-8	0"	WOR	IS - HS -	- EMPTY SPOON -
8	1330 ASB160B10 VOC TCL TAL TPH	8-10	24"	4 4 12 8	IS HS	0-10", N2, Grayish black, decayed state of organics. Wet. SOFT. [PT] 10-24", 5YR 4/1, brownish gray, low plasticity organic silty clay, grades to a 10YR 5/4 w/ depth, sand increases w/ depth. [OL]
10						- END OF BORING -
11						
12						

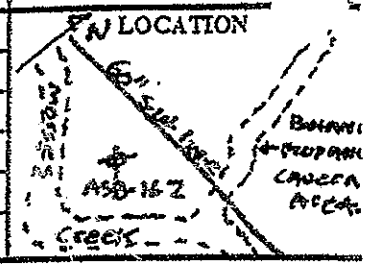
WOR → Weight of Rods

Arthur D Little

Soil Boring Log

Boring No. ASB-16Z
Client Exxon
Project Bayway RI
Case No. 57620

Date Start 9/5/96	Contractor CTE Drilling
Date Complete 9/5/96	Drill Method TRIPOD w/3" S.S.
Hole Diameter 3"	Type Of Rig TRIPOD
Casing Size NA	Location UNIT A / PITCH AREA
Boring Depth 14'	Geologist T. Goldthwaite / C. Mayer
Sampling Method 3" S.S. w/ 140 lb. hammer	

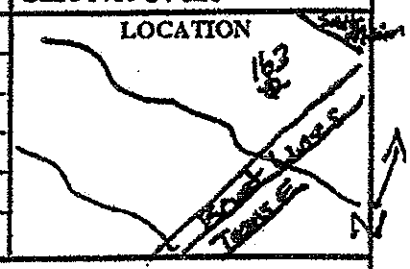


Scale in Feet	SAMPLE Type and number	Interval (Feet)	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0	12131C 9:50 TCL TAL TPH	0-2	10"	1 1 1 1	IS=0 HS=9.1	0-10" [ML] SILT w/trace very fn sand. Grayish brown 5YR 3/2. well sorted, moist, dense, slight plasticity, HC odor, no staining.
1						
2		2-4	0"	WOR	NA	No recovery
3						
4		4-6	6"	WOR	IS=54 HS=90	0-3" Fall in - Black sediment emulsion, loose, soft, wet, HC odor + staining 3-6" [PT] Peat some silt, dark yellowish brown and dark yellowish orange 10YR 6/6. Meadow mat, thick organic material, wet, dense, strong organic odor.
5						
6	MAX TCL TAL TPH 5 bottles 1000	6-8	16"	WOR	IS=79 HS=173	0-16" [PT] PEAT some silt, Peat is dark yellowish brown to dark yellowish orange 10YR 4/6. Thick dense organic material, wet, strong organic odor surrounded by + w/ intermittent patches of black sediment emulsion, loose, soft, wet, HC odor + staining.
7						
8		8-10	24"	WOR	IS=57 HS=166	0-2" Fall-in black sed-emulsion 2-5" Fall-in " " w/peat 5-24" [PT] Same as 0-16" interval above, no HC odor or staining.
9						
10		10-12	18"	1 2 2 2	IS=0 HS=3.9	0-14" Fall in [PT] 14-24" [CL] Clay some silt, trace peat, dark gray N3, stiff, dense, wet, low plasticity organic odor, no staining.
11						
12						

Arthur D Little	Soil Boring Log	Boring No. BSB163
		Client Exxon
		Project Bayway RI
		Case No. 57620

Date Start 8/27/96	Contractor CTE Drilling
Date Complete 8/27/96	Drill Method Tripod 3" SS
Hole Diameter 4.3"	Type Of Rig Tripod
Casing Size NA	Location Morses Creek/Boat Pipeline
Boring Depth 10'	Geologist C Mayer C Howell
Sampling Method 3" SS	

LOCATION



Scale in Feet	SAMPLE Type and number	Interval (Feet)	Recovery	Blows Per 6"	Total Organics (ppm)	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
0		0-2	2"	1 1 1 1	IS=10 HS=44	0-2" [OL] Organic SILT trace Peat, grayish brown 5YR 3/2, slightly moist, dense, soft, some black staining, HC odor
1						
2	MFK 1:40 TCL TAL TPH	2-4	16"	1 1 1 1	IS=21 HS=949	0-16" [PT] Peat w/some SILT, med yellowish brown to dk yellowish brown. High organic matter content (roots/plants), wet, soft, organic smell. 16-18" [OL] Like 0-2" above
3						
4		4-6	~~none~~ 2"	WOR	IS=3.8 HS=164	0-2" [PT] Peat w/some silt, med. yellowish brown to dk yellowish brown. High organic matter content (roots/plant), wet, soft, organic odor.
5						
6		6-8	16"	WOR	IS=0 HS=73	0-2" [PT] Same as above 2-16" [ML] Clayey SILT, med dark gray, soft, dense, wet, slight organic odor, no staining
7						
8	VOA 1:45 DUP TCL TAL TPH	8-10	16"	WOR	IS=0 HS=24	0-2" [PT] same as 0-2" above 2-16" [ML] Same as 2-16" above
9						
10		Bottom of Boring				

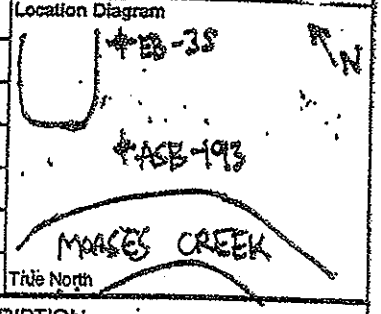
Arthur D Little

Soil Boring Log

Boring ID ASB193
Client Exxon
Project Bayway Pha
Case No. 37453

Date 4/20/99	Contractor CT+E
Bore Hole Diameter 4 1/4"	Drillers L. Lynch, T. Lynch
Boring Depth 12'	Hammer Weight 145 lbs.
Depth to Water 2.5'	Drill Method HSA
DP, WP, or MW Installed? NO	Sampling Method SS
Geologist Amy Lawrence	Refusal? NO
	Lithologic Category

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor, or sheen, presence of waste materials), stratigraphic type and general description
0	13:05	7	18 50/2"	Depth Interval IS 182 HS 0	0-5 moderate brown [5YR 4/4] SILT and sand, wet, medium compaction, odor 5-7 Black SILT, moist, compact, strong odor
2	~~ASB193~~ 13:14	24	4 6 8 5	Depth Interval IS 1778 HS 1897	0-3 moderate brown [5YR 4/4] SILT, moist, compact 3-16 Black coarse sand and gravel little cinder, poorly sorted, moist, strong hydrocarbon odor, free product 10-24 moderate brown [5YR 4/4] SILT some clay little gravel, poorly sorted, moist, compact
4	13:21	5	4 5 3 3	Depth Interval IS 258.7 HS 367	0-5 Brownish black SILT some clay moist, loose, some organic roots
6	13:23	24	2 4 5 6	Depth Interval IS 745 HS 1826	8-12 Light olive brown [5Y 5/6] SILT and organic roots, moist, compact (meadow mat) 12-14 medium gray SILT with roots, moist, compact (meadow mat) 14-24 Light brown [5YR 5/6] meadow mat
8	13:27	0	2 2 5 12	Depth Interval IS N/A HS N/A	NO Recovery
10					

Notes

Arthur D Little

Soil Boring Log

Boring ID ASB193
Client Exxon
Project Bayway Phase IB
Case No. 37453

Date 4/20/99
Boring Depth 12'
Geologist Amy Lawrence

Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" Interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
10	13:45	24	6 12 14 14	Depth Interval IS 0 HS 0	0-22 Moderate brown [5YR 4/4] SILT 22-24 Moderate brown [5YR 4/4] SI LT some clay some gravel, poorly sorted, dry, well compacted (TILL)
12				Depth Interval IS HS	
14				Depth Interval IS HS	
16				Depth Interval IS HS	
18				Depth Interval IS HS	
20				Depth Interval IS HS	

Forms.xls

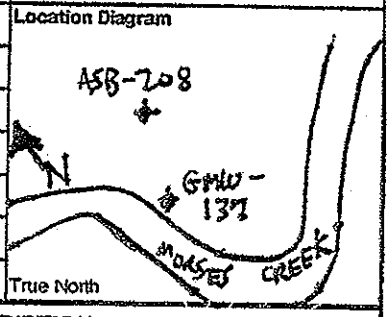
Arthur D Little

Soil Boring Log

Boring ID ASB-208
Client Exxon
Project Bayway Phase IB
Case No. 37453

Date 4/19/99	Contractor n/a
Bore Hole Diameter 3"	Drillers n/a
Boring Depth 2'	Hammer Weight n/a
Depth to Water 4'	Drill Method Hand auger
DP, WP, or MW installed? No	Sampling Method Hand auger
Geologist Sesha Vidyaw	Refusal? No
	Lithologic Category

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description
0	9:30 ASB208H2 Full grab	n/a	n/a	Depth Interval IS 5367 HS 1713	0-18" Black LOI silt, heavy/tar like material, compact, strong HC odor 18-24" Black LOI Organic matter, trace silt, wet
2				Depth Interval IS HS	
4				Depth Interval IS HS	
6				Depth Interval IS HS	
8				Depth Interval IS HS	
10					

Notes

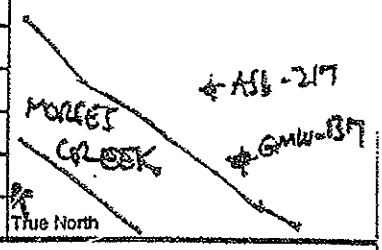
Arthur D Little

Soil Boring Log

Boring ID ASB-217
Client Exxon
Project Bayway Phase 3
Case No. 37453

Date 4/19/99	Contractor n/a
Bore Hole Diameter 3"	Drillers n/a
Boring Depth 2'	Hammer Weight n/a
Depth to Water 0.5'	Drill Method Hand Auger
DP, WP, or MW installed? No	Sampling Method Hand Auger
Geologist Sasha Vidyaev	Refusal? NO
	Lithologic Category

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description
0	11:15 [illegible] Full Suite	–	–	Depth Interval IS 395.7 HS 1862	0-9" black [10] SILT and tar-like material 9-24" black [10] organic matter, little silt
2				Depth Interval IS HS	
4				Depth Interval IS HS	
6				Depth Interval IS HS	
8				Depth Interval IS HS	
10					

Notes

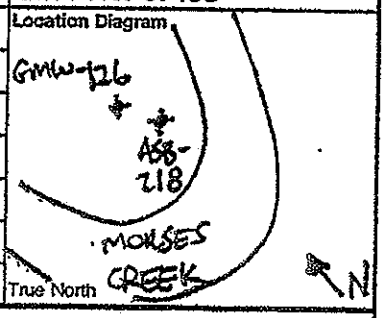
Arthur D Little

Soil Boring Log

Boring ID ASB-218
Client Exxon
Project Bayway Phase IB
Case No. 37453

Date 4/19/99	Contractor n/a
Bore Hole Diameter 3"	Drillers n/a
Boring Depth 2'	Hammer Weight n/a
Depth to Water 0.5'	Drill Method Hand auger
DP, WP, or MW installed? No	Sampling Method Hand auger
Geologist Sesha Vidhaw	Refusal? No
	Lithologic Category

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description
0	10:35 ASB218-12 Full Suite	–	–	Depth Interval IS 267.6 HS 1438	0-12" Black [10] SILT and tar-like material, compact, moist 12-24" Black [10] Organic matter, some silt, loose, wet
2				Depth Interval IS HS	
4				Depth Interval IS HS	
6				Depth Interval IS HS	
8				Depth Interval IS HS	
10					

Notes

Forms.xls

Arthur D Little

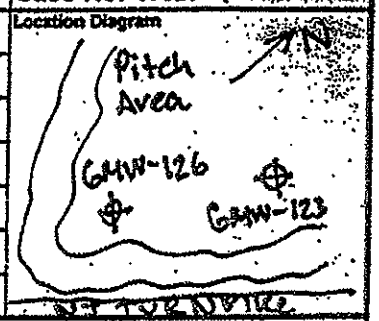
Soil Boring Log

GMW-123

Boring ID	GMW-123
Client	Exxon
Project	Bayway Phase IB
Case No.	57620

Date 11/13/98	Contractor CT & E
Bore Hole Diameter 6"	Drillers Nick Falluca, Sheann
Boring Depth 12'	Hammer Weight 140 lbs
Depth to Water 0.5'	Drill Method Hand Held Auger
DP, WP, or MW installed? MW	Sampling Method SS
Geologist Sasha Vidyaev	Refusal? No
	Lithologic Category

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
0	10:30	2"	3 2 2 4	Depth Interval IS 0.0 HS 0.0	0-2" Grayish brown [5YR 3/2] SILT, some fine sand, loose, dry
2	10:35 AMB12364	18"	2 1 1 3	Depth Interval IS 281.3 HS 533.2	0-3" black SILT and CLAY, trace organic matter loose, wet 3-18" Organic material (roots like) BLACK, trace clay and sand, loose, wet. Organic decay odor
4	10:41	24"	Pushed	Depth Interval IS 235.3 HS 168.5	0-4" Black SILT and fine SAND, dead sea shells, trace organic matter, loose, wet 4-24" Olive gray [5Y4/1] CLAY and Moderate yellow [5Y 7/6] organic matter (50%) loose, poorly sorted, wet. Strong organic decay odor.
6	10:52	24"	Pushed	Depth Interval IS 526.3 HS 998.7	0-6" Olive gray [5Y4/1] CLAY and moderate yellow [5Y7/6] organic material, loose, wet 6-24" Olive gray [5Y4/1] CLAY, trace organic material, compact, moist
8	11:03	24"	Pushed	Depth Interval IS 58.7 HS 93.4	0-10" Olive gray [5Y4/1] CLAY and organic material loose, wet - slough 10-24" Olive gray [5Y4/1] CLAY, trace organic (roots like) matter, compact, moist

GMW 123

Arthur D Little

Soil Boring Log

Boring ID CHW-[illegible]
Client Exxon
Project Bayway Phase IB
Case No. 57620

11/19/98

Boring Depth 12'

Geologist Sasha Vidyaev

Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
10	11:11	24"	Pushed	Depth Interval IS 20.1 HS 70.3	0-6" Olive gray [5Y4/1] CLAY and organic material, loose, wet - slough 6-24" Olive gray [5Y4/1] CLAY, trace (<5%) organic (roots like) material, compact, moist
12				Depth Interval IS HS	
14				Depth Interval IS HS	
16				Depth Interval IS HS	
18				Depth Interval IS HS	
20				Depth Interval IS HS	

Notes

Screen set @ 3-8'

Forms.xls

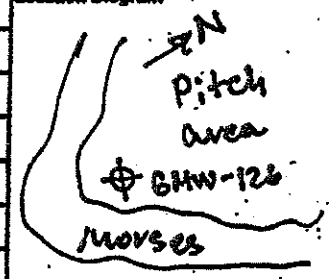
Arthur D Little

Soil Boring Log

Boring ID	GMW-126
Client	Exxon
Project	Bayway Phase IB
Case No.	57620

Date	11/12/98	Contractor	CT & E
Bore Hole Diameter	6"	Drillers	Nick Falluca, Sheaun
Boring Depth	12' (SS) 6' (Augered)	Hammer Weight	140 lbs
Depth to Water	0.5'	Drill Method	Hand Held Auger
DP, WP, or MW Installed?	MW	Sampling Method	SS
Geologist	Jasha Vidyaw	Refusal?	No
		Lithologic Category	

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
0	11:45 AMB12662 Full Suite	4"	1 1 1 1	Depth Interval IS 54.3 HS 585.3	0-2" Black asphalt like matter, strong hydrocarbon odor, compact, dry 2-4" Black SILT and CLAY, one trace organic material, compact, moist
2	11:52	18"	1 1 1 1	Depth Interval IS 14.9 HS 272.3	0-18" Black organic matter (roots like), trace silt and clay (+), loose, wet, strong organic decay odor.
4	11:59	18"	Pushed	Depth Interval IS 55 HS 75.3	0-4" Black organic matter (roots like), trace silt and clay, loose, wet. Strong organic decay odor 4-18" Dark gray, CLAY and SILT, trace organic (roots like) material, wet, loose
6	12:06	24"	Pushed	Depth Interval IS 27.2 HS 268.3	0-10" Black CLAY and SILT, trace organic matter wet - slough 10-24" Dark gray, CLAY, some silt, trace organic matter, compact, wet
8	12:16	24"	Pushed	Depth Interval IS 41.3 HS 78.9	0-2" Black organic matter (roots like), trace clay and silt, loose, wet - slough 2-24" Dark gray CLAY, some silt, trace organic matter (roots like), loose, wet.
10					

Notes

FORMS.XLS

Arthur D Little

Soil Boring Log

Boring ID GMW-12
Client Exxon
Project Bayway Phase IB
Case No. 57620

Date 11/12/98
Boring Depth 12'
Geologist Sasha Vidyaw

Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" Interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
10	12:49	24"	2 2 2 2	Depth Interval IS 17.9 HS 43.8	0-20" Dark gray, CLAY and SILT, trace organic matter, loose, wet 20-21" Grayish olive green [5GY 3/2] organic matter (roots like), dead sea shells, silt, compact, wet 21-24" Moderate brown [5YR 3/4] SILT, trace subangular granules, poorly sorted, compact, moist
12				Depth Interval IS HS	
14				Depth Interval IS HS	
16				Depth Interval IS HS	
18				Depth Interval IS HS	
20				Depth Interval IS HS	

Notes

Set screen 2.5 - 7.5'

Forms.xls

Arthur D Little

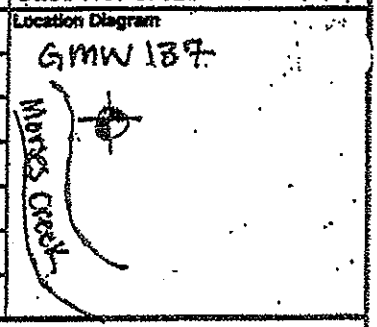
Soil Boring Log

Boring ID GMW 137
Client Exxon
Project Bayway Phase IB
Case No. 57620

Date 11/13/98
Bore Hole Diameter 6"
Boring Depth 11'
Depth to Water 2"
DP, WP, or MW installed? MW
Geologist Amy Laurence

Contractor CT&E
Drillers Bill Petley and Dave
Hammer Weight 140
Drill Method Hand Held Auger
Sampling Method SS
Refusal?
Lithologic Category

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=in Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
0	1030	0	1 1 1 1	Depth Interval IS HS	NO RECOVERY
2	1040		1	Depth Interval IS HS	NO RECOVERY
4	~~AMB13766~~ 1050 Full Suite	24"	1	Depth Interval IS 47 HS 227	0-24" Olive black [5Y 2/1] SILT and organic roots, wet, slight to medium hydrocarbon odor, peat (upper meadow mat)
6	1100	11"	1	Depth Interval IS 147 HS 210	0-11" Grayish brown [5YR 3/2] SILT and organic roots, wet, moderate hydrocarbon odor, peat, (upper meadow mat)
8	1110	11	1	Depth Interval IS 36 HS 559	0-8" Olive black [5Y 2/1] and Black, SILT and organic roots, wet, peat, (upper meadow mat) 8-11" Dark greenish gray [5GY 4/1] SILT and CLAY, wet, medium compaction, roots, hydrocarbon
10					

Notes

FORMS.XLS

Arthur D Little

Soil Boring Log

Boring ID GMW 137
Client Exxon
Project Bayway Phase IB
Case No. 57620

Date 11/13/98	Contractor
Bore Hole Diameter	Drillers
Boring Depth	Hammer Weight
Depth to Water	Drill Method
DP, WP, or MW installed?	Sampling Method
Geologist, M Laurence	Refusal?
	Lithologic Category

Location Diagram: See Page 1.

Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" Interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
10	1120	12"	3 11	Depth Interval IS 948 HS 1036	0-13" Grayish brown [5YR 3/2] SI LT with dominant roots, peat, sulfide odor 13-22" Dark greenish gray [5GY 4/1] SI LT some clay, moist, medium compaction, roots (lower meadow mat). 22-24" moderate brown [5YR 3/4] fine SAND some silt, well sorted, moist, medium compaction
11				Depth Interval IS HS	
				Depth Interval IS HS	
				Depth Interval IS HS	
				Depth Interval IS HS	

Notes

FORMS.XLS

Arthur D Little

Soil Boring Log

GMW-138

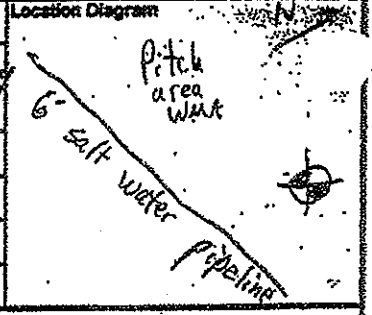
Boring ID

Client: Exxon
Project: Bayway Phase IB
Case No. 57620

Date: 11/13/98
Core Hole Diameter: 6"
Boring Depth: 8"
Depth to Water: 1"
DP, WP, or MW Installed? MW
Geologist: D. Brooks

Contractor: CT&E
Drillers: Nick Fallucca, Shawn Brady
Hammer Weight: 140"
Drill Method: Hand-held auger
Sampling Method: SS
Refusal? No
Lithologic Category: Meadow mat

Location Diagram



Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
0	2:10	10"	4 3 1 3	Depth Interval IS 92.3 HS 1385	0-2 Dusky brown 5YR 3/2 SILT, compact, dry 2-10 Black CLAY trace organic material, compact, moist, strong hydrocarbon odor
2	2:15	2"	1 1 2 1	Depth Interval IS 0.0 HS 114.3	0-2 Black SILT some organic matter, loose, moist, very sticky, strong hydrocarbon odor
4	2:20 AMB138G6 Max	10"	pushed	Depth Interval IS 217.4 HS 777.7	0-2 Black SILT trace organic material, compact, moist, strong hydrocarbon odor 2-10 Black SILT and organic material
6	2:30	12"	by hand	Depth Interval IS 23.7 HS 82.5	0-12 Black SILT and organic material, loose, wet, free product
8	2:35	24"		Depth Interval IS 116.0 HS 300.1	0:24 Black SILT and organic material, loose, wet
10					

Notes

Arthur D Little

Soil Boring Log

Boring ID	GMW-138
Client	Exxon
Project	Bayway Phase IB
Case No.	57620

Date	11/13/98	Contractor	Location Diagram: See Page 1.
Bore Hole Diameter		Drillers	
Boring Depth		Hammer Weight	
Depth to Water		Drill Method	
DP, WP, or MW installed?		Sampling Method	
Geologist	D. Brooks	Refusal?	
		Lithologic Category	

Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
10	2:40	24"	5 7 9 11	Depth Interval IS 90.0 HS 279.5	0-6 Olive black 5Y 2/1 SILT, loose, wet 6-14 Med. dark gray SILT trace organic material, compact, moist 14-24 Mod. brown 5YR 3/4 SILT some clay trace gravel ¼", compact, moist
12				Depth Interval IS HS	Screen set 3' to 8'
				Depth Interval IS HS	
				Depth Interval IS HS	
				Depth Interval IS HS	

Notes

FORMS.XLS

DAN RAVIV ASSOCIATES, INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-211
WELL PERMIT NUMBER

PROJECT NAME: ExxonMobil-Pitch Area
LOCATION: Linden, New Jersey
PROJECT NO.: 2141D
CONTRACTOR: CT&E

SAMPLER TYPE/DIA.: N/A
DEPTH TO BEDROCK: N/A
TOTAL DEPTH DRILLED: 8'
TYPE OF WELL: Monitoring
DRILLING METHOD: Solid Stem Auger
BIT TYPE: N/A

START DATE: 11/26/2002
FINISH DATE: 11/26/2002
DRILLER: Dave Marshall
LOGGED BY: Jason Fopiano

DEPTH FROM SURFACE (FEET)	DRILLING RATE (MIN/5 feet)		PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							2' Stickup from ground surface with screw cap
1							
2							
3							
4							
5							
6							
7							
8							
9							Bottom of Boring and Well at 8'
10							
11							Well Construction Details
12							0 to 3': 2" diameter PVC casing
							3 to 8': 2" diameter 20-slot PVC screen
							0 to 1.5': bentonite
							1.5 to 8': No. 1 sand pack

CASING TYPE/DIAMETER (IN.)
INNER: PVC/2" OUTER: --

STATIC WATER LEVEL: 4.3 (11/27/02) feet below surface
DEPTH WATER ENCOUNTERED: -- feet below surface

SCREENED OR OPEN INTERVAL: 3-8 (FEET BELOW SURFACE)

MEASURING POINT ELEVATION: -- feet above mean sea level
GROUND SURFACE ELEVATION: -- feet above mean sea level

DAN RAVIV ASSOCIATES, INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-212
WELL PERMIT NUMBER

PROJECT NAME: ExxonMobil-Pitch Area
LOCATION: Linden, New Jersey
PROJECT NO.: 2141D
CONTRACTOR: CT&E

SAMPLER TYPE/DIA.: N/A
DEPTH TO BEDROCK: N/A
TOTAL DEPTH DRILLED: 12'
TYPE OF WELL: Monitoring
DRILLING METHOD: Solid Stem Auger
BIT TYPE: N/A

START DATE: 11/26/2002
FINISH DATE: 11/26/2002
DRILLER: Dave Marshall
LOGGED BY: Jason Foplano

DEPTH FROM SURFACE (FEET)	DRILLING RATE (MIN/5 feet)		PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							2.5' Stickup from ground surface with screw cap
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							Bottom of Well at 9.5'
11							
12							End of Boring at 12'

Well Construction Details
0 to 4.5': 2" diameter PVC casing
4.5 to 9.5': 2" diameter 20-slot PVC screen
0 to 1.5': bentonite
1.5 to 9.5': No. 1 sand pack

CASING TYPE/DIAMETER (IN.)
INNER: PVC/2" OUTER: --

STATIC WATER LEVEL: 0.6 (11/27/02) feet below surface
DEPTH WATER ENCOUNTERED: -- feet below surface

SCREENED OR OPEN INTERVAL: 4.5-9.5 (FEET BELOW SURFACE)

MEASURING POINT ELEVATION: -- feet above mean sea level
GROUND SURFACE ELEVATION: -- feet above mean sea level

DAN RAVIV ASSOCIATES, INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-213

WELL PERMIT NUMBER

PROJECT NAME: ExxonMobil-Pitch Area
LOCATION: Linden, New Jersey
PROJECT NO.: 2141D
CONTRACTOR: CT&E

START DATE: 11/26/2002
FINISH DATE: 11/26/2002
DRILLER: Dave Marshall
LOGGED BY: Jason Fopiano

SAMPLER TYPE/DIA.: N/A
DEPTH TO BEDROCK: N/A
TOTAL DEPTH DRILLED: 12'
TYPE OF WELL: Monitoring
DRILLING METHOD: Solid Stem Auger
BIT TYPE: N/A

DEPTH FROM SURFACE (FEET)	DRILLING RATE (MIN/5 feet)		PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							2' Stickup from ground surface with screw cap
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							Bottom of Well at 10'
12							
							End of Boring at 12'

Well Construction Details
0 to 5': 2" diameter PVC casing
5 to 10': 2" diameter 20-slot PVC screen
0 to 2': bentonite
2 to 10': No. 1 sand pack

CASING TYPE/DIAMETER (IN.)
INNER: PVC/2" OUTER: --

STATIC WATER LEVEL: 2.7 (11/27/02) feet below surface
DEPTH WATER ENCOUNTERED: -- feet below surface

SCREENED OR OPEN INTERVAL: 5-10
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: -- feet above mean sea level
GROUND SURFACE ELEVATION: -- feet above mean sea level

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-500

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER:

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 2.5 Feet

DATE DRILLED 9/1/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Black, stained SILT, soft, slightly sticky, tr. Sand, tr. Organics, moist, odor
1		6				Same as above, strong odor
1.5		6				Same as above
2		6				1.5"-2" - Same as above 2"-6" - Dark brown slightly stained SILT, fluffy, tr. Organics, moist
2.5		6				0"-2" - Same as above 2"-4" - Slightly stained meadow mat 4"-6" - Gray CLAY, soft slightly stained at top, slightly moist
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-501

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 2 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 3 Feet
DATE DRILLED 9/1/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Black, sticky, rubber material 3"-6" - Black SILT, soft, fluffy, tr. Organics, slightly moist, slight odor
1		6				Brown black SILT, soft, fluffy, moist, tr. Organics, odor
1.5		6				Same as above
2		6				0"-4" - Black, fluffy, moist SILT, moist 4"-6" - Black sand and cinders, loose moist
2.5		0				No Recovery, very wet, water in boring
3		0				Same as above
3.5						Bottom of Boring at 3 Feet
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-502

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2.5 Feet
DATE DRILLED 9/2/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		4				0"-2" - Red brown SILT, tr. Sand, tr. Organics 2"-4" - Black SILT, soft, fluffy, tr. Organics. Black sticky rubber material at bottom with odor.
1		6				Black rubber, sticky material, soft with odor
1.5		6				0"-3" - Same as above, wet 3"-6" - Black SILT, tr Cinders, odor, wet, with tr black rubbery sticky material
2		6				Black SILT, soft, fluffy, tr. black rubbery sticky material on top, tr. Organics, very moist, odor
2.5		6				Black SILT, soft, fluffy, wet with odor, meadow mat on bottom, wet
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-503

Location Diagram

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 2.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 5 Feet

True North
DATE DRILLED 9/2/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown black sticky rubbery material, dry with tr. Fill-Sand, odor
1		6				Balck sticky rubbery material, tr. fine Sand, tr. black SILT, tr. Organics, slightly moist
1.5		6				Same as above
2		6				Same as above, moist
2.5		6				Same as above, very moist
3		6				Balck SILT with tr. black sticky rubbery material throughtout, tr. Organics, tr. fine Sand, wet, odor
3.5		6				Same as above with tr. Meadow mat on bottom
4		6				Meadow mat, organics, black sticky rubbery material throughout, very wet, odor
4.5		6				Same as above
5		0				No Recovery
						Bottom of Boring at 5 Feet

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-504

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 2 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 2.5 Feet

DATE DRILLED 9/2/2005

LOGGED BY. Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown black sticky rubbery material, with tr. Fill-Sand, tr. Organics, dry, slight odor
1		6				Black SILT with black sticky rubbery material throughout, tr. Organics, tr. Fill-Sand, moist, odor
1.5		0				No Recovery - Hole caving in
2		6				Black sticky rubbery material with tr. black SILT throughout, meadow mat on bottom
2.5		6				1.5"-2" - Black silty meadow mat, slightly loose, wet
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-505

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 2 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 4 Feet

DATE DRILLED 9/2/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6	ND			Brown sandy SILT, dry, tr. black sticky rubbery material
1		6	ND			Black sticky rubbery material, tr. brown sandy SILT, odor
1.5		6	ND			Same as above, slightly moist
2		6	10.5			Same as above, tr. Organics, tr. Meadow mat
2.5		6	ND			Black SILT, black sticky rubbery material, meadow mat, organics all throughout, wet
3		6	ND			Same as above
3.5		6	ND			Black SILT with meadow mat throughout, wet
4		6	ND			Black brown meadow mat, wet
4.5						Bottom of Boring at 4 Feet
5						

TRC RAVIV ASSOCIATES INC.

67 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-506

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet
DATE DRILLED 9/2/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black, sticky rubbery material, tr. Fill-Sand, slighlly moist on bottom
1		6				Black SILT with tr. black rubbery material, tr. Organics on bottom, very moist
1.5		6				Black soft fluffy SILT, tr. Organics, meadow mat on bottom, wet, odor
2		6				Black meadow mat with tr. black SILT, rope, wet, odor
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-507

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet
DATE DRILLED 9/2/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black, sandy SILT, dry, tr. black sticky rubbery material, odor
1		6				Black SILT, soft, fluffy, tr. black sticky rubbery material, moist, tr. Organics
1.5		6				Black SILT, soft, fluffy, tr. Meadow mat on bottom, wet
2		6				Black meadow mat, wet
2.5						Bottom of Boring at 2Feet
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER **ASB-508**

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 2 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 2.5 Feet

DATE DRILLED 9/13/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Black, brown SILT, tr. Organics, tr. black rubbery material, moist
1		6				Black, soft, fluffy SILT, organics throughout, tr. meadow mat on bottom, very moist
1.5		0				No recovery
2		0				No recovery
2.5		6				Black, soft SILT, meadow mat throughout, wet
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-509

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet
DATE DRILLED 9/7/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Red brown sandy SILT, slightly moist
1		6				Black SILT, soft, fluffy, tr. sticky rubbery material, tr. Organics, moist, odor
1.5		6				0"-3" - Black SILT, soft, fluffy, tr. Organics, odor, wet 3"-6" - Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-510

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED 9/7/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Red brown sandy SILT, loose, tr. Organics, black SILT, soft, fluffy, tr. black sticky ruberry material on bottom
1		6				Black SILT, soft, fluffy, tr. black sticky rubbery material, tr. Organics, moist, odor
1.5		6				0"-2" - Black SILT, fluffy, soft, wet, odor 2"-6" - Brown black meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-511

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet
DATE DRILLED 9/7/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Red brown sandy SILT, loose, dry 3"-6" - Black SILT, soft, fluffy, tr. Organics, slightly moist, odor
1		6				Black sticky rubbery material, tr. black SILT, moist, odor
1.5		6				Black soft, fluffy SILT, tr. Organics, black meadow mat on bottom, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-512

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet

DATE DRILLED 9/7/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Red, brown sandy SILT, loose, dry
1		6				Black soft, fluffy SILT, tr. Organics, tr. black sticky rubbery material, moist, odor
1.5		6				Black sticky rubbery material, moist, odor, tr. black SILT, tr. meadow mat on bottom
2		4				0"-2" - Black sticky rubbery material, tr. black SILT, moist, odor 2"-4" - Black to brown meadow mat, wet
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-513

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet
DATE DRILLED 9/12/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-4" - Brown, sandy SILT, tr. brown, black sticky rubbery material, dry 4"-6" - Black rubbery material, dry
1		6				Black sticky rubbery material, tr. brown SILT
1.5		6				0"-3" - Black, sticky rubbery material, tr. Organics, tr. SILT, moist 3"-6" - Greenish, black meadow mat, tr. Organics, tr. SILT, wet
2		6				0"-1" - Black sticky rubbery material, tr. SILT, tr. Organics, wet 1"-6" - Brown, yellow meadow mat, wet
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-514

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet
DATE DRILLED: 9/7/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-1" - Brown, black, dry, rubbery material 1"-6" - Black SILT, soft, fluffy, tr. Organics
1		6				Black SILT with black sticky rubbery material throughout, tr. Organics, moist, odor
1.5		6				Same as above
2		6				0"-2" - Black SILT, soft, fluffy, tr. Organics, tr. meadow mat, wet, odor 2"-6" - Brown, black meadow mat, wet
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-515

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 1 Feet

DATE DRILLED: 9/8/2005

LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown SILT, dry 2"-6" - Black, sticky rubbery material, organics throughout, tr. meadow mat on bottom
1		6				Black brown meadow mat, wet
1.5						Bottom of Boring at 1 Feet
2						
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-516

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 1 Feet

DATE DRILLED 9/8/2005

LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown SILT, dry 2"-6" - Black, sticky rubbery material, organics throughout, tr. meadow mat on bottom
1		6				Black brown meadow mat, wet
1.5						Bottom of Boring at 1 Feet
2						
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-517

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 2 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2.5 Feet
DATE DRILLED 9/13/2005
LOGGED BY. Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, sandy SILT, tr. black rubbery material, dry, loose
1		6				0"-3" - Black, soft, fluffy SILT 3"-6" - Black, sticky rubbery material, tr. Organics, tr. meadow mat, very moist
1.5		0				No recovery
2		0				No recovery
2.5		6				Yellowish, brown meadow mat, tr. brown SILT, wet
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-518

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 8 Feet
DATE DRILLED: 9/9/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, sandy SILT, some black sticky material, dry 3"-6" - Black, soft, fluffy SILT, some black sticky rubbery material, slightly moist
1		6				Black SILT, soft, moist, tr. black, sticky rubbery material, tr. Organics, tr. meadow mat, very moist
1.5		6				Black SILT, organics, meadow mat throughout, wet
2		0				No recovery
2.5		0				No recovery
3		0				No recovery
3.5		0				No recovery
4		0				No recovery
4.5		0				No recovery
5		6				Black, brown meadow mat, organics, roots, wet

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SOIL BORING LOG

BORING NUMBER
ASB-518

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 8 Feet
DATE DRILLED 9/9/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
5						
5.5		0				No recovery, very wet - very small amount meadow mat on Auger tip, possible fall in
6		0				No recovery, very wet - very small amount meadow mat on Auger tip, possible fall in
6.5		0				No recovery, very wet - very small amount meadow mat on Auger tip, possible fall in
7		0				No recovery, very wet - very small amount meadow mat on Auger tip, possible fall in
7.5		0				No recovery, very wet - very small amount meadow mat on Auger tip, possible fall in
8		0				No recovery, very wet - very small amount meadow mat on Auger tip, possible fall in
8.5						Bottom of Boring at 8 Feet
9						
9.5						
10						

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SOIL BORING LOG

BORING NUMBER
ASB-519

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED 9/8/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black, sticky rubbery material, odor
1		6				Black, sticky, rubbery material, odor, wet, tr. meadow mat on bottom
1.5		6				0"-1" - Black sticky rubbery material 1"-6" - Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-520

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 1.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 2.5 Feet

DATE DRILLED 9/7/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-1" - Dry, brown, black rubbery material 1"-6" - Brown, black, sandy SILT, dry, tr. black sticky rubbery material, odor
1		6				Black, sticky rubbery material, moist, odor, tr. black SILT
1.5		6				Same as above, tr. fine sand
2		6				Brown, black sandy SILT, loose, wet
2.5		6				Brown sand, tr. SILT, loose, wet
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-521

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 3 Feet
DATE DRILLED 9/8/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6	194			0"-1" - Black, brown, sticky rubbery material, dry 1"-3" - Black, brown, sticky rubbery material, moist 3"-6" - Black, soft, fluffy, SILT, tr. Organics, moist
1		6	369			Black, soft, fluffy SILT with black sticky rubbery material throughout, tr. Organics, moist
1.5		6	917			Same as above
2		6	72			0"-2" - Black, soft, fluffy SILT, wet, organics throughout 2"-6" - Blackish brown meadow mat
2.5		0				No recovery
3		0				No recovery, resealed hole
3.5						Bottom of Boring at 3 Feet
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-522

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 8 Feet
DATE DRILLED 9/9/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown, black, sticky rubbery material, dry 2"-6" - Black, soft, fluffy SILT, organics, roots throughout, moist
1		6				0"-2" - Black, soft, flufiy SILT, organics, roots throughout 2"-6" - Greenish, brown SILT, soft, tr. roots, meadow mat throughout
1.5		6				Brown meadow mat, wet, tr. greenish, brown SILT
2		6				Same as above
2.5		6				Brownish meadow mat, wet
3		6				Same as above
3.5		6				Same as above
4		0				No recovery
4.5		0				No recovery
5		0				No recovery

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SOIL BORING LOG

BORING NUMBER
ASB-522

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 8 Feet
DATE DRILLED: 9/9/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
5						
5.5		0				No recovery
6		0				No recovery
6.5		0				No recovery
7		0				No recovery
7.5		0				No recovery
8		0				No recovery
8.5						Bottom of Boring at 8 Feet
9						
9.5						
10						

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SOIL BORING LOG

BORING NUMBER
ASB-523

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED 9/8/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, sandy SILT, dry 3"-6" - Brown, black, sticky rubbery material, odor, slightly moist
1		6				0"-4" - Black meadow mat with black sticky rubbery material, odor, wet 4"-6" - Brown, black meadow mat, wet
1.5		6				Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-524

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED: 9/8/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, black, sticky rubbery material, dry, crusty, odor 3"-6" - Brown, black, sticky rubbery material with tr. meadow mat, moist, odor
1		6				Black, brown meadow mat, tr. black sticky rubbery material throughout, wet, odor
1.5		6				Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-525

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED 9/8/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6	7.2			0"-3" - Brown, sandy SILT, dry 3"-6" - Brown, black, sticky rubbery material, odor, slightly moist
1		6	7.2			0"-4" - Black meadow mat with black sticky rubbery material, odor, wet 4"-6" - Brown, black meadow mat, wet
1.5		6	7.2			Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-526

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 3 Inches
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1 Feet

DATE DRILLED: 9/8/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				1"-3" - Brown sandy SILT, dry, tr. black sticky rubbery material 3"-6" - Brown black SILT, moist, tr. black sticky material, tr. Organics, wet, odor
1		6				Black, brown, meadow mat, wet
1.5						Bottom of Boring at 1 Feet
2						
2.5						
3						
3.5						
4						
4.5						
5						

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57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-527

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 3 Inches

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 1 Feet

DATE DRILLED. 9/8/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, black SILT, tr. Organics, dry 3"-6" - Blackish gray clayes, SILT, tr. Organics, blackish meadow mat, wet
1		6				Blackish, brown meadow mat, wet
1.5						Bottom of Boring at 1 Feet
2						
2.5						
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-528

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 5 Inches

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED: 9/8/2005

LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown, black sticky rubbery material, dry 2"-5" - Organics, roots, very moist 5"-6" - Brown meadow mat, wet
1		0				No recovery
1.5		6				Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-529

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 5 Inches
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet
DATE DRILLED 9/8/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown, black sticky rubbery material, dry 2"-5" - Organics, roots, very moist 5"-6" - Brown meadow mat, wet
1		0				No recovery
1.5		6				Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-530

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 3 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 3.5 Feet

DATE DRILLED 9/8/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown SILT, loose, slightly moist 3"-6" - Black, soft, fluffy, SILT, tr. black sticky material, moist
1		6				Black, soft, fluffy SILT, tr. organics throughout, moist, tr. black sticky material
1.5		6				Black, soft, fluffy SILT, tr. organics throughout, moist
2		6				Black, soft, fluffy, SILT, tr. Organics, very moist
2.5		6				Black, soft, fluffy, SILT, tr. Organics, very moist, tr. fine sand
3		6				Black, fluffy, SILT, very moist, organics and meadow mat throughout
3.5		6				Brown meadow mat, wet, tr. black SILT at the top
4						Bottom of Boring at 3.5 Feet
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-531

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 5 Inches
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet
DATE DRILLED 9/8/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown, black sticky rubbery material, dry 2"-5" - Organics, roots, very moist 5"-6" - Brown meadow mat, wet
1		0				No recovery
1.5		6				Brown meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

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SOIL BORING LOG

BORING NUMBER
ASB-532

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet
DATE DRILLED: 9/12/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown sandy-silt, dry, loose 3"-6" - Black rubber material, tr. Brown silt, moist, soft
1		6				0"-6" - Black meadow mat, some organics, tr. Wood, some black sticky silt, bottom 3" very moist, soft
1.5		6				0"-1" Same as above 1"-6" Yellowish brown meadow mat, little grey-clay, wet, soft
2		2				0"-2" - Yellowish brown meadow mat, little grey-clay, wet, soft
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-533

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet
DATE DRILLED: 9/12/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown, black rubbery material, some SILT, dry 2"-6" - Black, fluffy, soft SILT with black sticky rubbery material throughout, tr. Organics, slightly moist
1		6				Black, soft, fluffy SILT, tr. black rubbery material, tr. Organics, moist
1.5		6				0"-2" - Black SILT, organics and peat throughout, moist 2"-6" - Greenish, brown meadow mat, tr. roots, tr. SILT, wet
2		6				Grayish, brown meadow mat, gray clayey SILT throughout, wet
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-534

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 4 Feet

DATE DRILLED: 9/12/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-4" - Brown, sandy silt, trace fine to medium gravel, dry, loose 4"-6" - Black, sticky rubbery material
1		1				0"-1" - Black,sticky rubbery material, some black meadow mat, wet
1.5		0				No Recovery
2		4				0"-4" - Black meadow mat, little black rubbery material, wet
2.5		0				No Recovery
3		0				No Recovery
3.5		3				0"-3" - Brown to yellowish green meadow mat, trace black silt, wet
4		6				0"-6" - Yellowish green meadow mat, very moist
4.5						Bottom of Boring at 4 Feet
5						

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SOIL BORING LOG

BORING NUMBER
ASB-535

Location Diagram

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER:

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 2 Feet

True North

DATE DRILLED: 9/12/2005

LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-1" - Brown, sandy SILT, tr. fine-medium gravel 1"-6" - Black, sticky, rubbery material, tr. brown SILT
1		6				Black, sticky rubbery material, moist, soft
1.5		6				0"-2" - Black rubbery material 2"-6" - Black, brown meadow mat, some black rubbery material, moist, soft
2		6				0"-1" - Black meadow mat, some black rubbery material 2"-6" - Yellowish, green meadow mat, very moist, soft
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-536

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 2 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2.5 Feet
DATE DRILLED 9/8/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-2" - Brown black sticky rubbery material, dry 2"-6' - Black, soft, fluffy, SILT
1		6				Black, soft, fluffy, SILT, tr. Organics, tr. shells, moist
1.5		6				Same as above
2		6				Black silty clay, tr. Organics, tr. shells, soft, moist
2.5		6				0"-2" - Black silty clay, moist 2"-6" - Black, brown meadow mat, wet
3						Bottom of Boring at 2.5 Feet
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-537

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 2.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 3.5 Feet
DATE DRILLED 9/12/2005
LOGGED BY. Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-1" - Brown, black rubbery material, tr. brown SILT, dry 1"-6" - Black, soft, fluffy SILT, some black sticky rubbery material, tr. Organics, slightly moist
1		6				Black, soft, fluffy SILT, tr. black sticky rubbery material and organics throughout, moist
1.5		6				Black, soft, fluffy SILT, tr. Organics throughout, moist
2		6				Same as above
2.5		6				Same as above
3		6				Black, soft, fluffy SILT, meadow mat and organics throughout, tr. grayish clayey SILT, wet
3.5		6				Grayish brown meadow mat, grayish clayey SILT throughout, soft, wet
4						Bottom of Boring at 3.5 Feet
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-538

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED 9/12/2005
LOGGED BY: Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black, sticky rubbery material, tr. Organics, tr. roots, dry to moist
1		6				Blackish, brown SILT, soft, moist, tr. fine sand, organics and roots on bottom, wet
1.5		6				0"-1" - Brown SILT, loose, wet, tr. fine sand, roots, organics 1"-6" - Brownish yellow meadow mat, wet
2						Bottom of Boring at 1.5 Feet
2.5						
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-539

Location Diagram

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 4 Feet

True North
DATE DRILLED. 9/13/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, black, sticky rubbery material, dry 3"-6" - Red, brown to black SILT, tr. fine sand, slightly moist
1		6				Red, brown to black SILT, soft, tr. fine sand, very moist
1.5		6				Red, brown to black SILT, soft, tr. fine sand, very moist
2		6				Brown, black clayey SILT, tr. Organics, soft, wet
2.5		4				Greenish, black meadow mat, some black SILT, tr. Organics, wet
3		0				No recovery
3.5		0				No recovery
4		6				Orange, brown meadow mat, tr. brown, black SILT, wet
4.5						Bottom of Boring at 4 Feet
5						

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SOIL BORING LOG

BORING NUMBER
ASB-540

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1.0 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 7 Feet
DATE DRILLED 9/12/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-4" - Brown sandy-silt, little organics, dry 4"-6" - Black, rubbery, sticky material, slightly moist
1		6				0"-4" - Black, rubbery, sticky material 4"-6" - Red brown sandy-silt, some fine to medium gravel
1.5		6				Same as above, trace black, rubbery material, moist
2		6				0"-3" - Same as above 3"-6" - Black meadow mat
2.5		0				No Recovery
3		0				No Recovery
3.5		4				0"-4" - Red brown to black silt, trace fine sand, little fine to medium gravel
4		0				No Recovery
4.5		2				0"-2" - Brownish yellow meadow mat, some black silt
5		0				No Recovery

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SOIL BORING LOG

BORING NUMBER
ASB-540

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 7 Feet
DATE DRILLED 9/12/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
5						
5.5		0				No Recovery
6		0				No Recovery
6.5		0				No Recovery
7		3				0"-3" - Yellowish brown meadow mat, trace brown silt
7.5						Bottom of Boring at 7 Feet
8						
8.5						
9						
9.5						
10						

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SOIL BORING LOG

BORING NUMBER
ASB-541

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 1.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 3 Feet
DATE DRILLED 9/12/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, sandy-silt, trace fine gravel, loose, dry 3"-6" - Black sticky, rubbery, moist, soft
1		0				No Recovery
1.5		4				0"-2" - Black, rubbery material, soft, moist 2"-4" - Black meadow mat
2		2				0"-2" - Black meadow mat, very moist
2.5		5				0"-2" - Black meadow mat, black clayey-silt, wet, soft 2"-5" - Brownish yellow meadow mat, trace black silt, wet, soft
3		2				0"-2" - Brownish yellow meadow mat
3.5						Bottom of Boring at 3 Feet
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-542

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 2 Feet

DATE DRILLED 9/13/2005
LOGGED BY. Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black, sandy SILT, tr. brown, black rubbery material throughout, tr. Organics and meadow mat on bottom, moist
1		2				0"-2" - Blackish, green meadow mat, wet, tr. SILT
1.5		0				No recovery
2		6				Yellowish, brown meadow mat, tr. SILT, wet
2.5						Bottom of Boring at 2 Feet
3						
3.5						
4						
4.5						
5						

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SOIL BORING LOG

BORING NUMBER
ASB-543

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 1 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 1.5 Feet

DATE DRILLED 9/13/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Red, brown, fine-medium weathered rock shale, tr. red, brown SILT, slightly moist, loose
1		6				Red, brown, fine-coarse weathered rock shale, red, brown SILT throughout, moist
1.5		6				Same as above, wet
						Bottom of Boring at 1.5 Feet
2						
2.5						
3						
3.5						
4						
4.5						
5						

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57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-544

Location Diagram

True North

PROJECT NAME: Pitch Area RAW
LOCATION: Linden, New Jersey
PROJECT NO.: 2555
CONTRACTOR: SGS
SAMPLER TYPE/DIA.: Macrocore/2"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Geoprobe
TOTAL DEPTH DRILLED: 3.5 Feet
DATE DRILLED: 9/13/2005
LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Black, brown, sticky rubbery material, organics throughout, tr. black SILT, dry to moist 3"-6" - Black, soft, fluffy SILT, tr. black rubbery material, organics and peat on bottom
1		6				Black peat, tr. black SILT, organics throughout, wet
1.5		0				No recovery
2		0				No recovery
2.5		0				No recovery
3		0				No recovery
3.5		6				Yellowish, brown meadow mat, tr. brown SILT, wet
4						Bottom of Boring at 3.5 Feet
4.5						
5						

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SOIL BORING LOG

BORING NUMBER **ASB-545**

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 3 Feet

DATE DRILLED 9/13/2005

LOGGED BY. Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Black, brown, sticky rubbery material, organics throughout, dry
1		6				0"-3" - Black, soft, fluffy SILT, tr. black sticky rubbery material, moist 3"-6" - Brown, black peat, roots, meadow mat, wet
1.5		3				3"-6" - Same as above
2		0				No recovery
2.5		0				No recovery
3		3				3"-6" - Yellowish, brown meadow mat, tr. brown, black SILT, wet
3.5						Bottom of Boring at 3 Feet
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-546

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 2.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 3 Feet

DATE DRILLED: 9/13/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black, sticky rubbery material, very elastic
1		6				Black, very soft, sticky rubbery material
1.5		6				Black, sticky, soft, rubbery material, very loose (filling in hole)
2		6				Same as above
2.5		6				Same as above
3		6				Black, sticky, soft, rubbery material, very loose (filling in hole), yellowish, brown meadow mat, tr. grayish, brown clayey SILT, wet
3.5						Bottom of Boring at 3 Feet
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-548

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 3 Feet

DATE DRILLED. 9/13/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				0"-3" - Brown, sandy SILT, tr. black rubbery material, dry 3"-6" - Black, soft, fluffy SILT, tr. black sticky rubbery material, tr. Organics and peat on bottom, moist
1		6				Black, soft, fluffy SILT, organics, peat, meadow mat throughout, wet
1.5		0				No Recovery
2		0				No Recovery
2.5		0				No Recovery
3		6				Yellowish, brown meadow mat, tr. brown SILT throughout, wet
3.5						Bottom of Boring at 3 Feet
4						
4.5						
5						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-549

Location Diagram

True North

PROJECT NAME: Pitch Area RAW

LOCATION: Linden, New Jersey

PROJECT NO.: 2555

CONTRACTOR: SGS

SAMPLER TYPE/DIA.: Macrocore/2"

DEPTH TO WATER: 1 Feet

BORING METHOD: Geoprobe

TOTAL DEPTH DRILLED: 2.5 Feet

DATE DRILLED: 9/13/2005

LOGGED BY Tom Buccheri

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
0.5		6				Brown, black SILT, tr. fine sand, black rubbery material throughout, organics throughout, slightly moist
1		6				Black SILT, soft, black sticky rubbery material throughout, organics throughout, moist
1.5		2				2"of silty black meadow mat, wet
2		0				No recovery
2.5		6				Yellowish, brown meadow mat, tr. brown SILT, soft, wet
						Bottom of Boring at 2.5 Feet
3						
3.5						
4						
4.5						
5						

Arthur D Little

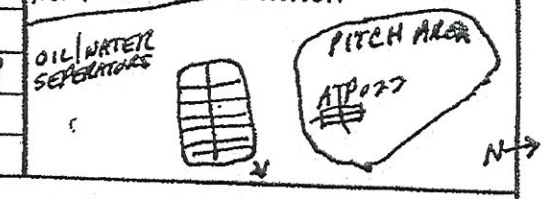
EXCAVATION PROFILE LOG

PITCH AREA (UNIT A)

Client	EXXON
Project	WMA
Case No.	57620
Date	8/1/96

Date Start	8/1/96	Contractor	NA
Date Complete	8/1/96	Heavy Equipment	580 CASE EXTENDAHOE
Sampling Method	BACK HOE	Geologist	ANTHONY BRANCO / CAROLYN MAYER
Pit Dimensions (LxWxD)	(13' X 7 X 4')	Vapor Monitoring Device	FID, LEL
Pit Orientation (include wall depicted)	N-S		

NJ. TURNPIKE LOCATION



HEAD SPACE

EXCAVATION

ATP002

1544 ppm

0 - 4' [CH] DUSKY BROWN (5YR 2/2) SILTY CLAY W/ LITTLE PEBBLES AND COARSE GRAVEL. BLACK STAINING, STRONG HC ODOR.

4' - 4' BLACK INTERMITTENT VERY VISCOUS, VERY HIGH PLASTICITY, WET, VERY STRONG HC ODOR, PRODUCT SATURATED FILL. WITH MOD. REDDISH BROWN SAND, WET, LOOSE, WELL SORTED, FILL MATERIAL.

BOTTOM OF TEST PIT

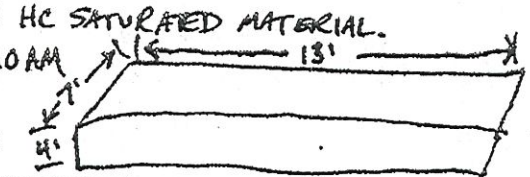
Scale (1 inch = 1.65 feet)

SOIL PROFILE

Scale (1 inch = 1.65 feet)

Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

COULD NOT MAINTAIN INTEGRITY OF TEST PIT DUE TO CONSTANT FALL IN OF PLASTIC, BLACK HC SATURATED MATERIAL.
MAX. CONTAMINATION SAMPLE COLLECTED AT 2-2-4' INTERVAL (ATP002B4). 09:10 AM
2-4' HEADSPACE UNATTAINABLE DUE TO MALFUNCTIONING FID.
NO DEFINITE HORIZONS WERE VISIBLE EXCEPT FOR FIRST 4 INCHES. 4"-4' BLACK HC SATURATED FILL AND SANDY FILL WERE VERY MIXED IN DEPTH AND THICKNESS.



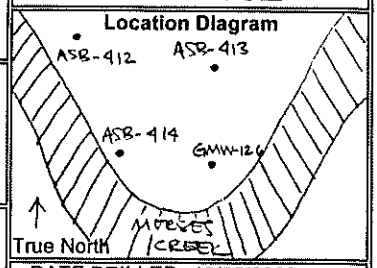
Was pit/Trench Photographed (Y/N) Y	Type and Number of Samples Collected 1 SET OF FULL SUITE ANALYSES

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-412



PROJECT NAME: Bayway BEE
LOCATION: Linden, New Jersey
PROJECT NO.: 2259A
CONTRACTOR: NA
SAMPLER TYPE/DIA.: Bucket Auger/3"
DEPTH TO WATER: 0.5 Feet
BORING METHOD: Hand Augering
TOTAL DEPTH DRILLED: 2 Feet

DATE DRILLED: **12/23/2003**
DRILLER: **NA**
LOGGED BY: **Eric Baumgarten**

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
1		6	ND	ASB412K0	OL	Dark brown and black SILT and ORGANICS, strong odors
2						
3						Bottom of Boring at 2 Feet
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

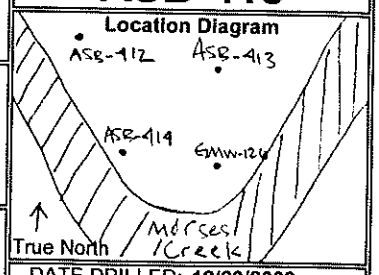
TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-413

Location Diagram



PROJECT NAME: Bayway BEE

LOCATION: Linden, New Jersey

PROJECT NO.: 2259A

CONTRACTOR: NA

SAMPLER TYPE/DIA.: Bucket Auger/3"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Hand Augering

TOTAL DEPTH DRILLED: 2 Feet

DATE DRILLED: **12/23/2003**
DRILLER: **NA**
LOGGED BY: **Eric Baumgarten**

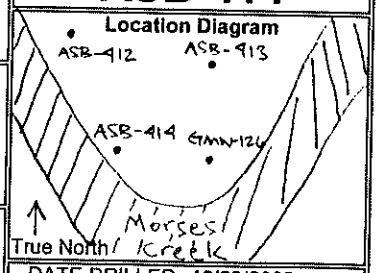
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
1		6	ND	ASB413K0	OL	Dark brown and black SILT and ORGANICS, strong odors
2						
3						Bottom of Boring at 2 Feet
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

TRC RAVIV ASSOCIATES INC.

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

SOIL BORING LOG

BORING NUMBER
ASB-414



PROJECT NAME: Bayway BEE

LOCATION: Linden, New Jersey

PROJECT NO.: 2259A

CONTRACTOR: NA

SAMPLER TYPE/DIA.: Bucket Auger/3"

DEPTH TO WATER: 0.5 Feet

BORING METHOD: Hand Augering

TOTAL DEPTH DRILLED: 2 Feet

DATE DRILLED: **12/23/2003**
DRILLER: **NA**
LOGGED BY: **Eric Baumgarten**

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0						
1		6	ND	ASB414K0	OL	Dark brown and black SILT and ORGANICS, strong odors
2						
3						Bottom of Boring at 2 Feet
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-647
WELL PERMIT NUMBER
E201206851

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

START DATE: 06/19/13
FINISH DATE: 06/19/13
DRILLER: D. Dugan
LOGGED BY: Z. Oliver

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 3' bgs
2				No Samples Collected			0 to 8' - Black and brown SAND, some silt and clay
4							
6							
8							End of boring at 8'

Well Construction Details
0 to 3 ft. below surface - 2" diameter PVC riser
3 to 8 ft. below surface - 2" diameter 0.01 slot PVC screen
0 to 8 ft. below surface - No. 00 Sand

CASING TYPE/DIAMETER (IN.)
INNER: 4 OUTER: NA

STATIC WATER LEVEL: 2.31 (07/12/13) feet below surface
DEPTH WATER ENCOUNTERED: 6.83 feet below surface

SCREENED OR OPEN INTERVAL: 3 - 8
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 6.14 ft., msl
GROUND SURFACE ELEVATION: 3.90 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-648
WELL PERMIT NUMBER
E201206852

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: NA
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

START DATE: 06/19/13
FINISH DATE: 06/19/13
DRILLER: D. Dugan
LOGGED BY: Z. Oliver

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 5' bgs
2				No Samples Collected			0 to 10' - Black and brown SILT, some clay and sand
4							
6							
8							
10							End of boring at 10'

Well Construction Details
0 to 5 ft. below surface - 2" diameter PVC riser
5 to 10 ft. below surface - 2" diameter 0.01 slot PVC screen
0 to 10 ft. below surface - No. 00 Sand

CASING TYPE/DIAMETER (IN.)
INNER: 2 OUTER: 6

STATIC WATER LEVEL: 2.40 (08/01/12) feet below surface
DEPTH WATER ENCOUNTERED: 9.13 feet below surface

SCREENED OR OPEN INTERVAL: 5 - 10
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 6.50 ft., msl
GROUND SURFACE ELEVATION: 3.80 ft., msl

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WELL LOG

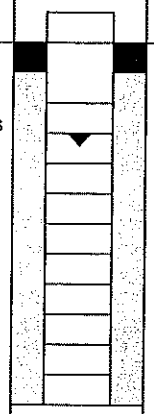
WELL NUMBER
GMW-649
WELL PERMIT NUMBER
E201206853

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: Not Encountered
TOTAL DEPTH DRILLED: 12 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

START DATE: 11/01/13
FINISH DATE: 11/01/13
DRILLER: William Petley
LOGGED BY: M. Bastidas

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 3' bgs
2				No Samples Collected			0 to 1' - Dark brown SILT, some medium to fine sand 1 to 9' - Impacted PEAT
4							
6							
8							
10							9 to 12' - Dark grey SILT, some clay
12							
							End of boring at 12'



Well Construction Details
0 to 2 ft. below surface - 2" diameter PVC riser
2 to 12 ft. below surface - 2" diameter 0.01 slot PVC screen
1 to 12 ft. below surface - No. 1 Sand
0 to 1 ft. below surface - cement grout

CASING TYPE/DIAMETER (IN.)
INNER: 2 OUTER: 6

STATIC WATER LEVEL: 0.36 (12/10/13) feet below surface
DEPTH WATER ENCOUNTERED: 1.50 feet below surface

SCREENED OR OPEN INTERVAL: 2 - 12
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 6.96 ft., msl
GROUND SURFACE ELEVATION: 4.00 ft., msl

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

WELL NUMBER
GMW-650
WELL PERMIT NUMBER
E201206854

PROJECT NAME: Eco RI
LOCATION: Bayway Refinery, Linden, New Jersey
PROJECT NO.: 200097
CONTRACTOR: SGS

START DATE: 10/29/13
FINISH DATE: 10/29/13
DRILLER: William Petley
LOGGED BY: M. Bastidas

SAMPLER TYPE/DIA.: 4" Hand Auger
DEPTH TO BEDROCK: Not Encountered
TOTAL DEPTH DRILLED: 10 feet
TYPE OF WELL: Monitoring
DRILLING METHOD: Manual/Hand Auger
BIT TYPE: NA

DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							3.0' stickup above ground surface, 6.0" outer casing from 1' bgs to 3' bgs
			9.6				0 to 5' - Dark brown SILT, some medium to fine sand, layer of product
2			ND				
			ND	No Samples Collected			
4			ND				
			40.5				
6			ND				5 to 10' - Impacted PEAT
			ND				
8			ND				
			ND				
10			ND				10 ft. Dark grey SILT with some clay
							End of boring at 12'

Well Construction Details
0 to 5 ft. below surface - 2" diameter PVC riser
5 to 10 ft. below surface - 2" diameter 0.01 slot PVC screen
4 to 10 ft. below surface - No. 1 Sand
3 to 4 ft. below surface - cement grout

CASING TYPE/DIAMETER (IN.)
INNER: 2 OUTER: 6

STATIC WATER LEVEL: 6.05 (12/12/13) feet below surface
DEPTH WATER ENCOUNTERED: 1.50 feet below surface

SCREENED OR OPEN INTERVAL: 5 - 10 (FEET BELOW SURFACE)

MEASURING POINT ELEVATION: 9.32 ft., msl
GROUND SURFACE ELEVATION: 6.70 ft., msl

Arthur D Little

Soil Boring Log

Boring ID ASB-123
Client Exxon
Project Bayway Pha
Case No. 37453

Date 4/13/99
Boring Depth 14'
Geologist Sasha Vidyaev

Scale in Feet	SAMPLE Time, Sample ID, Type	Recovery	Blows/6"	Max 6" interval VOC (ppm) IS=In Spoon HS=Headspace	GEOLOGIC DESCRIPTION Burmeister Soil Class ID, color (Munsell Number), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen, presence of waste materials), stratigraphic type and general description.
10	9:51	9"	8 4 4 5	Depth Interval IS 513.7 HS 520.5	0-9" Olive black [5Y2/1] SILT and organic matter (roots like), loose, wet
12	9:56	19"	5 4 6 8	Depth Interval IS 335.5 HS 1306	0-2" Sloughy 2-14" Olive black [5Y2/1] SILT and organic matter (peat), compact, moist 14-19" Dark gray [N3] CLAY
14				Depth Interval IS HS	
16				Depth Interval IS HS	
18				Depth Interval IS HS	
20				Depth Interval IS HS	
22					

Notes

Dan Raviv Associates, Inc.

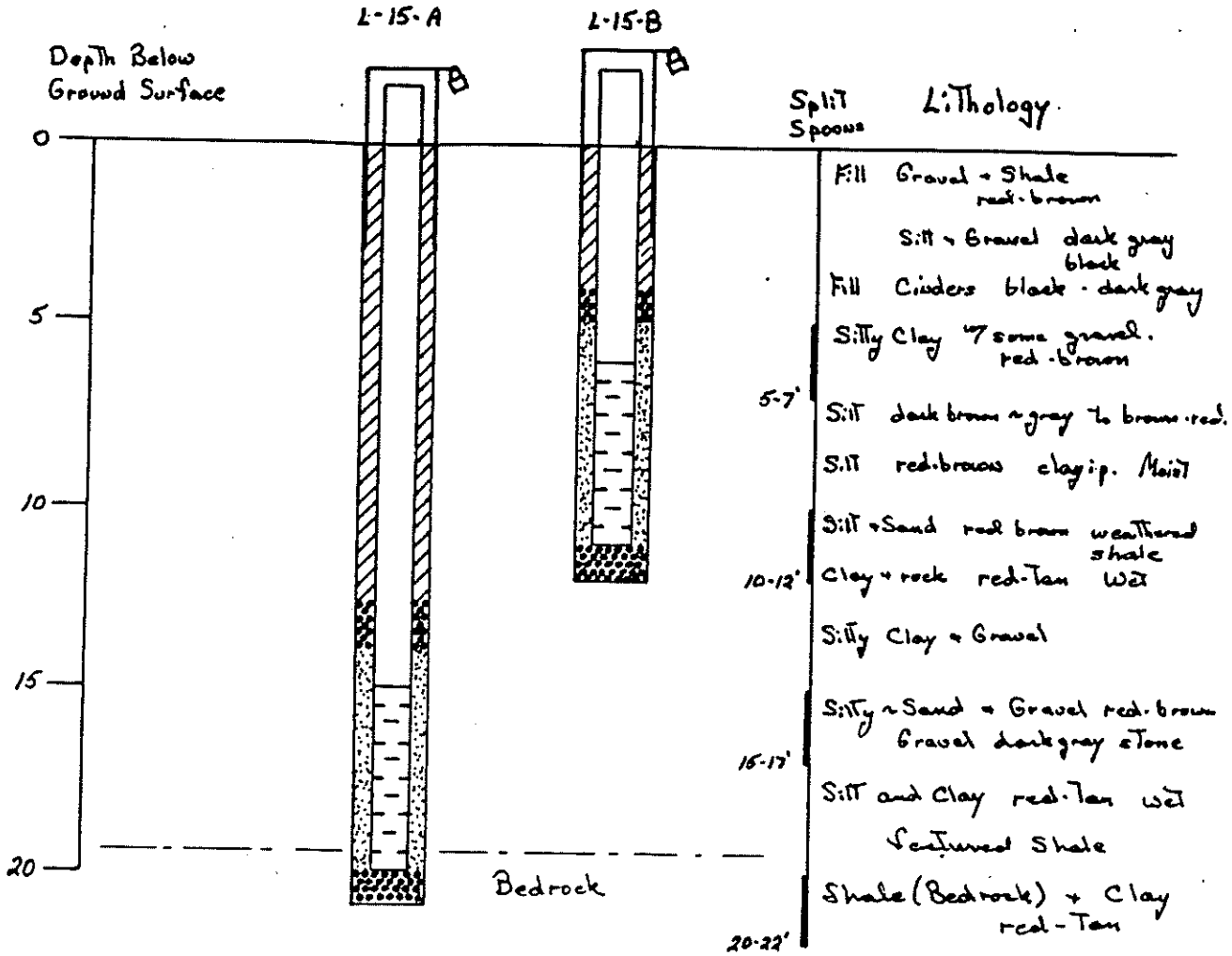
Page _____ of _____

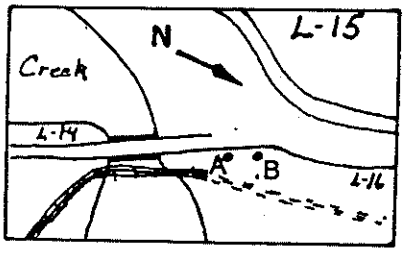
Job No. 85C266

PROJECT Exxon SUBJECT Monitoring Well Cluster

COMPUTATION 2" Well Construction L-15 A, B

COMPUTED BY DJM DATE _____ CHECKED BY _____ DATE _____





TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-821

Area: EEZ-11
Parent Location: ASB-163

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097 0000 0000
Contractor: SGS

DATE DRILLED: **11/14/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X 570709.62, Y: 653689.68
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.1'
		ND	ASB-821/0.0-0.5	1		SM	0.0-1.0'-Dark Brown fine-medium SAND, and silt, some organic materials, clods of hardened "tar like" material, very slight petroleum like odor and staining, loose
1		13					
		60.7		2		PT	1.0-4.0'-Meadow Mat / Peat, slight to moderate petroleum like staining, semi-firm
2		230					
		35.2					
3	72	72.5					
		797	ASB-821/3.0-3.5				
4		564					
		7.2		3		CL	4.0-5.5-' Gray CLAY, and organic material, no odor, no staining, wet
5		32.9					
		61					
6		293	ASB-821/5.5-6.0				5.5-6.0'- Gray CLAY, moderate petroleum-like odor, no staining, wet.
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 87-88

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-822

Area EEZ-11
Parent Location ASB-193

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED **11/18/13**
DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570214.32, Y: 654248.20
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 4 feet
BOTTOM TYPE: Clay

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 7.7'
		1	ASB-822/0.0-0.5	1		GM	0.0-1.0'- Red-Brown SILT, fine-medium Sand, and fine-medium gravel, no odor, no staining, loose.
1		1					
		580		2		SM	1.0-2.0' Dark Gray-Black SILT and fine-medium Sand, fine-medium subangular gravel, moderate petroleum-like odor and staining, loose.
2	48	184					
		87.3		3		CL	2.0-4.0' Red Brown silty CLAY, some medium-coarse gravel, trace black sand, till, moderate petroleum-like odor and staining, semi-firm.
3		220					
		284					
4		74.2	ASB-822/3.5-4.0				
							End of boring at 4' below pitch sediments (refusal)
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 108-109

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-823

Area EEZ-11
Parent Location: ASB-208

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000 0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED **12/09/13**
DRILLER **W. Petley, Scott Moore**
LOGGED BY **R. Guarino, M. Bastidas**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X. 570629.44, Y 654206.59
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Meadow Mat / Peat

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.3'
		1.6	ASB-823/0-0.5	1		SM	0-0.5'-Dark Brown SAND and silt, trace organic material, slight petroleum-like odor and staining, loose
1		4.5					0.5-2.5'- Dark Brown SAND and silt,clods of tar like material, some organic material, slight petroleum-like odor and staining, loose.
		149					
2		73	ASB-823/1.5-2.0				
		1170					
3	72	1331	ASB-823/2.5-3.0	2		PT	2.5-6.0'- Meadow Mat / Peat, heavy to slight petroleum-like odor and staining, semi-firm
		150	ASB-823/3.0-3.5				
4		123					
		139					
5		45					
		88					
6		38					
							End of boring at 6' below pitch sediments
7							
8							
9							
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14							
15							
16							

FB #7 Pg 32-33

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-824

Area: EEZ-11
Parent Location: ASB-412

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED: **11/14/13**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570644.60, Y: 653680.84
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.2'
		73.1	ASB-824/0 0-0.5	1		SM	0.0-1.0'-Dark Gray fine-medium SAND, and silt, some organic material, clods of "tar like" material, slight petroleum-like odor and staining.
1		59					
		431		2		PT	1.0-5.0'-Meadow Mat / Peat, slight to moderate petroleum like odor and staining, semi-firm.
2		34					
		132					
3	72	94.1					
		40.8					
4		714					
		67.5	ASB-824/4-4.5				
5		76.4					
		163	ASB-824/5 0-5.5	3		CL	5.0-6.0'-Gray CLAY,some organic material, slight petroleum like odor, no staining, semi-firm.
6		48					
							End of boring at 6' below pitch sediments
7							
8							
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10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 85-86

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-796

Area: EEZ-11
Parent Location: ASB-796

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/12/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 8 feet
COORDINATES: X: 570273.35, Y: 654200.23
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 6.5'
		10	ASB-796/0 0-0.5	1		SM/SC	0.0-0.5'-Red-Brown fine-medium SAND, some Silt, slight petroleum like odor and staining, loose.
1		193					0.5-2.0'-Red-Brown fine-coarse SAND, some silty Clay, trace rock fragments, trace organic material, slight petroleum like odor and staining, wet, sheen.
		210					
2		657	ASB-796/1 1-2.0				
		163		2		ML	2.0-7.0-Dark Gray SILT with fine-coarse Sand, trace organic material, shell fragments, moderate petroleum like odor and staining, saturated.
3		163					
		157					
4	96	51.9					
		79					
5		154	ASB-796/4 5-5.0				
		251					
6		29	ASB-796/5 5-6.0				
		498					
7		63.7	ASB-796/6 5-7.0				
		47.6		3		CL	7.0-8.0-Red Brown-Gray CLAY and fine organics material, no odor, no staining, semi-firm.
8		46.9	ASB-796/7 5-8				
							End of boring at 8' below pitch sediments
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 63-65

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-797

Area: EEZ-11
Parent Location: ASB-797

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED: 11/18/13

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570431.43, Y: 654256.40
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Meadow Mat / Peat

DRILLER: W. Petley, Scott Moore
LOGGED BY: R. Guarino, M. Bastidas

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 6.2'
		8.2	ASB797/0.0-0.5	1		SM	0.0-0.5'- Brown fine-medium SAND, loose distinct pockets of black tar-like material, trace rock fragments, slight petroleum-like odor and staining, loose
1		95.8		2		CL	0.5-1.0'- Dark gray-black silty CLAY, some red-brown fine-medium sand includes pockets of firm black tar-like material, trace organic material, moderate petroleum-like odor and staining, semi-firm
		510					
2		531					1.5-3.5'- Dark gray CLAY, semi soft, trace organic material, moderate petroleum-like odor and staining, semi-firm
		517					
3	72	647	ASB797/2.5-3.0				
		280					
4		306		3			3.5-6.0'- Meadow Mat / Peat, moderate petroleum-like odor and staining, semi-firm.
		95					
5		468					
		226	ASB797/5.5-6.0				
6		77.2					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 107-108

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-798

Area: EEZ-11
Parent Location: ASB-798

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery Linden, NJ
PROJECT NO.: 200097 0000 0000
Contractor: SGS

DATE DRILLED: 12/09/13

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 4 Feet
COORDINATES: X: 570726.67 Y: 654219.61
BOTTOM TYPE: Meadow Mat / Peat

DRILLER: W. Petley, Scott Moore
LOGGED BY: R. Guarino, M. Bastidas

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.2'
1	48	0.5	ASB-798/0-0.5	1		SM	0-0.5'- Dark brown SILT and fine-medium sand, trace organic material, slight petroleum-like odor and staining, loose. 0.5-3.0'- Dark brown SILT and fine-medium sand, black staining, clods of tar like material, slight petroleum-like odor and staining, loose
		48					
		65					
2		74					
		118					
3		120					
		301	ASB-798/3.0-3.5	2		PT	3.0-4.0'- Meadow Mat / Peat, moderate petroleum-like odor and staining, semi-firm
4		76					
							End of boring at 4' below pitch sediments
5							
6							
7							
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14							
15							
16							

FB #7 Pg 34-35

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-802

Area EEZ-11

Parent Location: ASB-802

PROJECT NAME: ExxonMobil ERI

Location: Bayway Refinery Linden, NJ

PROJECT NO.: 200097.0000.0000

Contractor: SGS

DATE DRILLED: **11/26/13**

SAMPLER TYPE/DIA.: Hand Auger

WATER DEPTH: NA

BORING METHOD: Hand Auger

TOTAL DEPTH DRILLED: 6 feet

COORDINATES: X: 570643.23 Y: 653995.14

BOTTOM TYPE: Meadow Matt / Peat

DRILLER: **W. Petley Scott Moore**

LOGGED BY: **R. Guarino C. Nicholas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 3.8'
		8	ASB-802/0-0.5	1		SM	0-0.5'- Brown SILT and fine-medium SAND, trace black clay, slight petroleum-like odor and staining, moist.
1		149	ASB-802/0.5-1.0	2		CL	0.5-1.0' Gray-black CLAY silt,some fine -medium sand, trace roots and organic material, moderate petroleum-like odor and staining, moist
		226		3		PT	1.0-6.0'- Meadowm Mat / Peat, moderate to heavy petroleum-like odor and staining, slight sheen.
2		1376	ASB-802/1.5-2.0				
		1067					
3	72	475					
		814					
4		140					
		203					
5		751					
		1288					
6		2105	ASB-802/5.5-6.0				
							End of boring at 6' below pitch sediments
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12							
13							
14							
15							
16							

FB #6 Pg 122-124

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-803

Area EEZ-11
Parent Location ASB-803

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED: 11/15/13
DRILLER: W. Petley, Scott Moore
LOGGED BY: R. Guarino, M. Bastidas

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570475.06, Y: 653886.95
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Meadow Mat / Peat

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							
		98.9	ASB-803/0.0-0.5	1		SC/ML	0.0-0.5'- Dark Gray CLAY with Silt, fine-medium sand, trace organics, slight pertoleum-like odor and staining, firm.
1		1137		2		PT	0.5-1.5'- Meadow Mat / Peat, moderate pertoleum like odor and staining, wet, sheen.
		199					
2		243		3		PT	1.5-5.0'- Meadow Mat / Peat, moderate petroleum-like odor and staining, firm.
		231					
3	66	214					
		191					
4		169					
		791					
5		163					
		ND		4			5.0-5.5'- No Recovery
6		371	ASB-803/5.5-6.0	5		PT	5.5-6.0'- Meadow Mat / Peat, moderate petroleum-like odor and staining, wet, sheen.
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 100-101

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-804

Area: EEZ-11
Parent Location: ASB-804

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED: **11/15/13**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570594.60, Y: 653701.13
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.4'
		35.6	ASB-804/0.0-0.5	1		SM	0.0-0.5-Brown fine-medium SAND, sub angular fine gravel, some organic material, clods of hardened tar-like material, very slight petroleum-like odor and staining, loose
1		222		2		PT	0.5-4.0- Meadow Mat / Peat, moderate to heavy petroleum-like odor and staining, semi-firm.
		140					
2		1896					
		209	ASB-804/2.5-3.0				
3	72	2147					
		841					
4		1663					
		182	ASB-804/4.0-4.5	3		CL	4.0-6.0'- Gray CLAY,soft, some organic material, trace shells, slight to moderate petroleum like odor and staining, semi-firm.
5		208					
		257					
6		162					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 92-94

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Sediments

BORING NUMBER

ASB-805

Transect: EEZ-11
Parent Location ASB-805

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/15/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 570784.20, Y: 653775.81
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 3.9'
		4.5	ASB-805/0 0-0.5	1		SM	0.0-0.5- Dark Brown fine-medium SAND, some silt, some organic material, aerobic-odor, no staining, loose.
1		84		2		PT	0.5-4.0'- Meadow Mat / Peat, slight petroleum-like odor and staining, semi-firm.
		46					
2		60					
		52					
3	66	92					
		67					
4		212	ASB-805/3 5-4.0				
		58	ASB-805/4 0-4.5	3		CL	4.0-5.0'-Gray CLAY, some organic material, no odor, no staining, saurated, soft.
5		177					
		95.6					5.0-5.5'- Gray CLAY, little organic material, no odor or staining, semi-firm.
6							End of boring at 5.5 ' below pitch sediments
7							
8							
9							
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11							
12							
13							
14							
15							
16							

FB #6 Pg 94-96

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-806

Area: EEZ-11
Parent Location: ASB-806

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/26/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 5 feet
COORDINATES: X: 571028.56, Y: 653949.82
BOTTOM TYPE: Meadow Mat / Peat

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, C. Nicholas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 3.8'
	60	15.1	ASB-806/0-0.5	1		SM	0-0.5'- Brown-dark brown SILT, and fine-coarse sand, potckets of black tar-like material, slight petroleum-like odor and staining, loose
1		186		2		CL	0.5-2.0'- Gray-brown silty CLAY, some fine-medium sand, and organic material, moderate petroleum-like odor and staining, moist
		592	ASB-806/1-1.5				
2		172					
		858					
3		715	ASB-806/2.5-3	3		PT	2.5-5.0'- Meadow Mat / Peat, heavy petroleum-like odor and staining, semi-firm.
		292					
4		1475	ASB-806/3.5-4				
		559					
5		1994	ASB-806/4.5-5				
		NA		4			No recovery, soil clinging to outside of auger, with fine black SAND, and silty clay.
6		NA					
							End of boring at 5' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 125-127

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-807

Area. EEZ-11
Parent Location. ASB-807

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED 11/14/13

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 570655.36 Y: 653606.76
BOTTOM TYPE: Clay

DRILLER. W. Petley, Scott Moore
LOGGED BY. R. Guarino, M. Bastidas

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.2'
		ND	ASB-807/0 0-0.5	1		SM	0.0-1.0'-Gray-Brown SILT, and fine-medium Sand, trace organic material, clods of hardened tar-like material, slight petroleum-like odor and staining, loose
1		24.9					
		58.5		2		PT	1.0-4.5'-Meadow Mat / Peat, moderate petroleum-like odor and staining, semi-firm.
2		202					
		173					
3	72	247					
		324	ASB-807/3 0-3.5				
4		322					
		109					
5		38.1		3		CL	4.5-6.0'-Gray CLAY, some organic material, very slight petroleum-like odor and staining, soft.
		54.1	ASB-807/5 0-5.5				
6		52.4					
							End of boring at 6' below pitch sediments
7							
8							
9							
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12							
13							
14							
15							
16							

FB #6 Pg 83-84

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-808

Area: EEZ-11
Parent Location ASB-808

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/11/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 571005.78 Y: 653767.35
BOTTOM TYPE: Clay/Silt

DRILLER **W. Petley** **Scott Moore**
LOGGED BY **R. Guarino** **M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.0'
		6.1	ASB-808/0 0-0.5	1		SM	0.0-0.5'-Gray Brown sandy SILT, no odor, no staining, loose
1		0.2					0.5-1.0-Gray Brown SILT, trace subangular red brown medium-fine rock fragments, no odor, no staining, wet.
		1.5		2		PT	1.0-2.5-Meadow Mat / Peat, no odor, no staining, firm.
2		ND					
		36.9					
3	72	25.8		3		ML	2.5-3.0-Greenish Brown CLAY, no odor, no staining, firm.
		45.9	ASB-808/3 0-3.5				3.0-4.0'-Greenish Brown CLAY, some organic material, trace terocota fragments at 4.0', no odor, no staining, firm.
4		24.1					
		33.3		4		SM	4.0-4.5'-Brown Gray SILT, and organic material, no odor, no staining, firm.
5		71.4	ASB-808/4 5-5.0	5		ML	4.5-6.0'-Greenish Gray Brown CLAY silt , and organic material, no odor, no staining, firm
		43.3					
6		37.9					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 56-59

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Sediments

BORING NUMBER

ASB-809

Transect: EEZ-11
Parent Location: ASB-809

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: 11/13/13

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 570933.55, Y: 653665.83
BOTTOM TYPE: Clay

DRILLER: W. Petley, Scott Moore
LOGGED BY: R. Guarino, M. Bastidas

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.1'
		4.1	ASB-809/0-0.5	1		ML	0.0-0.5'-Red-Brown-Gray SILT, fine-medium sand, some organic material, slight petroleum-like odor and staining, loose.
1		249		2		PT	0.5-4.0'- Meadow Mat / Peat, moderate petroleum-like odor and staining, firm.
		271					
2		579	ASB-809/1.5-2.0				
		240					
3		170					
		180					
4	72	163					
		85		3		CL	4.0-6.0'- Gray CLAY, trace organic material, trace shells, slight petroleum like odor and staining, firm.
5		49.3	ASB-809/4.5-5.0				
		108					
6		108					
							End of boring at 6' below pitch sediments
7							
8							
9							
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11							
12							
13							
14							
15							
16							

FB #6 Pg 70-71

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Sediments

BORING NUMBER

ASB-810

Transect: EEZ-11
Parent Location: ASB-810

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED: **11/13/13**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570857.36, Y: 653550.93
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.0'
		6.3	ASB-810/0-0.5	1		SM	0.0-0.5'-Red-Brown Gray SILT, fine-medium sand, some organic material, trace gray clay, no odor, no staining, semi-firm.
1		537		2		PT	0.5-4.5'-Meadow Mat / Peat, moderate petroleum-like odor and staining, semi-firm.
		687					
2		1064					
		718					
3		1093					
		573					
4	72	1313	ASB-810/3.5-4.0				
		342					
5		376	ASB-810/4.5-5.0	3		CL	4.5-6.0'-Gray CLAY, trace organic material, trace shell framents, moderate to slight petroleum-like odor and staining, soft to firm.
		202					
6		NA					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 70-71

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Sediments

BORING NUMBER

ASB-811

Transect EEZ-11
Parent Location: ASB-811

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/26/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 570749.94, Y: 653851.23
BOTTOM TYPE: Meadow Matt / Peat

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, C. Nicholas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.0'
		67.4	ASB-811/0-0.5	1		PT	0.0-6.0'- Meadow Mat / Peat, and dark brown organic silt clay, trace fine sand, moderate to heavy petroleum-like odor and staining. Slight sheen at 1.5 feet.
1		239					
		1228	ASB-811/1-1.5				
2		408					
		79.8					
3	72	77.8					
		321					
4		939					
		140					
5		446					
		1305					
6		2179	ASB-811/5.5-6.0				
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 120-122

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-825

Area EEZ-11
Parent Location: ATP-2

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery Linden, NJ
Contractor: SGS

DATE DRILLED: **11/18/13**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X 570345.27 Y 654306.78
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 7.9'
		24.6	ASB-825/0.0-0.5	1		GW	0.0-0.5'- Gray angular fine-medium gravel, some fine-coarse Sand, and silt, strong chemical like odors.
1		148		2		SM	0.5-1.0'- Gray brown fine-medium SAND, and silt, little gravel, trace organic material, moderate petroleum-like odor and staining, loose.
		196		3		CL	1.0-1.5'- Gray brown silty CLAY, trace organics, moderate petroleum-like odor and staining, semi-firm.
2		71.5					1.5-2.0'- Red brown-gray brown silty CLAY, some subangular medium gravel, trace organics, moderate petroleum-like odor and staining, semi-firm.
		948	ASB-825/2.0-2.5				2.0-3.0'-Redish brown-dark gray CLAY, little fine-medium gravel, and subangular rock fragments, trace organic material, moderate petroleum-like odor and staining, semi-firm, wet.
3	72	420					
		112					3.5-6.0'- Dark gray silty CLAY, and fine-medium sand, some fine-medium subangular rock fragments, some organic material, moderate petroleum-like odor and staining, semi-firm, wet.
4		215					
		176					
5		67.7					
		165	ASB-825/5.5-6.0				
6		74.6					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 105-106

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-812

Area: EEZ-11
Parent Location. ASB-87

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **12/03/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 2 feet
COORDINATES: X: 570588.46 Y: 654359.29
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 9.3'
1	24	179	ASB-812/0-0.5	1		SM	0.0-1.5'-Red brown SILT, and fine-coarse sand, possible shale rock fragments, some organic material, black staining, pockets of hardened tar-like material, slight petroleum-like odor and staining, loose
		180	ASB-812/0.5-1				
		84	ASB-812/1.5-2				
2		80.1		2		CL	1.5-2.0'- Red Brown silty CLAY, some fine-medium Sand, trace gravel, and subangular rock fragments, and organic material, no odor, no staining, semi-firm
							End of boring at 2' below pitch sediments
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 131-133

TRC Environmental Corporation
57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-813

Area: EEZ-11
Parent Location: ASB-88

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/14/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 570612.65, Y: 653659.36
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.2'
		35.4	ASB-813/0 0-0.5	1		SM	0.0-0.5'-Dark-Brown fine-medium SAND, hardened tar-like material, moderate petroleum-like odor and staining, loose.
1		33.3		2		PT	0.5-5.0'-Meadow Mat / Peat, moderate to heavy petroleum-like odor and staining, semi-firm.
		168					
2		290	ASB-813/1 5-2.0				
		169					
3	60	791					
		676					
4		952					
		1069	ASB-813/4 0-4.5				
5		1053	ASB-813/4 5-5.0				
		NA		3			5.0-6.0'-No Recovery, Gray CLAY residue on hand auger.
6		NA					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 81-82

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-815

Area: EEZ-11
Parent Location ASB-121

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery Linden, NJ
PROJECT NO.: 200097 0000.0000
Contractor: SGS

DATE DRILLED: **12/92013**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X 570597 82
Y 654240.60
BOTTOM TYPE: Meadow Mat / Peat

DRILLER: **W. Petley**
Scott Moore
LOGGED BY: **R. Guarino**
M. Bastidas

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4 4'
		97	ASB-815/0-0 5	1		SM	0-0.5'-Dark brown fine-medium SAND, trace organic material, slight petroleum-like odor and staining, loose.
1		124	ASB-815/0 5-2 0				0.5-2.0- Dark brown fine-medium SAND and silt, black staining, some organic material, clods of hardened tar like material, moderate petroleum-like odor and staining, wet
		199					
2		169					
		258		2		PT	2.0-6.0'- Meadow Mat / Peat, slight to moderate petroleum-like odor and staining, semi-soft
3	72	279	ASB-815/2 5-3 0				
		67					
4		77					
		39					
5		60					
		80					
6		15	ASB-815/5 5-6.0				
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #7 Pg 29-31

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

ASB-815

Area EEZ-11
Parent Location ASB-122

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED **12/09/13**
DRILLER **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570783.56, Y: 654374.80
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 6 feet
BOTTOM TYPE: Meadow Mat / Peat

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 6.2'
		ND	ASB-815/0-0.5	1		SM	0-0.5'- Red brown clayey SILT and fine-medium sand, some organics, no odor, no staining, wet.
1		84.4		2		FILL	0.5-4.0'- Tar like substance with organic material, some silt, and sand, slight to moderate petroleum-like odor and staining, beginning of what appears to be impacted peat at 3.5 feet.
		6.4					
2		115					
		178					
3	72	189					
		258	ASB-815/3.5-4				
4		1265					
		170		3		PT	4.0-4.5'- Meadow Mat / Peat, moderate petroleum-like odor and staining, semi-firm.
5		1073	ASB-815/4.5-5				4.5-5.0'-Dark Gray CLAY, trace organic material, moderate petroleum-like odor and staining, semi-soft
		272					5.0-6.0'- Meadow Mat / Peat, moderate petroleum-like odor and staining, semi-soft
6		169					
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 134-136

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

HSB-229

Area EEZ-2a
Parent Location: HSB-229

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/25/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 11 feet
COORDINATES: X: 570465.76, Y: 653801.82
BOTTOM TYPE: Clay

DRILLER **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, C. Georgiadis**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 3.7'
		8.8	HSB-229/0-0.5	1		GP-SW	0-0.5'- Red Brown fine-medium SAND, and coarse gravel, slight petroleum-like odor and staining, loose.
1		33.2		2		SM	0.5'-1.5'- Brown medium-coarse SAND, some organic material, moderate petroleum-like odor and staining, wet
		21.7				PT	1.5-5.5'- Meadow Mat / Peat, slight petroleum-like odor and staining, semi-firm.
2		81.3	HSB-229/1.5-2				
		68.9					
3		51.7					
		198	HSB-229/3-3.5				
4		91.8					
		94.8					
5		93.4					
		92.1					
6	132	88.6	HSB-229/5.5-6	3		CL	6.0-10.5'-Gray CLAY, and organic material, slight petroleum-like odor and staining, semi-firm.
		30.3					
7		37	HSB-229/6.5-7				
		43.3					
8		46.6	HSB-229/7.5-8				
		7.1					
9		49.9	HSB-229/8.5-9				
		76.7					
10		30	HSB-229/9.5-10				
		43.1					
11		56.8		4			10.5-11'- Gray CLAY, organic material,shells,decayed down roots (wood), no odor, no staining, firm.
							End of boring at 11' below pitch sediments
12							
13							
14							
15							
16							

FB #6 Pg 114-117

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

HSB-230

Area: EEZ-2a
Parent Location: HSB-230

PROJECT NAME: ExxonMobil ERI
Location: Bayway Refinery, Linden, NJ
PROJECT NO.: 200097.0000.0000
Contractor: SGS

DATE DRILLED: **11/14/13**

SAMPLER TYPE/DIA.: Hand Auger
WATER DEPTH: NA
BORING METHOD: Hand Auger
TOTAL DEPTH DRILLED: 6 feet
COORDINATES: X: 570576.46, Y: 653616.31
BOTTOM TYPE: Clay

DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 4.1'
		93.8	HSB-230/0 0-0.5	1		SM	0.0-3.0'-Dark-Brown SILT,and fine sand, trace organic material, slight to moderate petroleum-like odor and staining, loose to semi-firm.
1		76.6					
		17.2					
2		212	HSB-230/1 5-2.0				
		1033					
3		37.6					
	48	NA		2			3.0-5.0'- No recovery, Mixture of CLAY and meadow mat from hole cuttings, very fluid.
4		NA					
		NA					
5		NA					
		37.8		3		CL	5.0-6.0'- Gray CLAY, Some organic material, no odor, no staining, very soft.
6		49.5	HSB-230/5 5-6.0				
							End of boring at 6' below pitch sediments
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 79-80

TRC Environmental Corporation

57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

Pitch Area Soils

BORING NUMBER

HSB-231

Area: EEZ-2a
Parent Location: HSD-231

PROJECT NAME: ExxonMobil ERI
PROJECT NO.: 200097.0000.0000
Location: Bayway Refinery, Linden, NJ
Contractor: SGS

DATE DRILLED: **11/13/13**
DRILLER: **W. Petley, Scott Moore**
LOGGED BY: **R. Guarino, M. Bastidas**

SAMPLER TYPE/DIA.: Hand Auger
BORING METHOD: Hand Auger
COORDINATES: X: 570576.45, Y: 653616.30
WATER DEPTH: NA
TOTAL DEPTH DRILLED: 8 feet
BOTTOM TYPE: Clay

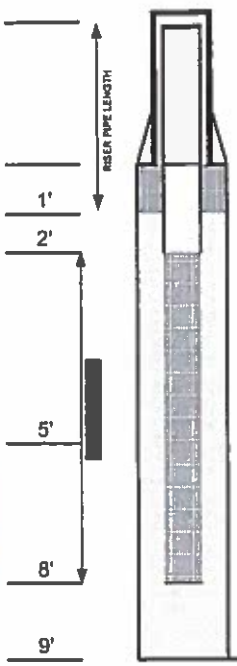
DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							Elevation= 3.9'
		172	HSD-231/0 0-0 5	1		SM	0.0-0 1.0'-Dark-Brown SILT,and fine Sand, trace organic material, moderate petroleum-like odor and staining, loose
1		412					
		773	HSD-231/1 0-1 5	2		PT	1.0-3.5'-Meadow Mat / Peat, heavy petroleum-like odor and staining, saturated
2		195					
		460					
3		115					
		86					
4	84	59	HSD-231/3 5-4 0	3		CL	3.5-7.0'- Gray CLAY, some organic material,trace shell fragments, no odor, no staining, semi-stiff
		45.6					
5		52.2	HSD-231/4 5-5 0				
		50					
6		30.8	HSD-231/5 5-6 0				
		35.1					
7		43.6	HSD-231/6 5-7 0				
		NA		4			7 5-8 0'- No recovery
8		NA					
							End of boring at 8' below pitch sediments
9							
10							
11							
12							
13							
14							
15							
16							

FB #6 Pg 74-75

WELL CONSTRUCTION DIAGRAM (ABOVE-GRADE)

PROJ. NAME: Pitch FS GMW-211R		WELL ID:	GMW-211R
PROJ. NO: 212836.00	DATE INSTALLED: 3/26/2014 INSTALLED BY: SGS		CHECKED BY:

ELEVATION (BENCHMARK: USGS)	DEPTH /HEIGHT RELATIVE TO GROUND SURFACE (FEET)



3.5' TOP OF CASING

0' GROUND SURFACE

CEMENT GROUT

PVC 1' BGS TO GROUND SURFACE

No. 0 sand, 1' - 8'

BOTTOM OF SCREEN, 8'

BOTTOM OF FILTER PACK

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 4-INCH STAINLESS STEEL

PIPE SCHEDULE: 40

PIPE JOINTS: _____

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 4 IN. FROM 9 TO 0 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: 2 IN. FROM 8 TO 0 FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: BAIL

TIME DEVELOPING: 0.25 HOURS

WATER REMOVED: <5 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: Slightly cloudy

COLOR BEFORE: Gray

CLARITY AFTER: Slightly cloudy- clear

COLOR AFTER: Clearish gray

ODOR (IF PRESENT): Pitch area odor

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	8.00	T/PVC		
DTB AFTER DEVELOPING:	8.00	T/PVC		
SWL BEFORE DEVELOPING:	5.20	T/PVC		
SWL AFTER DEVELOPING:	7.80	T/PVC		
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 2402

REVISED 11/2013

Date Begin - End:	10/24/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-1**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger & Hollow-stem Auger		
Weather:	60° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62918° N
Longitude: -74.21837° E
Approximate Ground Surface Elevation (ft.): 7
Location Offset: At Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Clayey SAND (SC): black, wet												Hand auger to 0.5 feet
			Pitch Material: black, wet, with sand, cinders, and ash	Sh-1			6"								
	5														
				Sh-2			NR								
			Sandy Lean CLAY with Gravel (CL): reddish brown, wet, very soft												
			PEAT: black, wet, very soft												
	5														
0															
	10														
-5															

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 24, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0.5 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 3 ft. below ground surface at the end of drilling.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20168335
DRAWN BY:	DEP
CHECKED BY:	JPL
DATE:	2/6/2018
REVISED:	-

BORING LOG GEO-1

XOM Bayway Pitch
Bayway Refinery Complex
Linden, NJ

APPENDIX

GEO-1

KLEINFELDER - 180 Sheree Blvd., Suite 3800 | Exton, PA 19341 | PH: 610.594.1444 | FAX: 610.594.2743 | www.kleinfelder.com

PLOTTED: 02/06/2018 05:09 PM BY: DPagel
gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	10/25/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-1A**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	50° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62918° N
Longitude: -74.21837° E
Approximate Ground Surface Elevation (ft.): 7
Location Offset: 1' S of Stake
Surface Condition: tidal marsh flat

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Clayey SAND (SC): black, wet												
			Pitch Material: black, wet, with sand, cinders, and ash	Sh-1A			2"								Sample tube angled ~25° from vertical
	5														
				Sh-2A		PP=0.75	21"								Sample tube angled ~25° from vertical
			Sandy Lean CLAY with Gravel (CL): reddish brown, wet, very soft												
			PEAT: black, wet, very soft												
	5														
	0														
	10														
	-5														

LABORATORY RESULTS

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 25, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0.5 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 0.5 ft. below ground surface at the end of drilling.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG GEO-1A

XOM Bayway Pitch
Bayway Refinery Complex
Linden, NJ

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GEO-1A

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Date Begin - End:	10/31/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-2**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger & Hollow-stem Auger		
Weather:	50° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62915° N
Longitude: -74.21810° E
Approximate Ground Surface Elevation (ft.): 7
Location Offset: At Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material: black, wet												Hand auger to 1 foot
				PS-1		PP=0.5	24"								
5															
			PEAT: black, wet, very soft	PS-2		PP=0.5	24"								
	5		**Sandy Lean CLAY (CL)**: light brown, wet, very soft												
0															
	10														
-5															

The boring was terminated at approximately 6.5 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 31, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0.5 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 2 ft. below ground surface at the end of drilling.

GENERAL NOTES:
PS-# = Piston Sampler Shelby Tube
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG GEO-2

XOM Bayway Pitch
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GEO-2

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Date Begin - End:	10/26/2016 - 10/28/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-3**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger & Hollow-stem Auger		
Weather:	50° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62929° N
Longitude: -74.21799° E
Approximate Ground Surface Elevation (ft.): 8
Location Offset: At Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material: black, wet, with sand												Hand auger to 1 foot
			Pitch Material: black, wet												
				PS-1		PP=0.25	18"								
5															
				Sh-1		PP=0.25	20"								Sample tube angled ~25° from vertical
	5		**PEAT**: black, wet, very soft												
0															
	10														
-5															

The boring was terminated at approximately 5.5 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 28, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 1 ft. below ground surface during drilling.
Groundwater was observed at approximately 1 ft. below ground surface at the end of drilling.
GENERAL NOTES:
PS-# = Piston Sampler Shelby Tube
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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Date Begin - End:	10/31/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-4**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	50° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62917° N
Longitude: -74.21781° E
Approximate Ground Surface Elevation (ft.): 6
Location Offset: At Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material: black, wet												
5				PS-1		PP=0.75	22"								
			Sandy Lean CLAY (CL): reddish brown, wet, very soft												
			Meadow Mat: black, wet, very soft												
	5														
0															
	10														
-5															

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 31, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 1 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 1 ft. below ground surface at the end of drilling.
GENERAL NOTES:
PS-# = Piston Sampler Shelby Tube
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG GEO-4

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GEO-4

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Date Begin - End:	11/01/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-4A**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	50° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62917° N
Longitude: -74.21781° E
Approximate Ground Surface Elevation (ft.): 6
Location Offset: 1' E of Stake
Surface Condition: tidal marsh flat

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
5			**Pitch Material**: black, wet	PS-1A		PP=0.25	24"								

The boring was terminated at approximately 3 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on November 01, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 1 ft. below ground surface during drilling.
Groundwater was observed at approximately 1 ft. below ground surface at the end of drilling.

GENERAL NOTES:
PS-# = Piston Sampler Shelby Tube
The exploration location and elevation are approximate and were estimated by Kleinfelder.

5
0
-5

5
10

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BORING LOG GEO-4A

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GEO-4A

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Date Begin - End:	10/25/2016 - 10/26/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-5**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger & Hollow-stem Auger		
Weather:	50° F, overcast	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62912° N
Longitude: -74.21758° E
Approximate Ground Surface Elevation (ft.): 5
Location Offset: At Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material: black, wet												Hand auger to 0.5 feet
				Sh-1			NR								Sample tube angled ~25° from vertical
			PEAT: black, wet, soft	Sh-2		PP=1.0	13"								Sample tube angled ~25° from vertical
0	5														
-5	10														

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil cuttings on October 26, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0.5 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 1 ft. below ground surface at the end of drilling.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG GEO-5

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GEO-5

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Date Begin - End:	10/28/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-5A**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger & Hollow-stem Auger		
Weather:	50° F, partly cloudy	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62912° N
Longitude: -74.21758° E
Approximate Ground Surface Elevation (ft.): 5
Location Offset: 1' S of Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material: black, wet												Hand auger to 1 foot
				PS-1		PP=0.25	24"								
			PEAT: black, wet, very soft												
				PS-2		PP=0.25	24"								
0	5														
-5	10														

The boring was terminated at approximately 5.5 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 28, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
PS-# = Piston Sampler Shelby Tube
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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BORING LOG GEO-5A

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GEO-5A

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Date Begin - End:	10/31/2016	**Drilling Company:**	SGS Drilling		**BORING LOG GEO-6**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Geoprobe 7720DT	**Hammer Type:**	none
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	50° F, sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62909° N
Longitude: -74.21710° E
Approximate Ground Surface Elevation (ft.): 4
Location Offset: At Stake
Surface Condition: tidal marsh flat

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf) *Wet Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material: black, wet												
0			**PEAT**: black, wet, with intermixed pitch material and meadow mat, sulfur odor												
	5														
-5															
	10														
-10															

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with soil cuttings and bentonite on October 31, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
No samples taken.
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20168335
DRAWN BY:	DEP
CHECKED BY:	JPL
DATE:	2/6/2018
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BORING LOG GEO-6

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GEO-6

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SAMPLER AND DRILLING METHOD GRAPHICS

- BULK / GRAB / BAG SAMPLE
- MODIFIED CALIFORNIA SAMPLER (2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)
- CALIFORNIA SAMPLER (3 in. (76.2 mm.) outer diameter)
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)
- SHELBY TUBE SAMPLER
- HOLLOW STEM AUGER
- SOLID STEM AUGER
- WASH BORING

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

WOH - Weight of Hammer
WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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PROJECT NO.:	20173380
DRAWN BY:	DEP
CHECKED BY:	DCH
DATE:	7/21/2017
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GRAPHICS KEY

Bayway Refinery Complex
1400 Park Avenue
Linden, NJ

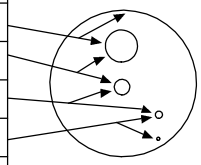
APPENDIX

KEY-1

PLOTTED: 07/24/2017 11:51 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017 [LEGEND 1 (GRAPHICS KEY) USCS_STANDARD]
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2017.GLB

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

	AMOUNT	
Term of Use	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25≤ PP <0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5≤ PP <1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1≤ PP <2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2≤ PP <4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4≤ PP	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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PROJECT NO.: 20173380
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CHECKED BY: DCH
DATE: 7/21/2017
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SOIL DESCRIPTION KEY

Bayway Refinery Complex
1400 Park Avenue
Linden, NJ

APPENDIX

KEY-2

PLOTTED: 07/24/2017 11:51 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A [LEGEND 2 (SOIL DESC KEY)]
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2017.GLB

Date Begin - End:	6/09/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-1**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	60° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62867° N
Longitude: -74.21760° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): dark brown, wet												
			Pitch Material: black, wet												
				S-1		BC=1 WOH WOH			629						
			PEAT: dark brown, wet												
				S-2		BC=WOH WOH WOH			835						
0															
	5			S-3		BC=WOH WOH WOH			910						
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 09, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.

GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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PROJECT NO.:	20173380
DRAWN BY:	DEP
CHECKED BY:	DCH
DATE:	7/21/2017
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BORING LOG FDI-1

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-1

PLOTTED: 07/24/2017 11:53 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB

Date Begin - End:	6/09/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617		**BORING LOG FDI-2**
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	60° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62878° N
Longitude: -74.21666° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): olive brown and black, wet												
			Pitch Material: black, wet												
				S-1		BC=1 1 WOH									
			PEAT: olive brown and black, wet												
				S-2		BC=WOH WOH WOH									
0															
	5			S-3		BC=WOH WOH WOH									
			Organic SILT (OL): dark brown, wet												
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 09, 2017.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0 ft. below ground surface during drilling.

GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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PROJECT NO.:	20173380
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BORING LOG FDI-2

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-2

PLOTTED: 07/24/2017 11:53 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2017.GLB

Date Begin - End:	6/08/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617		**BORING LOG FDI-3**
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	75° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62794° N
Longitude: -74.21727° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): dark brown and black, wet												
			PEAT: dark brown and black, wet												
				S-1		BC=1 WOH WOH									
				S-2		BC=WOH WOH WOH									
0															
	5			S-3		BC=WOH WOH WOH									
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 08, 2017.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0 ft. below ground surface during drilling.

GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-3

Bayway Refinery Complex
Final Design Investigation
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Linden, NJ

APPENDIX

FDI-3

PLOTTED: 07/24/2017 11:53 AM BY: DPagel
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PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [__KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	6/09/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617		**BORING LOG FDI-4**
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	60° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62834° N
Longitude: -74.21658° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): brown and black, wet												
			PEAT: dark brown, wet	S-1		BC=1 WOH WOH			474						
				S-2		BC=1 WOH WOH			534						
0															
	5		**Organic SILT (OH)**: dark brown, wet	S-3		BC=WOR WOR WOR		OH	13		98	91	53	10	
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 09, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.

GENERAL NOTES:
WOR = Weight of Rod
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-4

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-4

PLOTTED: 07/24/2017 11:59 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2017.GLB

Date Begin - End:	6/06/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-5**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	60° F, Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62918° N
Longitude: -74.21834° E
Approximate Ground Surface Elevation (ft.): 6
Surface Condition: Tidal Flats

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)
			Pitch Material: black, wet				
5			intermingled with fine sand	S-1		BC=2 4 4	
				S-2		BC=3 2 2	
			PEAT and meadow mat: black, wet, intermingled with pitch				
			PEAT: olive brown, wet				
	5			S-3		BC=1 2 1	
0			**GLACIAL TILL** **Lean CLAY with Sand (CL)**: reddish brown, wet				
	10						
-5							

LABORATORY RESULTS

USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks

The boring was terminated at approximately 7 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 06, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
GENERAL NOTES:
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-5

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-5

PLOTTED: 07/24/2017 11:53 AM BY: DPagel
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PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	6/06/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-6**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	60° F, Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62930° N
Longitude: -74.21789° E
Approximate Ground Surface Elevation (ft.): 6
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material with Sand: black, wet												
5				S-1		BC=1 WOH 1			69						
				S-2		BC=WOH 1 WOH			71						
			PEAT: black and olive brown, wet, intermingled with pitch												
	5			S-3		BC=1 WOH 1			39						
0			**GLACIAL TILL** **Lean CLAY with Sand (CL)**: reddish brown, wet												
	10														
-5															

The boring was terminated at approximately 7 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 06, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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PROJECT NO.:	20173380
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BORING LOG FDI-6

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-6

PLOTTED: 07/24/2017 11:54 AM BY: DPagel
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gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	6/06/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617		**BORING LOG FDI-7**
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	60° F, Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62899° N
Longitude: -74.21845° E
Approximate Ground Surface Elevation (ft.): 5
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material with Sand: black, wet												
				S-1		BC=1 WOH 1			99						
			Pitch Material: black, wet												
				S-2		BC=WOH WOH WOH			128						
			PEAT: black and olive brown, wet												
0	5			S-3		BC=1 1 WOH			450						
-5	10														

The boring was terminated at approximately 7 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 06, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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PROJECT NO.:	20173380
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BORING LOG FDI-7

Bayway Refinery Complex
Final Design Investigation
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APPENDIX

FDI-7

PLOTTED: 07/24/2017 11:54 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB [_KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End:	6/07/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-8**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	80° F, Partly cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62904° N
Longitude: -74.21823° E
Approximate Ground Surface Elevation (ft.): 5
Surface Condition: Tidal Flats

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material with Sand: black, wet												
			Pitch Material: black, wet	S-1		BC=1 WOH WOH									
				S-2		BC=1 WOH 1									
			PEAT: black and olive brown, wet												
0	5			S-3		BC=1 WOH 1									
-5	10														

The boring was terminated at approximately 7 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 07, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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PROJECT NO.:	20173380
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BORING LOG FDI-8

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-8

PLOTTED: 07/24/2017 11:54 AM BY: DPagel
OFFICE FILTER: HAMILTON
PROJECT NUMBER: 20173380.001A [_KLF_BORING/TEST PIT SOIL LOG]
gINT FILE: Klf_gint_master_2017
gINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2017.GLB

Date Begin - End:	6/07/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-9**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	80° F, Partly cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62908° N
Longitude: -74.21662° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material with Sand: black, wet												
			Pitch Material: black, wet	S-1		BC=1 WOH WOH			341						
			PEAT: olive brown and black, wet, fabric debris at 3 feet												
0				S-2		BC=WOH 1 WOH			619						
	5			S-3		BC=1 WOH WOH			315						
-5															
	10														

The boring was terminated at approximately 7 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 07, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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PROJECT NO.:	20173380
DRAWN BY:	DEP
CHECKED BY:	DCH
DATE:	7/21/2017
REVISED:	-

BORING LOG FDI-9

Bayway Refinery Complex
Final Design Investigation
1400 Park Avenue
Linden, NJ

APPENDIX

FDI-9

PLOTTED: 07/24/2017 11:54 AM BY: DPagel
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Date Begin - End:	6/08/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-10**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	75° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62717° N
Longitude: -74.21659° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): dark brown, wet												
			PEAT: dark brown, wet												
				S-1		BC=1 WOH WOH			560						
				S-2		BC=1 WOH WOH			511						
0															
	5			S-3		BC=WOH WOH WOH			150						
			Organic SILT (OL): olive brown, wet												
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 08, 2017.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0 ft. below ground surface during drilling.

GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-10

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Date Begin - End:	6/08/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-11**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	75° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62774° N
Longitude: -74.21594° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): dark brown, wet												
			Pitch Material: black, wet												
				S-1		BC=2 1 1									
			PEAT: dark brown, wet												
				S-2		BC=WOH WOH WOH									
0															
	5			S-3		BC=WOH WOH WOH									
			Organic SILT (OL): olive brown, wet												
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 08, 2017.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 0 ft. below ground surface during drilling.

GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-11

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FDI-11

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Date Begin - End:	6/15/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617		**BORING LOG FDI-12**
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis/K. Butcher		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	75° F, Sunny	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62982° N
Longitude: -74.21751° E
Approximate Ground Surface Elevation (ft.): 10
Surface Condition: Caverns Tidal Zone

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Silty SAND with Gravel (SM): yellowish brown, moist												
			Pitch Material with Sand and Gravel: black, moist												
				S-1		BC=7 9 9			26						
			Pitch Material: black, moist	S-2		BC=2 2 3			37						
5	5			S-3		BC=4 4 3			34						
			PEAT: black, wet												
			GLACIAL TILL **Lean CLAY with Sand (CL)**: mottled reddish brown and gray, wet												
			Sandy Lean CLAY with Gravel (CL): reddish brown, wet												
0	10														

LABORATORY RESULTS

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 15, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 5.5 ft. below ground surface during drilling.
GENERAL NOTES:
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-12

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FDI-12

PLOTTED: 07/24/2017 11:55 AM BY: DPagel
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Date Begin - End:	6/15/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-13**	
Logged By:	D. Pagel	**Drill Crew:**	J. Lewis/K. Butcher		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	75° F, Sunny	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62971° N
Longitude: -74.21691° E
Approximate Ground Surface Elevation (ft.): 7
Surface Condition: Caverns Tidal Zone

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material with Sand and Gravel: black, wet												
				S-1		BC=WOH WOH WOH									
	5														
				S-2		BC=3 3 4									
	5			S-3		BC=5 5 7									
∇			**PEAT**: olive brown, wet, with meadow mat												
	0														
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 15, 2017.

GROUNDWATER LEVEL INFORMATION:
∇ Groundwater was observed at approximately 6.5 ft. below ground surface during drilling.

GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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Date Begin - End:	6/07/2017	**Drilling Co.-Lic.#:**	SGS - #JD1617	**BORING LOG FDI-14**	
Logged By:	D. Pagel	**Drill Crew:**	B. Petley/J. Lewis		
Hor.-Vert. Datum:	NAD83 - NAVD88	**Drilling Equipment:**	Hand Auger	**Hammer Type - Drop:**	15 lb. DCPT - 20 in.
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger		
Weather:	75° F, Partly Cloudy	**Bore Diameter:**	6 in. O.D.		

FIELD EXPLORATION

Latitude: 40.62913° N
Longitude: -74.21627° E
Approximate Ground Surface Elevation (ft.): 4
Surface Condition: Tidal Flats

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Pitch Material with Sand: black, wet												
				S-1		BC=1 1 WOH			90						
			PEAT: olive brown and black, wet												
				S-2		BC=1 WOH WOH			796						
0															
	5			S-3		BC=1 WOH WOH			700						
-5															
	10														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with bentonite and cuttings on June 07, 2017.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 0 ft. below ground surface during drilling.
GENERAL NOTES:
WOH = Weight of Hammer
Boring was located in the field by Kleinfelder using a handheld GPS unit. Elevation approximated from topography map prepared by Keller & Kirkpatrick, Inc, dated Januray 16, 2017.

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BORING LOG FDI-14

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FDI-14

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