BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	**)**	
	)	
RCRA DELISTING ADJUSTED	**)**	**AS 25 - ____**
STANDARD PETITION OF	**)**	**(Adjusted Standard – Land)**
EXXONMOBIL OIL CORPORATION	**)**	**(RCRA Delisting)**

NOTICE OF FILING

To:

Illinois Pollution Control Board
Don Brown, Clerk
100 West Randolph St.
Suite 11-500
Chicago, IL 60601

Illinois Environmental Protection Agency
Division of Legal Counsel
1021 North Grand Avenue East
P.O. Box 19267
Springfield, IL 62795-9276

U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, IL 60604

U.S. Environmental Protection Agency
Office of Land and Emergency Management
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Please take notice that on April 25, 2025, the Petitioner filed electronically with the Office of the Clerk of the Illinois Pollution Control Board, the attached RCRA Delisting Adjusted Standard Petition of ExxonMobil Oil Corporation, Certificate of Service, and Appearance, copies of which are served upon you.

Dated: April 25, 2025

Respectfully submitted,

/s/ *Eric E. Boyd*

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CERTIFICATE OF SERVICE

I, the undersigned attorney, certify that I have filed the documents described above electronically with the Illinois Pollution Control Board and served the Illinois Environmental Protection Agency, the U.S. Environmental Protection Agency, Region 5, and the U.S. Environmental Protection Agency, Office of Land and Emergency Management, with the same documents by First Class Mail, postage prepaid, on April 25, 2025.

Dated: April 25, 2025

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OF COUNSEL:
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ExxonMobil Oil Corporation

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RCRA DELISTING ADJUSTED	**)**	**AS 25 - ____**
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EXXONMOBIL OIL CORPORATION	**)**	**(RCRA Delisting)**

RCRA DELISTING ADJUSTED STANDARD PETITION OF EXXONMOBIL OIL CORPORATION

NOW COMES the Petitioner, ExxonMobil Oil Corporation ("Petitioner" or "ExxonMobil"), by and through its undersigned counsel, and pursuant to Section 28.1 of the Illinois Environmental Protection Act (the "Act"), 415 ILCS 5/28.1, 35 Ill. Adm. Code Part 104, and 35 Ill. Adm. Code 720.122 (40 C.F.R. 260.22), and petitions the Illinois Pollution Control Board (the "Board") for an adjusted standard to delist specific Primary Treatment Solids ("PTS") designated as F037, F038, K048, and K051 generated at Petitioner's refinery located at 25915 S. Frontage Road, Channahon, Illinois (the "Joliet Refinery"), from classification as hazardous waste under 35 Ill. Adm. Code Part 721.[1] In support, Petitioner states as follows:

I. INTRODUCTION

Petitioner requests an adjusted standard to delist the waste PTS designated as F037, F038, K048, and K051 generated at the Joliet Refinery from classification as hazardous wastes. The petitioned wastes do not meet any of the criteria under which the waste was listed as a hazardous waste, do not exhibit hazardous waste characteristics, and do not exhibit any additional factors, including containing additional constituents, that may cause the wastes to be hazardous wastes. These facts are demonstrated by the analytical data and other information provided in the attached

[1] On November 6, 2024, ExxonMobil and the Illinois Environmental Protection Agency ("IEPA") held a meeting in Springfield to discuss this matter, during which ExxonMobil provided the agency with a draft of this Petition for an opportunity to review and comment prior to filing. This Petition addresses the IEPA's comments.

Exhibit A: Technical Support Document F037, F038, K048 & K051 Delisting Petition ("**Ex. A**" or "**Technical Support Document**"), which Petitioner incorporates in full herein. Delisting will allow these wastes to be managed as non-hazardous, thereby reducing unnecessary regulatory burdens and associated costs while continuing to protect human health and the environment. Petitioner respectfully requests that the Board adopt the proposed adjusted standard.

II. ADJUSTED STANDARD ELEMENTS

A. STANDARD FROM WHICH AN ADJUSTED STANDARD IS SOUGHT AND EFFECTIVE DATE (35 ILL. ADM. CODE 104.406(A))

ExxonMobil seeks an adjusted standard from the hazardous waste requirements specified in 35 Ill. Adm. Code Part 721. Specifically, this Petition requests delisting of the following refinery wastes generated from the wastewater treatment operations and oil recovery processes at the Joliet Refinery: F037 (petroleum refinery primary oil/water/solids separation sludge); F038 (petroleum refinery secondary (emulsified) oil/water/solids separation sludge); K048 (dissolved air flotation (DAF) float from the petroleum refining industry); and K051 (API separator sludge from the petroleum refining industry). The two wastes from nonspecific sources, F037 and F038, are listed in 35 Ill. Adm. Code 721.131. The two wastes from specific sources, K048 and K051, are listed in 35 Ill. Adm. Code 721.132. Both regulations were originally effective on May 17, 1982 and have been amended with the most recent effective date of November 19, 2018.

B. REGULATION OF GENERAL APPLICABILITY TO IMPLEMENT THE REQUIREMENTS OF THE RCRA (35 ILL. ADM. CODE 104.406(B))

The regulations of general applicability for which this adjusted standard is sought are 35 Ill. Adm. Code 721.131 and 35 Ill. Adm. Code 721.132. These and other Illinois hazardous waste regulations in 35 Ill. Adm. Code Parts 720-728 were promulgated to implement the hazardous waste provisions of Subtitle C of the federal Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §§ 6921-6939g, and implementing federal RCRA regulations, 40 C.F.R. Parts 260-273.

The Illinois listings for F037 and F038 in 35 Ill. Adm. Code 721.131 are identical in substance to the federal listings for F037 and F038 in 40 C.F.R. § 261.31. Likewise, the Illinois listings for K048 and K051 at 35 Ill. Adm. Code 721.132 are identical in substance to the federal listings for K048 and K051 at 40 C.F.R. § 261.32.

C. LEVEL OF JUSTIFICATION REQUIRED FOR THIS ADJUSTED STANDARD (35 ILL. ADM. CODE 104.406(C))

Under 35 Ill. Adm. Code 720.122, a person may file a RCRA adjusted standard petition with the Board seeking "to exclude a waste from a particular generating facility from the lists in Subpart D of 35 Ill. Adm. Code 721." The petition will be granted if:

1) The petitioner demonstrates that the waste produced by a particular generating facility does not meet any of the criteria under which the waste was listed as a hazardous or acute hazardous waste; and

2) The Board determines that there is a reasonable basis to believe that factors (including additional constituents) other than those for which the waste was listed could cause the waste to be a hazardous waste, that these factors do not warrant retaining the waste as a hazardous waste. A Board determination under the preceding sentence must be made by reliance on, and in a manner consistent with, "EPA RCRA Delisting Program -- Guidance Manual for the Petitioner", incorporated by reference in Section 720.111(a). A waste that is so excluded, however, still may be a hazardous waste by operation of Subpart C of 35 Ill. Adm. Code 721.

35 Ill. Adm. Code 720.122(a). In accordance with Section 720.122(a)(2), **Exhibit A** is structured to closely track the formatting and substantive requirements for delisting petitions as set forth in the U.S. Environmental Protection Agency's ("EPA") *RCRA Delisting Program -- Guidance Manual for the Petitioner* (Mar. 23, 2000) and Appendix A thereto ("Framework for Delisting Petitions").

The listed wastes addressed by this Petition—F037, F038, K048, and K051—are listed with hazard code "T." For such wastes, under 35 Ill. Adm. Code 720.122(d), the following requirements also apply:

1) The petitioner must demonstrate that the waste meets the following:

   A) It does not contain the constituent or constituents (as defined in Appendix G of 35 Ill. Adm. Code 721) that caused USEPA to list the waste; or

   B) Although containing one or more of the hazardous constituents (as defined in Appendix G of 35 Ill. Adm. Code 721) that caused USEPA to list the waste, the waste does not meet the criterion of 35 Ill. Adm. Code 721.111(a)(3) when considering the factors used in 35 Ill. Adm. Code 721.111(a)(3)(A) through (a)(3)(K) under which the waste was listed as hazardous.

2) Based on a complete petition, the Board will determine, if it has a reasonable basis to believe that factors (including additional constituents) other than those for which the waste was listed could cause the waste to be hazardous waste, that these factors do not warrant retaining the waste as a hazardous waste.

3) The petitioner must demonstrate that the waste does not exhibit any of the characteristics, defined in 35 Ill. Adm. Code 721.121, 721.122, 721.123, or 721.124, using any applicable methods prescribed in those Sections.

D. NATURE OF PETITIONER'S ACTIVITY THAT IS SUBJECT TO THE PROPOSED ADJUSTED STANDARD (35 ILL. ADM. CODE 104.406(D))

1. Facility location, age, and number of employees

The Joliet Refinery (ID No. 197800AAA) is located at 25915 S. Frontage Road, Channahon, Illinois (Will County) and occupies approximately 330 acres. The facility was built in 1972 and has been in operation for over 50 years. The facility has approximately 625 employees and also supports on average about 250 contractors. The Joliet Refinery has a capacity of approximately 275,000 barrels per day.

2. Nature of Petitioner's activity, pollution control equipment already in use, and affected area

The relevant pollution control equipment in use at the Joliet Refinery are the components of the on-site wastewater treatment plant (WWTP) which includes primary and secondary treatment systems. (**Ex. A** at p. 2). The WWTP processes wastewater from refinery operations, generating the listed hazardous wastes that are the subject of this Petition. (**Ex. A** at p. 4). Primary

treatment includes a diversion box, Preseparator Flume, American Petroleum Institute (API) Separator, and Dissolved Air Flotation (DAF) unit. (**Ex. A** at p. 2). Secondary treatment includes a biological treatment unit, clarifiers, and an integrated biological system. (**Ex. A** at p. 2). Following secondary treatment, wastewater is routed to a guard basin for polishing and, once fully treated, is discharged into the Lower Des Plaines River through Outfall 001 pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No: IL0002861. (**Ex. A** at p. 2).

PTS, which includes the wastes subject to this Petition, is periodically removed from the Preseparator Flume, API separator, and DAF unit via vacuum truck and stored onsite in tanks before further processing. (**Ex. A** at p. 2). The point at which the solid PTS is removed from the dewatering equipment is considered the primary point of generation. (**Ex. A** at p. 12). Process improvements have occurred within the refining production units, which have reduced/removed oil, solids, and contaminants discharged by production units and ultimately improved water quality of the WWTP influent as well as the primary and secondary treatment effluent. (**Ex. A** at pp. 6; 11).

F037 is defined as any primary oil/water/solids separation sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. 35 Ill. Adm. Code 721.131. At the Joliet Refinery, F037 is the solids portion that separates from the wastewater via gravity separation in the Preseparator Flume during primary treatment. (**Ex. A** at p. 4).

F038 is any secondary (emulsified) oil/water/solids separation sludge generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. 35 Ill. Adm. Code 721.131. At the Joliet Refinery, F038 is the solids generated in the DAF unit. (**Ex. A** at p. 4).

K048 is any dissolved air flotation (DAF) float from the petroleum refining industry and K051 is any sludge generated in an API separator, and thus include the sludge generated by these wastewater treatment processes at the Joliet Refinery. 35 Ill. Adm. Code 721.132.

When needed during turnarounds or periods of maintenance, PTS is removed from the tanks and physically dewatered to remove as much liquid as possible. (**Ex. A** at pp. 5-6). After dewatering, the PTS is transported for offsite disposal at a permitted hazardous waste landfill, which most recently have been the Clean Harbors Lambton Facility in Sarnia, Ontario, in Canada (over 300 miles from the Joliet Refinery) and the Veolia Environmental Services facility in Port Arthur, Texas (over 800 miles from the Joliet Refinery). (**Ex. A** at p. 6). If granted, the adjusted standard would allow ExxonMobil to dispose of the wastes at a subtitle D non-hazardous waste landfill in Illinois,[2] eliminating the need to transport the wastes hundreds of miles to specialized hazardous waste landfills.

3. Qualitative and quantitative description of the emissions currently generated by Petitioner's activity

With respect to the discharges under the Joliet Refinery's NPDES permit, between 2018 through 2023, the average annual wastewater flowrate was 2.7 million gallons per day with a maximum of 4.5 million gallons per day. (**Ex. A** at p. 11). The wastewater and any solids that do not settle out exit the DAF unit and go on to secondary treatment. (**Ex. A** at p. 11). The average oil content entering the WWTP units is estimated to be approximately 0.02% based on the average flow through the WWTP and the daily oil recovery. (**Ex. A** at p. 15).

The long-distance transportation of the PTS via diesel trucks to the hazardous waste facilities in Canada and Texas hundreds of miles from the Joliet Refinery results in emissions to the environment, including total hydrocarbon, carbon monoxide, oxides of nitrogen, fine

[2] Currently, a landfill in Wilmington, Illinois is expected to receive the delisted wastes.

particulate matter, and carbon dioxide. ExxonMobil has estimated these emissions by applying standardized measures from the U.S. Department of Transportation.[3] **Chart 1** below shows the transportation-related emissions per round trip to the facilities in Sarnia, Ontario, Port Arthur, Texas, and Wilmington, Illinois.[4]

Chart 1: Transportation Emissions Per Round Trip

Pollutant	Emission Factor [grams/mile]	Emissions per Round Trip to Sarnia, Ontario, Canada [pounds]	Emissions per Round Trip to Port Arthur, Texas [pounds]	Emissions per Round Trip to Wilmington, IL [pounds]
Total Hydrocarbon (THC)	0.193	0.313	0.845	0.009
Carbon Monoxide (CO)	1.643	2.666	7.194	0.080
Oxides of Nitrogen (NO_X)	2.892	4.693	12.66	0.140
Fine Particulate Matter ($PM_{2.5}$)	0.067	0.109	0.293	0.003
Carbon Dioxide (CO_2)	1,411	2,289	6,178	68.44

As shown in **Chart 1**, transportation emissions per round trip are dramatically reduced if disposal occurs at the non-hazardous waste landfill in Wilmington, Illinois rather than at the facilities in Canada and Texas. The figures in **Chart 1** demonstrate reductions in emissions in the range of

[3] *See Estimated U.S. Average Vehicle Emissions Rates per Vehicle by Vehicle Type Using Gasoline and Diesel*, USDOT Bureau of Transportation Statistics, available at: https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-vehicle-type-using-gasoline-and.

[4] Round trip miles to Sarnia, Ontario, Canada; Port Arthur, Texas; and Wilmington, IL are, respectively, 736; 1,986; and 22.

about 97% (relative to transportation to Canada) to 99% (relative to transportation to Texas) for each of the five pollutants.

Chart 2 below annualizes the emissions estimates based on typical yearly truckloads to the facility in Canada and maximum potential truckloads to the facility in Texas. In a typical year, about 167 truckloads of PTS are sent to the facility in Canada while few or no truckloads are sent to the facility in Texas. A maximum potential year could result in an approximate doubling of the amount of PTS requiring transportation, and if an issue arose which prevented transportation out of the country, then the PTS would be sent to the facility in Texas. Accordingly, **Chart 2** presents emissions estimates based on these typical and maximum potential figures based on the facility, and shows the estimated reduction in emissions under each scenario.

Chart 2: Transportation Emissions Per Typical and Maximum Years and Reductions Under Adjusted Standard

Pollutant	Transportation Emissions for a Typical Year and transported to Clean Harbors in Sarnia, Ontario, Canada [pounds/year]	Reduction in Emissions for a Typical Year by Delisting & Disposal in Wilmington, IL [pounds/year]	Transportation Emissions for a Maximum Year and transported to Veolia in Beaumont, Texas [pounds/year]	Reduction in Emissions for a Maximum Year by Delisting & Disposal in Wilmington, IL [pounds/year]
Total Hydrocarbon (THC)	52.3	50.7	282.2	279.1
Carbon Monoxide (CO)	445	432	2,403	2,376
Oxides of Nitrogen (NO_X)	784	760	4,229	4,182
Fine Particulate Matter ($PM_{2.5}$)	18.2	17.6	98.0	96.9
Carbon Dioxide (CO_2)	382,345	370,916	2,063,414	2,040,556

Consistent with **Chart 1**, the figures in **Chart 2** show reductions in annualized emissions of about 97% for a typical year (in which about 167 truckloads are sent to the facility in Canada) to 99% for a maximum year (in which about double, or 334, truckloads are sent to the facility in Texas).

By eliminating the need to transport PTS across hundreds of miles to disposal facilities, the adjusted standard would allow ExxonMobil to dispose of the wastes at a subtitle D non-hazardous waste landfill in Illinois and substantially reduce transportation-related emissions. The much shorter distances would also reduce the risk of spills/releases along the transportation routes.

E. DESCRIPTION OF EFFORTS NECESSARY TO COMPLY (35 ILL. ADM. CODE 104.406(E))

As discussed above, Petitioner's current processes for managing the wastes subject to this Petition involve generation by periodically removing PTS from the Joliet Refinery's onsite wastewater treatment systems, followed by transportation to permitted landfills in Sarnia, Ontario and Port Arthur, Texas. Continued compliance with the regulations of general applicability—35 Ill. Adm. Code 721.131 with respect to F037 and F038 and 35 Ill. Adm. Code 721.132 with respect to K048 and K051—would not involve additional capital investments because the processes for managing these wastes have been in place (though improved over time) for several decades. The primary variable cost at issue with continued compliance versus compliance with the adjusted standard is the cost of transporting and disposing the wastes at the permitted landfills far from the facility.

Comparing Petitioner's current processes for managing the wastes as listed hazardous wastes versus managing the wastes as non-hazardous if the proposed adjusted standard is granted, the principal variable expenses that would change are those for transportation and disposal of the wastes. **Chart 3** below presents the current costs to Petitioner of transportation and disposal of the wastes on an annual basis, based on a typical year in which approximately 167 truckloads of PTS are transported and disposed. Each truckload holds about 15 tons of PTS, equating to about 2500 tons of PTS transported and disposed per year. **Chart 4** below presents the estimated

alternative costs to Petitioner of transportation and disposal of the wastes on an annual basis for a typical year under the proposed adjusted standard.

Chart 3: Current approximate annual costs of transportation and disposal of PTS as hazardous waste.

Expense	Cost per ton	Tons per year	Cost per year
Transportation to disposal facilities	$ 491	2500	$ 1,227,500
Disposal at hazardous waste landfill	$ 480	2500	$ 1,200,000
Total			**$2,427,500**

Chart 4: Estimated adjusted standard annual costs of transportation and disposal of PTS as non-hazardous waste.

Expense	Cost per ton	Tons per year	Cost per year
Transportation to disposal facilities	$ 41	2500	$ 102,500
Disposal at non-hazardous waste landfill	$ 14	2500	$ 35,000
Total			**$137,500**

As these numbers show, the difference between current costs and estimated costs should the adjusted standard be granted is approximately $2,290,000 less per each typical year.

Petitioner has assessed and ruled out the viability of potential compliance alternatives for handling the PTS. Alternatives analyzed included: (1) centrifuging the PTS and sending it offsite as hazardous waste to be consumed in a local cement kiln; (2) centrifuging the PTS and sending it offsite as oil bearing secondary material (OBSM) to be processed at a facility approved under the RCRA Verified Recycling Exclusion (VRE) or Transfer-Based Recycling Exclusion (TBRE); and, (3) disposing the PTS as hazardous waste via incineration at the Veolia facility in Port Arthur.

Centrifuging the PTS for use in a cement kiln was ruled out because the BTU content of the centrifuged waste was too low (<10,000 BTUs) for acceptance by the kiln.

The second and third potential alternatives were found to be cost prohibitive relative to the delisting alternative. Centrifuging the PTS and sending it as OBSM for processing at a VRE or TBRE approved facility would cost approximately $4,090,000 in a typical year based on a transportation cost of $886 per ton plus a processing cost of $750 per ton, multiplied by 2500 tons per year. Disposal via incineration would cost approximately $7,115,000 in a typical year based on a transportation cost of $946 per ton plus a disposal cost of $1,900 per ton, multiplied by 2500 tons per year. Moreover, these alternatives would still entail significant transportation distances leading to emissions at levels comparable to the status quo of transporting the PTS for disposal at the landfills in Canada and Texas.

Accordingly, the delisting alternative is the superior alternative based on environmental and cost considerations.

F. NARRATIVE DESCRIPTION OF PROPOSED ADJUSTED STANDARD (35 ILL. ADM. CODE 104.406(F))

1. Proposed language of adjusted standard

Petitioner proposes the following adjusted standard language:

Effective *[effective date]*, waste PTS designated as F037, F038, K048 and K051 generated at the ExxonMobil Oil Corporation petroleum refinery at 25915 S. Frontage Road, Channahon, Illinois (the "Joliet Refinery") shall not be deemed hazardous waste under 35 Ill. Adm. Code Part 721, subject to the following conditions:

a) Applicability. This adjusted standard is provided only for the waste PTS designated as F037, F038, K048 and K051 generated at the Joliet Refinery's wastewater treatment operations and oil recovery processes, as described in the RCRA Delisting Adjusted Standard Petition, including the Technical Support Document filed therewith on April 25, 2025.

b) PTS Testing.

1) ExxonMobil will perform quarterly testing of a composite representative sample of the waste for the constituents listed in Table A (below) and hazardous characteristics as defined in 35 Ill. Adm. Code 721.121, 721.122, 721.123, and 721.124. If an initial sample concentration is observed above the delisting level, then a verification sample will be collected within 7 days of receipt of the analytical data and reanalyzed for the constituent(s) exhibiting a concentration greater than the delisting level. A confirmed exceedance of the delisting level will be deemed present if both the original and verification sample exhibit concentrations above the delisting level.

2) All analyses pursuant to this adjusted standard shall be performed according to SW-846 methodologies incorporated by reference in 35 Ill. Adm. Code 720.111.

3) The operator shall not transport the waste subject to this adjusted standard outside of the State of Illinois.

c) Delisting Levels. Based on testing pursuant to the conditions of this adjusted standard, the constituent concentrations in the waste subject to this adjusted standard must not exceed any of the values below in Table A in addition to hazardous characteristics as defined in 35 Ill. Adm. Code 721.121, 721.122, 721.123, and 721.124. Otherwise such waste must be managed and disposed of as hazardous waste in accordance with 35 Ill. Adm. Code Parts 703 and 722-728. Table A represents the detected hazardous constituents for which PTS designated as F037, F038, K048, and K051 is listed.

Table A
Detected Hazardous Constituents for which
PTS designated as F037, F038, K048, and K051 is listed

Constituent	TCLP Delisting Level (mg/l)
Benzo(a)pyrene	34.300
Chromium (III) (Chromic Ion)	4.940
Chromium (VI) (+6)	0.019
Chrysene	9.140
Lead	1.280

d) Notifications, Data Submittals, and Certification.

1) At least 30 days prior to transporting the first load of waste pursuant to this adjusted standard, the operator shall provide IEPA with a one-time written notification stating that the operator intends to commence transportation of PTS pursuant to this adjusted standard and the name of the landfill facility to which the PTS will be transported. If the operator changes disposal

facilities, it shall provide to IEPA a one-time written notification of such change.

2) ExxonMobil must submit semi-annually to the IEPA a report of the data collected pursuant to the testing procedures of this adjusted standard. Alternatively, IEPA may consent to receipt of only the summary or a subset of the data or both.

3) All analytical data created pursuant to this adjusted standard shall be compiled and maintained at the Joliet Refinery for a minimum of three years. This data shall be made available for inspection by any representative of the State of Illinois upon request.

4) All data submittals to the IEPA must be accompanied with the following certification statement:

> Under civil and criminal penalty of law for the making or submission of false or fraudulent statements or representations, I certify that the information contained in or accompanying this document is true, accurate, and complete.
>
> As to any identified section of this document for which I cannot personally verify its truth, accuracy, or completeness, I certify, as ExxonMobil Oil Corporation's official having supervisory responsibility for the person(s) who, acting under my direct instructions, made the verification, that this information is true, accurate, and complete.
>
> In the event that any of this information is determined by the Board or a court of law to be false, inaccurate, or incomplete, I recognize and agree that this exclusion of waste will be void as if it never had effect or to the extent directed by the Board or court and that ExxonMobil Oil Corporation will be liable for any actions taken in contravention of its obligations under RCRA (including its RCRA Part B permit) or the Comprehensive Environmental Response, Compensation and Liability Act or corresponding provisions of the Environmental Protection Act premised upon ExxonMobil Oil Corporation's reliance on the void exclusion.
>
> _____
> (Name of certifying person)
>
> _____
> (Title of certifying person)
>
> _____
> (Date)

2. Narrative description of proposed adjusted standard language

The proposed adjusted standard provides a site-specific delisting from hazardous waste classification for PTS generated at the Joliet Refinery designated as F037, F038, K048, and K051. These wastes are generated during the refinery's wastewater treatment and oil recovery processes. The adjusted standard allows ExxonMobil to manage these wastes as non-hazardous, subject to strict verification, testing, and compliance conditions.

Under the adjusted standard, ExxonMobil is required to perform quarterly testing on the wastes to confirm they do not exceed the hazardous waste delisting levels established in Table A of the adjusted standard, which applies to the constituents Benzo(a)pyrene, Chromium (III), Chromium (VI), Chrysene, and Lead. The specific delisting levels applicable to each of these constituents are set forth in Table A of the proposed adjusted standard text. These delisting levels establish maximum allowable concentrations for hazardous constituents in the waste, below which the waste is considered non-hazardous. In addition to this specific testing, ExxonMobil must ensure that the waste does not exhibit hazardous waste characteristics. The delisted waste must not be transported outside the State of Illinois, which ensures that any waste managed under the adjusted standard remains subject to Illinois' environmental regulations, and it provides added oversight for the transportation and disposal of the delisted waste.

If testing reveals an exceedance of a delisting level, ExxonMobil is required to collect a verification sample within seven days of receipt of the analytical results, and reanalyze the waste. A confirmed exceedance of the delisting level, demonstrated by both the initial and verification samples, will result in the waste being managed as hazardous waste under 35 Ill. Adm. Code Parts 703 and 722-728.

ExxonMobil is required to notify the IEPA in writing at least 30 days before transporting the first load of waste meeting the delisting levels. The notification must identify the landfill facility to which the waste will be transported. If the disposal facility changes, a new written notification must be submitted to the IEPA. ExxonMobil must also submit a semi-annual report to the IEPA summarizing the data collected from its waste verification and testing activities. The IEPA may, at its discretion, allow ExxonMobil to submit only a summary or subset of this data. Additionally, ExxonMobil is required to retain all testing and analytical data for a minimum of three years at the Joliet Refinery, and such data must be made available for inspection upon request by representatives of the State of Illinois.

All data submitted to the IEPA must be accompanied by a certification statement, signed by an ExxonMobil official with supervisory responsibility for the individuals generating the data. The certification must affirm that the data and information are true, accurate, and complete, and acknowledge that providing false or fraudulent information may result in civil or criminal penalties. If any part of the data is later found to be inaccurate, the waste exclusion may be voided, and ExxonMobil could be subject to legal liabilities under RCRA, CERCLA, or other applicable state and federal laws.

3. <u>Efforts necessary to achieve this proposed standard and the corresponding costs</u>

The risk analyses and Delisting Risk Assessment Software ("DRAS") modeling results presented in the **Technical Support Document** filed herewith demonstrate that meeting the delisting levels and handling the delisted PTS as non-hazardous waste will not pose a risk to human health or the environment. Therefore, no additional efforts beyond compliance with the procedures set forth in the proposed adjusted standard will be required to achieve its conditions.

As detailed above under Section II(D), the delisted PTS is expected to be transported and disposed of in a non-hazardous waste landfill in Wilmington, Illinois, resulting in a 97-99% reduction in transportation-related emissions relative to the status quo of transporting the PTS hundreds of miles to facilities in Canada and Texas. The transportation and disposal costs borne by ExxonMobil to comply with the adjusted standard in a typical year would be approximately $137,500, which is a reduction from the current transportation and disposal costs of about $2,427,500.

G. DESCRIPTION OF THE IMPACT OF PETITIONER'S ACTIVITIES ON THE ENVIRONMENT (35 ILL. ADM. CODE 104.406(G))

The transportation to and disposal of the wastes subject to this petition at facilities hundreds of miles away from Joliet Refinery is energy inefficient and results in emissions associated with diesel truck transportation, including carbon dioxide, nitrogen oxides, carbon monoxide, particulate matter, and air toxics. Adoption of the adjusted standard to allow the wastes to be disposed of at non-hazardous waste landfills in Illinois would drastically shorten the transportation distance and thereby reduce transportation-related emissions.

In addition to the reduced emissions associated with transportation of the wastes, quantitative and qualitative impacts are presented in the **Technical Support Document**, including detailed waste analyses and risk assessments (*see, e.g.,* **Ex. A** at pp. 4-6 (waste details and volumes); 11-14 (treatment processes); 17-21 (sampling methodologies and results); 25-31 (risk analyses and discussion of background concentrations for specific constituents)).

H. STATEMENT OF JUSTIFICATION FOR THE PROPOSED ADJUSTED STANDARD (35 ILL. ADM. CODE 104.406(H))

The level of justification, along with other information or requirements needed for an adjusted standard as outlined by the regulation of general applicability, 35 Ill. Adm. Code 720.122,

is provided in Section II(C), above. The technical justification for the proposed adjusted standard can be found in **Exhibit A**. The following explains how Petitioner justifies the proposed adjusted standard according to 35 Ill. Adm. Code 720.122.[5]

1. The wastes do not meet the criteria for which they were listed and there are no additional factors (including additional constituents) that could cause the waste to be a hazardous waste. (35 Ill. Adm. Code 720.122(a)(1) and (d)(1)(A); 35 Ill. Adm. Code 720.122(a)(2) and (d)(1)(B)).

As detailed in **Exhibit A**, Petitioner has evaluated the results of an extensive analytical testing program to confirm that the physical and chemical characteristics of the wastes subject to this petition do not meet the criteria for which they were listed and there are no additional factors (including additional constituents) that could cause the wastes to be hazardous wastes. (**Ex. A** at pp. 23-31 (waste analysis information)).

To demonstrate that the wastes are not characteristically hazardous, analysis of each of the PTS samples was performed by Totals and Toxicity Characteristic Leaching Procedure (TCLP) (40 C.F.R. § 261.24) and for Reactivity, Corrosivity, and Ignitability (RCI) (40 C.F.R. § 261.21-261.23). To demonstrate that the PTS does not meet any of the criteria under which the wastes from which it was derived were listed as hazardous, and that no additional factors (*e.g.*, constituents) cause the PTS to be hazardous, each of the samples were analyzed for a

[5] The following discusses the requirements of 35 Ill. Adm. Code 720.122(a)(1) and (d)(1)(A); 720.122(a)(2) and (d)(1); 720.122(h); 720.122(i); 720.122(p) and (r); and 720.122(q). 35 Ill. Adm. Code 720.122(b) does not apply because PTS waste is a mixture of one or more listed hazardous wastes, rather than a mixture of solid non-hazardous waste and one or more listed hazardous wastes. 35 Ill. Adm. Code 720.122(c) and (e) do not apply because the wastes subject to this Petition are listed with code "T" and not codes "I," "C," "R," "E," or "H." 35 Ill. Adm. Code 720.122(f) and (g) do not apply because the wastes are not radioactive or infectious (see 40 C.F.R. § 260.22). 35 Ill. Adm. Code 720.122(j) and (l) acknowledge the Board's authority to request any additional information needed to evaluate the Petition and to order a partial exclusion. 35 Ill. Adm. Code 720.122(m) does not apply because the wastes subject to this Petition have not been delisted by USEPA. 35 Ill. Adm. Code 720.122(n) provides the requirement for RCRA delisting adjusted standard petitions to be served on USEPA, which Petitioner will effectuate. 35 Ill. Adm. Code 720.122(o) does not apply because, to Petitioner's knowledge, the IEPA has not determined in a permit or a letter that these wastes are not subject to 35 Ill. Adm. Code 721.

comprehensive analyte list consistent with the *RCRA Delisting Program -- Guidance Manual for the Petitioner*. Per the guidance, the COCs were drawn from the "full universe" of constituents identified in: 40 CFR 261 ("Identification and Listing of Hazardous Waste") and Appendix VIII thereto ("Hazardous Constituents"); additional chemicals listed in Section 6.1 of the guidance; and, 40 CFR 264 ("Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities") and Appendix IX thereto ("Ground-Water Monitoring List"). In accordance with the guidance, the list of COCs was narrowed based on industry knowledge, process knowledge, historical analytical history, and EPA guidance—specifically the Appendix VIII hazardous constituents applicable to refinery wastes identified in EPA Region 5's "Skinner List." (**Ex. A** at p. 16; *see also* **Ex. A**, Table 2). All maximum concentrations were less than applicable hazardous waste criteria. (**Ex. A** at p. 25).

Finally, the analytical data was determined to be representative and valid, as required to support the use of the data in the risk assessment modeling used for delisting purposes, which is the EPA DRAS. (**Ex. A** at p. 25). The DRAS model is used by the EPA and IEPA to assess environmental risks from disposing of wastes proposed for delisting. The model simulates potential risks if the wastes are improperly managed in an unlined landfill, with uncontrolled groundwater releases and surface emissions. It calculates the risks and determines the maximum allowable concentrations of waste constituents for safe delisting. The model evaluates various exposure pathways, including human health, groundwater protection, surface water impact, and ecological effects. The latest DRAS V.4 Model was used to determine if the waste meets the risk criteria for delisting. (**Ex. A** at pp. 25-26).

The DRAS model was used to analyze data from four independent sampling events conducted over four months, covering the transition from Summer to Winter blend gasoline

production. (**Ex. A** at p. 26). The waste proposed for delisting was tested for a comprehensive list of constituents, including total concentrations and TCLP for detected organic compounds and metals, except for PCBs and dioxin congeners. (**Ex. A** at p. 26). Metals were also analyzed under acidic, neutral, and basic conditions according to delisting requirements. (**Ex. A** at p. 26).

With the exception of the polychlorinated biphenyl (PCB) congener Aroclor-1248, all constituents detected in at least one sampling event were included in the DRAS modeling. Aroclor-1248 was detected in one sample (PTS-04) at 15 mg/kg and in a duplicate at 5.9 mg/kg, but this is considered an anomaly and likely a laboratory artifact, as PCBs are not associated with the wastes. (**Ex. A** at p. 26). Although no specific quality control (QC) issues were identified, the QC process did not use the same congener (1248), making it impossible to conclusively confirm if the detection was a lab error. (**Ex. A** at p. 26). However, the detected PCB concentrations are well below the regulated limit of 50 mg/kg and are acceptable for disposal in a Subtitle D landfill under TSCA regulations. (**Ex. A** at p. 26).

2. There were more than four samples taken over a period sufficient to represent the variability or the uniformity of the waste. (35 Ill. Adm. Code 720.122(h)).

The Sampling and Analysis Plan included in **Exhibit A** meets the requirements of non-biased representation of the PTS due to the number of samples collected, temporal variability, quality assurance, and the comprehensive analytical analysis of the samples. (**Ex. A** at p. 19 and App'x A (Sampling and Analysis Plan) thereto). The WWTP operates continually, and the petitioned wastes are continuously generated at the Preseparator Flume, API Separator, and DAF units. (**Ex. A** at p. 19). The strategy to address temporal variability involved collecting four samples at monthly intervals to encompass four time periods representing refinery conditions during production of Summer and Winter blend fuels. (**Ex. A** at p. 19). The strategy to address

spatial variability was to collect samples from the dewatered contents of the tanks containing the PTS. (**Ex. A** at p. 19).

3. The Technical Support Document, Exhibit A, provides the requisite sampling and testing data and Petitioner's signature. (35 Ill. Adm. Code 720.122(i)).

Exhibit A provides the information required by 35 Ill. Adm. Code 720.122(i), including facility information, analytical data from the four sampling events, quality control analyses, and DRAS modeling results, as follows:

Subpart of 35 Ill. Adm. Code 720.122	Citation to Exhibit A
720.122(i)(1): The name and address of the laboratory facility performing the sampling or tests of the waste;	pp. 17-18 (sampling strategy and collection by ERM); 23 (sample analysis by ALS Laboratory Group in Houston)
720.122(i)(2): The names and qualifications of the persons sampling and testing the waste;	p. 17 (listing personnel); App'x C (qualifications)
720.122(i)(3): The dates of sampling and testing;	p. 18 (samples collected between July 2023 and October 2023)
720.122(i)(4): The location of the generating facility;	pp. 1-2 (Joliet Refinery)
720.122(i)(5): A description of the manufacturing processes or other operations and feed materials producing the waste and an assessment of whether such processes, operations, or feed materials can or might produce a waste that is not covered by the demonstration;	pp. 8-15 (detailed information on facility operations, manufacturing processes, waste treatment areas, waste management units, contributing processes, and process materials)
720.122(i)(6): A description of the waste and an estimate of the average and maximum monthly and annual quantities of waste covered by the demonstration;	pp. 4 (waste description); 5-6 (volume of petitioned wastes, monthly and annual
720.122(i)(7): Pertinent data on and discussion of the factors delineated in the respective criterion for listing a hazardous waste, where	pp. 23-31 (waste analysis information); App'x A (Sampling and Analysis Plan)

the demonstration is based on the factors in 35 Ill. Adm. Code 721.111(a)(3);	
720.122(i)(8): A description of the methodologies and equipment used to obtain the representative samples;	pp. 18-22 (sampling strategy); App'x A (Sampling and Analysis Plan)
720.122(i)(9): A description of the sample handling and preparation techniques, including techniques used for extraction, containerization, and preservation of the samples;	pp. 18-22 (sampling strategy); App'x A (Sampling and Analysis Plan)
720.122(i)(10): A description of the tests performed (including results);	pp. 23-31 (waste analysis information); App'x F (analytical reports, including results from quality control analyses)
720.122(i)(11): The names and model numbers of the instruments used in performing the tests; and	App'x F (includes names and model numbers of all equipment used during the analysis)
720.122(i)(12): The following statement signed by the generator or the generator's authorized representative: *I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.*	pp. 2-3

4. The waste will be generated and managed in Illinois and the adjusted standard will apply only to the Joliet Refinery. (35 Ill. Adm. Code 720.122(k), (p) and (r)).

As detailed in this Petition and the **Technical Support Document**, the petitioned wastes will be generated and managed in Illinois. The requested adjusted standard will only apply to wastes generated at the Joliet Refinery.

5. The Adjusted Standard, if granted, would not render the Illinois RCRA program less stringent than if the decision were made by USEPA. (35 Ill. Adm. Code 720.122(q)).

This Petition and the **Technical Support Document** demonstrate that the adjusted standard, if granted, will not render the Illinois RCRA program less stringent than if the decision were made by the USEPA.

I. CONSISTENCY WITH FEDERAL LAW (35 ILL. ADM. CODE 104.406(I))

The proposed adjusted standard meets the requirements prescribed in 35 Ill. Adm. Code 720.122, which are identical in substance to the requirements for delisting a hazardous waste set forth in 40 CFR 260.122. No additional procedural requirements for Board action are required under the RCRA. Accordingly, for all of the reasons discussed herein and in the **Technical Support Document** attached hereto, the Board may grant the proposed adjusted standard consistent with federal law.

J. PETITIONER'S RIGHT TO A HEARING (35 ILL. ADM. CODE 104.406(J))

Petitioner waives a hearing on this Petition.

K. DOCUMENTS RELIED UPON (35 ILL. ADM. CODE 104.406(K))

In addition to the information presented within this Petition, Petitioner relies on the **Technical Support Document** attached hereto and incorporated herein, which provides the detailed analytical information supporting the request for an adjusted standard.

III. CONCLUSION

For the foregoing reasons, ExxonMobil Oil Corporation respectfully requests that the Illinois Pollution Control Board grant the requested adjusted standard to delist the waste PTS designated as F037, F038, K048, and K051 under 35 Ill. Adm. Code Part 721 from hazardous waste classification.

Dated: April 25, 2025

Respectfully submitted,

/s/ *Eric E. Boyd*

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OF COUNSEL:
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Attorneys for Petitioner
ExxonMobil Oil Corporation

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	**)**	
	)	
RCRA DELISTING ADJUSTED	**)**	**AS 25 - ____**
STANDARD PETITION OF	**)**	**(Adjusted Standard – Land)**
EXXONMOBIL OIL CORPORATION	**)**	**(RCRA Delisting)**

APPEARANCE

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U.S. Environmental Protection Agency
Region 5
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Chicago, IL 60604

U.S. Environmental Protection Agency
Office of Land and Emergency Management
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

NOW COMES, Eric E. Boyd, Edward A. Cohen, and Timothy B. Briscoe, of Thompson Coburn LLP, and hereby enter their appearance as attorneys for the Petitioner, ExxonMobil Oil Corporation, in the above-captioned matter.

Dated: April 25, 2025

Respectfully submitted,

/s/ *Eric E. Boyd*

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OF COUNSEL:
THOMPSON COBURN LLP

Attorneys for Petitioner
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Exhibit A

Technical Support Document F037, F038, K048 & K051 Delisting Petition

Technical Support Document F037, F038, K048 & K051 Delisting Petition

ExxonMobil Joliet Refinery, Illinois

PREPARED FOR
ExxonMobil

DATE
15 April 2025

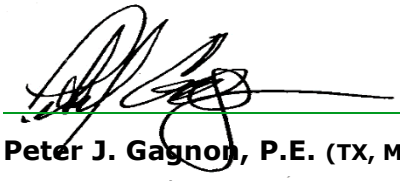
REFERENCE
0647752

SIGNATURE PAGE

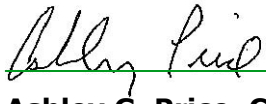
Technical Support Document F037, F038, K048 & K051 Delisting Petition

ExxonMobil Joliet Refinery, Illinois

0647752



Peter J. Gagnon, P.E. (TX, MT,OK), BCEE
Partner-in-Charge



Ashley G. Price, CEP
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840 West Sam Houston Parkway North
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Texas Registered Engineering Firm F-2393
Texas Board of Professional Geoscientists Firm 50036

CONTENTS

APPENDICES

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
ALS	ALS Laboratory Group
API	American Petroleum Institute
CFR	Code of Federal Regulations
CHD	Catalytic Hydro-Desulfurization
COCs	Constituents of Concern
DRAS	EPA Delisting Risk Assessment Software
EAB	East Aeration Basin
EBTU	East Biological Treatment Unit
EPA	Environmental Protection Agency
ERM	Environmental Resources Management Southwest, Inc.
ExxonMobil	ExxonMobil Corporation
FCC	Fluidized Catalytic Cracking
ft	Feet
gpm	gallons per minute
IBS	Integrated Biological System
in	inches
JRF	Joliet Refinery
LCS/LCSD	Laboratory Control Spike / Laboratory Control Spike Duplicate
Mgal	Million gallons
MGD	million gallons per day
MOSC	Mobil Oil Sludge Coking
MS/MSD	Matrix Spike / Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
MWTF	Multiple Waste Treatment Facility
NELAP	National Environmental Laboratory Accreditation Program
OBSM	Oil Bearing Secondary Material
OM	Oil Movements
OWS	Oily Water Sewer
PTS	Primary Treatment Solids
QAPP	Quality Assurance Project Plan
RCI	Reactivity, Corrosivity and Ignitability

Acronym	Description
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SIC	Standard Industrial Classification
SRB	Stormwater Retention Basin
SRU	Sulfur Recovery Unit
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
VOC	Volatile Organic Compound
WAB	West Aeration Basin
WWTP	Waste Water Treatment Plant
yd	yard

PART 1: DELISTING ADMINISTRATIVE INFORMATION

1. Name of Petitioner.
   a. Name of individual or firm sending petition:

      ExxonMobil Product Solutions Company, Joliet Refinery

   b. Mailing address of individual or firm:

      Street/P.O. Box: 25915 S. Frontage Road

      City: Channahon

      State: Illinois

      Telephone: (779) 209-6488

2. People to contact for additional information pertaining to this petition:
   a. Name: Title: Company Telephone No.

Heidi Mulhall	*Environmental Advisor*	*ExxonMobil*	*779-209-6488*
Peter J. Gagnon, P.E., BCEE	*Gulf Coast Area Manager, Partner*	*Environmental Resources Management Southwest, Inc. (ERM)*	*281-600-1000*

   b. Mailing address of contact(s) if different from petitioner:

      For ExxonMobil:

      Street/P.O. Box: *25915 S. Frontage Road*

      City: *Channahon*

      State:*Illinois* Zip Code: *60410*

      For Environmental Resources Management Southwest, Inc.:

      Street/P.O. Box: *840 W. Sam Houston Parkway North, Suite 600*

      City: *Houston*

      State: *Texas* Zip Code: *77024*

3. Facility Responsible for Generating Petitioned Waste:
   a. Name of facility:

      ExxonMobil Product Solutions Company

   b. Location of facility:

      Street/P.O. Box: *25915 S. Frontage Road*

      City: *Channahon*

      State: *Illinois* Zip Code: *60410*

   c. RCRA ID number: ILD064403199

4. Location of Petitioned Waste:

   Same as facility name and address given in item 3.

5. Describe the proposed delisting action.

   ExxonMobil requests a standard delisting for the Primary Treatment Solids (PTS) generated at the ExxonMobil Joliet Refinery (JRF), shown in Figure 1. Under routine operating conditions, the industrial wastewater is routed through the refinery oily water sewer (OWS) into the Wastewater Treatment Plant (WWTP). The WWTP includes Primary Treatment and Secondary Treatment. Primary Treatment units include a diversion box, Preseparator Flume, American Petroleum Institute (API) Separator, and Dissolved Air Floatation (DAF) unit. Oil is skimmed off the top of the API separator and sent to Tank 525/526. The top of the DAF unit is skimmed to Tank 585/586. After passing through the DAF unit, the wastewater is conveyed to the Secondary Treatment system. Secondary Treatment includes the East Biological Treatment Unit (EBTU), West Aeration Basin (WAB), East Aeration Basin (EAB), east clarifier, west clarifier and Integrated Biological System (IBS). After passing through these systems, wastewater is then routed to the Guard Basin for polishing before discharge. Once the wastewater has been treated in the WWTP, it discharged into the Lower Des Plaines River through Outfall 001 pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No: IL0002861. Figure 2a presents a flow chart of the WWTP.

   Solids from the Preseparator Flume, API Separator, and DAF unit (i.e. PTS) get periodically removed from the units via vacuum truck and transported into Tanks 585/586 before eventual processing via Mobil Oil Sludge Coking (MOSC). JRF currently sends most PTS through the MOSC system onsite. However, at times (e.g., during a maintenance or turnaround event) PTS removed from Tanks 585/586, physically dewatered and disposed off site in a permitted landfill facility.

6. Provide a statement of the need and justification for the proposed action.

   ExxonMobil requests the delisting based on the characteristics of the specific waste at this site. The petitioned waste does not meet any of the criteria under which the waste was listed as a hazardous waste, the waste does not exhibit the hazardous waste characteristics, and the waste does not exhibit any additional factors, including additional constituents, which may cause the waste to be a hazardous waste. The requirements imposed by USEPA for management, transportation, and disposal of hazardous waste are, therefore, unnecessary for this waste.

7. Signed Certification Statement:

   ExxonMobil has retained the services of Environmental Resources Management Southwest, Inc. (ERM) and ALS Laboratory Group (ALS) and has relied upon their qualifications and expertise in preparation of this petition and verification of sampling methodology.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signed by Authorized Representative,

Typed Name: Matthew Wetzel

Title: Process Manager

**Note: An "authorized representative" is a person responsible for the overall operation of a facility or an operational unit (i.e., part of a facility), for example, a plant manager, superintendent, or person of equivalent responsibility. Consultants or other outside parties should not sign the certification statement.*

PART 2: DELISTING WASTE AND WASTE MANAGEMENT INFORMATION

BASIS FOR THE WASTE LISTING

1. Scenario that best describes the petitioned waste.

   a. Petitioned waste is <u>not</u> a mixture of two or more listed hazardous wastes.

      Not Applicable.

   b. Petitioned waste is a mixture of two or more listed hazardous wastes.

      Common name of mixture:

      Primary Treatment Solids (PTS)

      For all listed wastes provide:

      EPA Hazardous Waste Number: F037, F038, K048, and K051

      Hazardous waste description:

      Per the definition provided in 40 CFR 261.31, an F037 listed hazardous waste is any primary oil/water/solids separation sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges also include sludge generated from gravitational separation in oil/water/solids separator, sumps, ditches, and other conveyances. The Primary Treatment of the WWTP receives industrial waste generated at JRF. Solids removed from the refinery wastewater in the Preseparator Flume, API Separator, and DAF unit are periodically removed via vacuum truck and transferred into Tanks 585/586 for eventual processing by Mobil Oil Sludge Coking (MOSC). The solids portion that separates from the wastewater during Primary Treatment (i.e., gravity separation in the Preseparator Flume) is an F037 waste stream by definition. The basis for a F037 hazardous waste is Toxic Waste (T).

      Per the definition provided in 40 CFR 261.31, an F038 listed hazardous waste is any secondary (emulsified) oil/water/solids separation sludge generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. The PTS generated at JRF includes solids generated in the DAF unit.

      Per the definition provided in 40 CFR 261.31, K048 listed hazardous waste as any dissolved air flotation (DAF) float from the petroleum refining industry.

      Per the definition provided in 40 CFR 261.31, K051 listed hazardous waste is any sludge generated in an API separator. The API receives wastewater generated at the JRF as part of the WWTP. The sludge separates from the wastewaters in the API separator making it an K051 waste stream.

c. Petition waste is a mixture of one or more solid non-hazardous wastes and one or more listed hazardous wastes, as described in 40 CFR §261.3(a)(2)(iii-iv).

Not Applicable.

d. Petitioned waste is generated from the treatment, storage, or disposal of one or more listed hazardous wastes (or solid non-hazardous and listed hazardous waste mixture), as described in 40 CFR §261.3(c)(2)(i).

Not Applicable.

2. Describe the physical form of the petitioned waste (e.g., solid, liquid).

Solid

3. If the physical form is sludge or liquid, estimate based on waste analysis the percentage of solids (e.g., provide a range).

Not applicable, waste is a solid. Percent moisture of samples ranged from 44.1% to 49.9%.

HISTORY OF WASTE GENERATION

4. Generation of the petitioned waste.

a. Waste has been generated in the past.

Provide the year when waste was first generated:

PTS have been generated since the refinery was opened in 1972.

b. Waste is presently being generated.

The waste is presently generated in the Preseparators, DAF unit, and API Separator. Prior to offsite disposal the waste is dewatered to physically remove as much liquid as possible.

c. Waste will be generated in the future.

The waste will continue to be generated in the Preseparators, DAF unit, and API Separator.

VOLUME OF PETITIONED WASTE

5. Is the petition for a waste of fixed quantity (e.g., a discrete volume of waste contained in a unit)?

No

a. Petitioned waste is/will be generated on a routine or continuous basis.

	Average Quantity	Maximum Quantity	Unit of Measurement
Monthly Volume	*200* *170*	*400* *340*	*Tons* *Yd^3*
Annual Volume	*2,500* *1,695*	*5,000* *4,250*	*Tons* *Yd^3*

Describe the method of volume estimation.

The volume estimation is based on flowmeter measurements from the MOSC process, approximately one roll-off box (13.5 tons) of dewatered material generated for every 20,000 gallons of PTS. Wastes were converted from tons to cubic yards with the assumption of 1,400 kg/m^3.

HISTORY OF WASTE MANAGEMENT

6. As appropriate, describe the present, past, and proposed waste management methods for the petitioned waste.

   a. Present waste management methods, and off-site facility or facilities used (name, address, and waste management method).

   Industrial wastewaters generated at the ExxonMobil JRF are currently managed as Oil Bearing Secondary Material (OBSM). The industrial wastewaters are first routed through to the Oily Water Sewer (OWS) from the different complexes within the refinery. The eight main complexes contributing to industrial wastewaters are a Reformer, Catalytic Hydro-Desulfurization (CHD), Coker, Crude/Alkylation, Fluidized Catalytic Cracking (FCC), Oil Movements (OM), Sulfur Recovery Unit (SRU), and Utilities. The OWS conveys the wastewater beneath Arsenal Road to the ExxonMobil WWTP. The industrial wastewaters are routed through the WWTP for Primary and then Secondary treatment before the effluent is discharged through Outfall 001 into the Des Plaines River, as described above in item 5.

   Currently the majority of the PTS are managed as OBSM. In 2008, the IBS tank was installed as an additional unit in the Secondary Treatment process. In 2018, ExxonMobil JRF initiated a Ship/Shape project. Ship/Shape is the process of grinding up the contents of Tanks 585/586 through a machine to reduce particle size to facilitate pumping to the Coker. This project allowed for more efficient use of Mobil Oil Sludge Coking (MOSC). Subsequently, ExxonMobil JRF also removed flight scrapers from the preseparator flume and made pump modifications/improvements to the DAF unit.

   When needed during turnarounds or periods of maintenance, the PTS are removed from the tanks and dewatered prior to offsite disposal at a state-permitted landfill (most recently the Clean Harbors Lambton Facility in Ontario Canada and Veolia Beaumont Texas Facility).

   b. Past waste management methods, if different from present, and off-site facility or facilities used (name, address, and waste management method).

   Past waste management methods have not differed from present methods of being managed as OBSM. In 2008, the IBS tank was installed as an additional unit in the secondary treatment process. In 2018, ExxonMobil JRF initiated a Ship/Shape project. Ship/Shape is the process of grinding up the contents of PTS in Tanks 585/586 through a machine to reduce particle size to facilitate pumping to the Coker. This project allowed for more efficient processing by MOSC. Subsequently, ExxonMobil JRF also removed flight

scrapers from the preseparator flume and made pump modifications/improvements to the DAF.

c. Proposed waste management methods if delisting petition is granted, and off-site facility or facilities to be used (name, address, and waste management method).

The proposed waste management for the PTS (i.e. the petitioned waste) is for disposal to an off-site subtitle D non-hazardous landfill.

PART 3: DELISTING PROCESS INFORMATION

GENERAL OPERATIONS AT THE FACILITY

1. Describe facility business area(s) and operations. Include Standard Industrial Classification (SIC) code(s).

   The JRF processes crude oil in the production of a number of petroleum products, including diesel, gasoline, coke, sulfur, propylene, and asphalt.

   The SIC for the JRF is 2911-Petroleum Refining.

2. List and describe products manufactured at the facility.

   The JRF employs a number of petroleum processing steps to produce the following principal products: gasoline, diesel, sulfur, asphalt, coke, and propylene.

3. List and describe all wastes (including all hazardous wastes) generated at the facility.

   See Table 1.

4. Describe your manufacturing and waste treatment areas and waste management units. Attach schematics showing the layout of the facility.

   Industrial wastewaters generated at the ExxonMobil JRF facilities are first routed through to the OWS from the different complexes within the refinery. The eight main complexes contributing to industrial wastewaters are a Reformer, CHD, Coker, Crude/Alkylation, FCC, OM, SRU, and Utilities. See Figure 3 for the layout of the refinery. The Reformer and CHD primarily removes sulfur from product. The FCC cracks heavy material while the Crude/Alkylation unit processes crude oil and combines synthesized light material, respectively.OM coordinates tankage in the units while the SRU treats sour water from these units. Utilities include cooling water, steam generation, power generation, electricity, and wastewater.

   The OWS collects the wastewater from the various complexes at the refinery and conveys it underground across Arsenal Road to the ExxonMobil WWTP. The industrial wastewaters are routed through the WWTP for Primary and Secondary Treatment. Primary Treatment includes a diversion box, Preseparator Flume, API Separator, and DAF unit. At the API Separator and DAF, oil is skimmed off the top of the wastewater and sent to Tank 525/526 for eventual reintroduction into the slop oil system. Solids from the Preseparator Flume, API Separator, and DAF unit get periodically removed via vacuum truck and transported to Tanks 585/586 for eventual MOSC. It is generally only during maintenance events, such has refinery wide turnarounds or when maintenance is being completed on the MOSC system itself, that PTS are removed and dewatered for offsite disposal.

5. Describe the regulatory status of all on-site waste treatment, storage, and disposal units. Include a list of all hazardous waste permits and other permits issued under Federal and State environmental statutes. Include the permit numbers in this list.

   There are not any active or inactive on-site permitted waste management units at the JRF.

   A summary Federal and State permits maintained by the JRF are presented below.

Title V Permit Operating Permit
Illinois EPA Air Division
I.D. No.: 197800AAA *Date Received: November 12, 2004*
Application No.: 95120304

NPDES Permit
Illinois EPA Water Division
Permit no: IL0002861 *Date Received: September 29, 2021*
Bureau ID: W1978000007

Maintenance Dredging Permit
Department of Army Corps Engineers
Permit no: LRC-2013-835 *Date Received: February 18, 2014*

Underground Storage Tank Motor Fuel Dispensing Permit
Office of Illinois State Fire Marshall
Facility no: 2033538 *Date Received: September 29, 2022*

CONTRIBUTING MANUFACTURING PROCESSES

6. Describe and include schematics of all "pre-process" steps used to prepare materials for processing before primary manufacturing operations, including surface and equipment preparation operations. Identify all pre-process material inputs and outputs in your description and schematics.

See Figure 4 for the layout of the OWS. The eight main complexes contributing to industrial wastewaters to the OWS are the Reformer, CHD, Coker, Crude/Alkylation, FCC, OM, SRU, and Utilities. See Figure 3 for the layout of the refinery. The Reformer and CHD primarily removes sulfur from product. The FCC cracks heavy material while the Crude/Alkylation unit processes crude oil and combines synthesized light material, respectively.OM coordinates tankage in the units while the SRU treats sour water from these units. Utilities include cooling water, steam generation, power generation, electricity, and wastewater. The OWS takes the wastewater and conveys it underground across Arsenal Road to the WWTP.

7. Provide a step-by-step description and schematic of each manufacturing process contributing to the petitioned waste. Include each process step, reactions occurring, flow rates, and material inputs and outputs, as well as reaction intermediates and byproducts. Identify and describe waste inputs and outputs on the schematic(s) and show how each waste is managed.

The industrial wastewaters are routed through the WWTP for Primary and then Secondary Treatment. Primary Treatment includes a diversion box, Preseparator Flume, API Separator, and DAF unit. Both the API Separator and DAF unit are long concrete channels with a surface area of 1,800 ft^2 and 1,242 ft^2, respectively, and a depth of approximately 8 ft. There is an east and west bay to both the API Separator and DAF unit with a capacity of roughly 1,250 gallons per minute (gpm). At the API Separator and DAF unit, oil is skimmed off the top of the wastewater and sent to Tank 525/526 for eventual reintroduction into the slop oil system. Solids from the Preseparator Flume, API Separator, and DAF unit are periodically removed via vacuum truck and transported to Tanks 585/586 for eventual MOSC. The method of volume

estimation of PTS generated is estimated using a flowmeter during the MOSC process. PTS is only dewatered for off site disposal during a maintenance or turnaround event.

After passing through the DAF unit, the wastewater undergoes Secondary Treatment. The Secondary Treatment system includes the EBTU, WAB, EAB, and IBS. After treatment in the WWTP, the effluent is discharged through Outfall 001 into the Des Plaines River.

8. Describe, and identify on the schematic, exactly where the petitioned waste is generated (if generated by a manufacturing process).

   The petitioned waste is not generated by a manufacturing process, rather, it is considered part of the WWTP. As such, refer to Part 3, #15 of this report for details on the point of waste generation.

9. List and describe all process equipment, including the function of each unit and the ranges of the operating parameters.

   JRF runs continuously except for scheduled turnaround events (approximately every three years). The typical industrial wastewater temperatures range from 60 to 120° F, and pH values range from 5 to 10. The OWS collects the wastewater from the various complexes at the refinery and conveys it underground across Arsenal Road to the ExxonMobil WWTP. The WWTP includes Primary Treatment and Secondary Treatment. Primary Treatment includes a diversion box, Preseparator Flume, API Separator, and DAF. The Preseparator Flume is a gravity separator that allows the physical separation of free-phase oil, water, and suspended solids during residence time in the unit. Oil is skimmed off the top of the API separator and sent to Tank 525/526. The top of the DAF unit is skimmed to Tank 585/586. Solids from the Preseparator Flume, API Separator, and DAF unit are periodically removed via vacuum truck and transported to Tanks 585/586 for eventual MOSC. With the exception of the oil skimmers, the Preseparator Flume, API Separator, and DAF unit do not have any process equipment contributing to the physical settling out of the petitioned waste (Figures 5 and 6). JRF currently sends most PTS through the MOSC system onsite. The dewatering equipment (i.e., centrifuge) is the primary process equipment directly contributing to the physical separating of the petitioned waste from the liquid fraction. PTS is only dewatered during a maintenance or turnaround event.

10. Describe all of your operating cycles (batch cycles, versus continuous operation, start-up, shut-down, maintenance, cleaning) on a daily, weekly, or other period basis, as appropriate. Identify periods when process wastes are not generated (e.g., plant shutdowns or routine equipment maintenance).

    Industrial wastewater is continuously generated at the JRF. Therefore, the Preseparator Flume, API Separator, and DAF unit are in continuous operation except for planned maintenance and shut-down activities. Therefore, PTS is also generated on a continuous basis. ExxonMobil JRF does not conduct routine cleanouts with the exception listed above.

11. Assess the extent that all contributing manufacturing processes, operations, process materials, or generated wastes have varied in the past or may vary in the future.

    The processes, operations, or process materials contributing to the generation of the waste have not materially varied in the past, with the following exceptions. Process improvements

have occurred within the refining production units. These efforts to reduce/remove oil, solids, and contaminants discharged by productions units have ultimately improved water quality of the WWTP influent as well as the Primary and Secondary Treatment effluent. The quality and characteristics of wastewater entering the Preseparator Flume, API Separator, and DAF unit are not expected to vary significantly in the foreseeable future.

12. Describe how the composition and generation rate of the petitioned waste may periodically vary due to any aspect of manufacturing process variability.

The composition of the petitioned waste is not expected to vary significantly beyond the parameters specified in the attached sampling data (Tables 3a and 3b). The JRF produces both Summer blend fuel and Winter blend fuel. Due to this variation, sampling was conducted to include two samples of PTS generated during the production of each blend. Significant differences in the waste composition or characteristics were not observed. The generation rate will vary with the industrial wastewater production rate at the JRF each month. The estimated monthly and annual average and maximum generation rates for the petitioned waste are presented in Part 2, Item 5 above.

13. Does a waste treatment process contribute to the petitioned waste?

Yes **[Continue with item 14]**

No **[Skip to item 22]**

CONTRIBUTING WASTE TREATMENT PROCESSES

14. Provide a step-by-step description and schematic of each waste treatment process contributing to the petitioned waste. Include process steps, reactions occurring, flow rates, material inputs, and waste inputs and outputs.

See Figures 5 and 6.

The waste treatment process contributing to generation of the petition waste is the physical separation of the wastewater phases: settlement of solids and flotation of free-phase oil. This process generally takes place within the Preseparator Flume, API Separator, and DAF unit.

The amount of wastewater influent to the Preseparator Flume, API Separator, and DAF unit is a function of the amount of wastewater generated at the JRF.

In 2023, the average PTS flowrate through the WWTP was 300,000 gallons per month with a maximum of 600,000 gallons in a single month. Between 2018 through 2023 the average annual wastewater flowrate was 2.7 million gallons per day with a maximum of 4.5 million gallons per day. The wastewater and any solids that do not settle out exit the DAF unit and go on to Secondary Treatment. In summary, the petitioned waste is generated solely by the gravity settling and floatation of solid materials out of refinery wastewater influent within the WWTP Primary Treatment System.

15. Describe, and identify on the schematic, exactly where the petitioned waste is generated (if applicable).

    Refinery wastewaters generated throughout the JRF are conveyed to the WWTP where the solids and DAF float are separated (see Figures 2 through 4). The PTS is dewatered to physically separate a liquid fraction and facilitate off-site disposal. Therefore, the point at which the solid PTS is removed from the dewatering equipment is considered the primary point of generation (Figure 2b).

16. Identify and describe waste inputs and outputs on the schematic(s) and show how each waste is managed.

    Refinery wastewaters generated throughout the JRF are conveyed to the WWTP where the solids and DAF float are separated as part of Primary Treatment. The settled solids from the Preseparator Flume and API Separator, as well as solids and float from the DAF unit are consolidated as PTS (Figures 2a and 2b).

17. Describe all non-process wastes entering the waste treatment processes, including composition, rate of inputs, and source.

    The only wastes entering the Primary Treatment units of the JRF WWTP are industrial wastewaters discharged by the refinery process units into the OWS.

18. List and describe all process equipment, including the function of each unit and the ranges of the operating parameters.

    The eight main complexes at JRF contribute industrial wastewaters to the OWS. The wastewater then flows through the diversion box and then the Preseparator Flume. The Preseparator Flume is comprised of two large rectangular channels allow for solids and oil to separate from the wastewater stream via gravity. After passing through the Preseparator Flume, the wastewater flows into the API Separator, which includes two rectangular channels to allow gravity separation of oil and suspended solids from the wastewater. Barrel skimmers remove oil from the water surface in the API Separator. In between the API Separator and the DAF unit, the wastewater passes through a mixing section with agitators and chemical injection (flocculant and coagulant). The wastewater then enters the DAF unit, which uses a dissolved air grid to bring any entrained oil to the surface. The DAF is also equipped with skimmers to remove the "float" from the water surface. The skimmed material from the Preseparator Flume, API Separator, and DAF unit is sent to Tanks 525/526. Periodically, one side of the DAF unit or API Separator will be taken out of service for cleaning (to remove accumulated solids and some water) and/or for maintenance. Solids and water are removed from these units with a vacuum truck and transferred into Tanks 585/586.

    When possible, material from Tanks 585/586 is used for MOSC, as quenching material in the coke drums. In-between Tanks 585/586 and the Coker, PTS solids are ground up to reduce particle size and facilitate pumping to the Coker. Periodically and during turn arounds Tanks 585/586 are cleaned and the PTS removed, dewatered, and sent offsite for disposal as waste.

19. Describe all of your operating cycles (batch cycles versus continuous operation, start-up, shut-down, maintenance, cleaning) on a daily, weekly, or other period basis, as appropriate. Identify periods when treatment wastes are not generated (e.g., plant shutdowns or routine equipment maintenance).

    JRF runs continuously except for scheduled turnaround events (approximately every three years). During refinery operation, the eight main complexes at JRF contribute industrial wastewaters to the OWS. Therefore, the Preseparator Flume, API Separator, and DAF unit are in continuous service except when periodically one side of the API Separator or DAF is taken out of service for cleaning or maintenance, approximately biweekly or on a monthly basis. During these times, accumulated solids and some water are removed with a vacuum truck and transferred to Tanks 585/586. The frequency of the API Separator and DAF unit cleanings are based on historical solids accumulation rates and observation by the unit operators. Typically, PTS is only dewatered during a maintenance/turnaround event.

20. Assess the extent that all contributing treatment processes, operations, process materials, or generated wastes have varied in the past or may vary in the future.

    The WWTP influent, processes, operations, or process materials have not materially varied in the past, with the following exceptions. Process improvements have occurred within the refining production units generating industrial wastewaters. These efforts to reduce/remove oil, solids and contaminants discharged by productions units have ultimately improved water quality and characteristics of the WWTP Primary and Secondary Treatment Systems effluent. The wastewater entering the WWTP are not expected to vary significantly in the foreseeable future.

21. Describe how the composition and generation rate of the petitioned waste may periodically vary due to any aspect of treatment process variability.

    The petitioned waste is not expected to vary beyond the parameters specified in the attached sampling data due to treatment process variability. The only treatment contributing to the generation of the petitioned waste is the air injecting, skimming, and gravity separation of solids from the wastewater entering the Preseparator Flume, API Separator, and DAF unit. The generation rate is not expected to exceed the volume specified in Part 2, Section 5.a.

22. Has the petitioned waste been managed in a land-based unit?

    Yes **[Continue with item 23]**

    No **[Skip to item 25]**

23. Provide the following information (items 23a through 23g) for each unit that is (or was) used to manage the petitioned waste:

    (If the petitioned waste is managed in more than one unit, assign a number to each unit (e.g., Unit#1, Unit #2, etc.) and use the unit numbers to associate a description with a specific unit).

a. Unit location/address (show if on- or off-site).
b. Description of unit construction (current design and materials).
c. History of unit design (e.g., chronological summary of any changes to original construction).
d. Purpose and description of any unit design and operating changes.
e. Estimated surface area.
f. Estimated unit capacity volume.

Not Applicable.

24. Listing of waste and material inputs which have occurred throughout the life of the unit, if Provide detailed schematic(s) of the waste unit(s) showing (as appropriate) unit dimensions, influent point(s), effluent point(s), and waste thickness.

Not Applicable.

PROCESS MATERIALS

25. List all materials used in the operations that contribute to the petitioned waste. The list should include:
    a. The name of the material(s).

       Industrial wastewater from refining manufacturing process units at the JRF and stormwater runoff contribute to the petitioned waste.

    b. The process/operation in which it is used (i.e., manufacturing process, treatment process, waste management operations).

       PTS is generated by the mechanical separation of oil and water from the settled solids from industrial wastewater at the JRF during Primary Treatment.

    c. Function of each material in the process.

       The Preseparator Flume is a large, rectangular channel that allows suspended solids and oil to separate from the wastewater stream via gravity. The wastewater then flows into the API separator and DAF unit for additional suspended solids and oil removal. Oils recovered during Primary Treatment is sent to Tank 525/526 for eventual reintroduction into the slop oil system. Solids removed from the wastewater stream in the Preseparator Flume, API Separator, and DAF unit during Preliminary Treatment get periodically transferred from the units via vacuum truck into Tanks 585/586 for either use in the MOSC or are dewatered and sent for offsite waste disposal.

    d. Approximate annual quantities used.

       The amount of influent is a function of the amount of wastewater generated at the JRF identified on Figure 3 for the sewer system.

26. Provide Material Safety Data Sheets (MSDS) and any other compositional information for trade name and non-elemental materials. Include raw materials, cleaners, oils, solvents, strippers and any by-products generated by the process.

Not Applicable. Only industrial wastewater contributes to the petitioned waste.

27. Specify the source, quality (i.e., recycled or virgin), and quantity of oil, grease, and hydraulic fluids entering the process.

    Some oil may be part of the WWTP influent entering the Preseparator Flume, API Separator, and DAF unit from the industrial wastewater generated at the JRF. However, the average oil content entering the WWTP units is estimated to be approximately 0.02% based on the average flow through the WWTP and the daily oil recovery.

SPECIAL INFORMATION

28. Are you requesting an upfront exclusion for a waste that is not currently generated but will be in the future?

    Yes **[Continue with item 29]**

    No **[Skip to item 32]**

29. Explain how the bench-scale or pilot-scale process demonstration adequately models the proposed full-scale process.

    Not Applicable.

30. Explain any real or potential differences between the two processes.

    Not Applicable.

31. Describe the impact of those differences on the character of the petitioned waste.

    Not Applicable.

32. Are you requesting an exclusion for a waste generated by a multiple waste treatment facility (MWTF)?

    Yes **[Continue with item 33]**

    No **[Skip to Part 4]**

33. Describe your procedure for prescreening clients and wastes and how this procedure will be carried outed should your waste be excluded.

    Not Applicable.

34. Describe the procedures by which you will make sure that: (1) treatment levels needed by an exclusion are maintained and (2) a hazardous waste is not disposed improperly as non-hazardous.

    Not Applicable.

PART 4: DELISTING ANALYTICAL PLAN DEVELOPMENT

1. Provide a complete list of the constituents and parameters of concern identified for your petitioned waste based on appropriate waste constituent analyses and the results of an engineering analysis. Identify those constituents of concern (COCs) quantitated by laboratory analysis and those quantitated using mass balance demonstrations.

   The sampling program was designed in accordance with 35 IAC 720.122(a)(2) and in a manner consistent with the cited "EPA RCRA Delisting Program – Guidance Manual for the Petitioner" (Guidance). Per the direction of the Guidance, the COCs was drawn from the following "full universe" of constituents:

   - *40 CFR 261 – Identification and Listing of Hazardous Waste, Appendix VIII "Hazardous Constituents"*
   - *Additional chemicals listed in Section 6.1 of the Guidance*
   - *40 CFR 264 – Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Appendix IX "Ground-Water Monitoring List"*

   In accordance with the Guidance, the list of COCs was derived from the full universe was narrowed based on industry knowledge, process knowledge, historical analytical history, and EPA guidance. More specifically, the EPA guidance was EPA Region 5's "Skinner List" of Appendix VIII hazardous constituents applicable to refinery wastes (included as Appendix H). Table 2 provides the list of COCs, along with the full universe from which the list of COCs was drawn.

   Four monthly sampling events were conducted in accordance with the Illinois Environmental Protection Agency (IEPA)-approved Sampling and Analysis Plan (SAP). The first and third samples of the petitioned waste were analyzed for total concentrations of the constituents listed in Table 2, and toxicity and hazardous characteristics (40 CFR §261.24). The analytical suite for the second and fourth sampling events included detected constituents from the first and third events.

2. Provide mass balance demonstrations for those constituents of concern in your list for which analyses were not conducted. Provide all calculations and assumptions.

   Not applicable. All constituents of concern identified in Table 2 were analyzed.

3. Explain why any other delisting constituent of concern is not on the constituent of concern list for your petitioned waste.

   Not applicable. All constituents of concern identified in Table 2 were analyzed.

4. Explain why your petitioned waste does not exhibit any hazardous waste characteristic for which analysis was not conducted.

   Laboratory analyses were conducted for hazardous waste characteristics and the petitioned waste did not exhibit any hazardous waste characteristics (Table 3b).

PART 5: DELISTING SAMPLE AND ANALYSIS INFORMATION

1. Has a draft sampling and analysis plan been submitted to IEPA for review before petition preparation?

   Yes, The SAP and Quality Assurance Project Plan (QAPP) were submitted to the IEPA on October 3, 2022 and approved on February 10, 2023. These documents have been included as Appendix A and B, respectively.

   a. Submittal date of sampling and analysis plan: *October 3,2022*

   b. Log number assigned by EPA to your draft submittal: *Not Applicable*.

WASTE SAMPLING INFORMATION

2. Were all sampling-related activities performed by in-house staff?

   Yes – ExxonMobil conducted sampling-related activities.

   a. Name and address of the organization(s) or company(s) responsible for designing the sampling strategy and collecting the samples.

   Name: Environmental Resources Management Southwest, Inc. (ERM)

   Street: 840 West Sam Houston Pkwy N #600

   City: Houston *State: TX* *Zip: 77024*

   Telephone: 281-600-1000

   b. For each individual person (in-house and otherwise) who designed the sampling plan, the quality control plan, and/or participated in sample collection, please provide a resume of qualifications and the following information:

   Name: Heidi Mulhall
   Affiliation: ExxonMobil
   Title: Environmental Advisor, Joliet Refinery

   Name: Peter J. Gagnon, P.E. (TX, MT, OK), BCEE
   Affiliation: ERM (consultant for ExxonMobil)
   Title: Partner-in-Charge

   Name: Ashley Price
   Affiliation: ERM (consultant for ExxonMobil)
   Title: Project Manager

   Name: Daniel Collazos
   Affiliation: ERM (consultant for ExxonMobil)
   Title: Staff Geologist

Please see Appendix C for resume of qualifications for the personnel listed above.

SAMPLING STRATEGY

3. Provide the following information (items 3a through 3f) on the sampling strategy you followed to make sure that the samples were representative.

a. Identify which process point discharges, containment areas (e.g., lagoons), or other areas (e.g., soil) were sampled and why these areas were selected for sample collection.

The petitioned waste is generated from the JRF industrial wastewater treatment and stored in Tanks 585 and 586 prior to being dewatered. Prior to sampling, the PTS solids will be transferred via in plant piping or vacuum truck to a dewatering unit (portable centrifuge). PTS was sampled from the dewatering unit after dewatering. This sampling location (i.e., the dewatering unit) is the generation point of PTS.

b. Describe the techniques and guidelines used to select waste sampling points (e.g., random sampling procedure or fixed transect and offset sampling procedure).

The PTS was collected from the dewatering unit after dewatering following storage in Tanks 585/586.

c. Describe the sampling and subsampling (i.e., transferring of sample aliquots into containers specific to certain analyses) procedures used during the sample collection process, including the particular days and times selected for sample collection, the number of grab samples collected for each composite sample, and why these procedures were used.

The potential temporal variability in Tanks 585 and 586 was addressed through a variation in sampling frequency, thus representing a range in possible constituent concentrations with time. The Preseparator Flume, API Separator, and DAF unit operate continually, so temporal variability was characterized by collecting a total of one (1) sample, at the portable centrifuge at a frequency of once every month for four consecutive months, beginning in July 2023. Additionally, during these four months the production of Summer blend fuel and Winter blend fuel was equally represented (two months production for each).

ExxonMobil personnel performed sample collecting activities from the centrifuge. An equal representation from both Tanks 585 and 586 were sampled. A composite sample was derived by collecting and compositing separate aliquots from various locations in the centrifuge using a shovel, trowel, and stainless-steel mixing bowl. Samples of PTS derived from Tank 585 were collected in July 2023 and October 2023 and samples of PTS derived from Tank 586 were collected in August 2023 and September 2023.

The samples bottles were placed in a cooler with sufficient ice to maintain a temperature of approximately 4°C, picked up by an ALS Laboratory courier, and packaged and shipped to the ALS Laboratory in Houston, Texas for analysis. Each sample bottle label included a unique sample identification, the time and date sampled, the parameters to be analyzed, the preservatives (if any), and the sampler's initials.

The sample identification numbers for each sampling effort were recorded on sample labels and chain-of-custody forms and the other applicable documentation used during the sampling activity. Completed sampling forms are included as Appendix D.

These procedures were used because they provide objective, representative, and useable results for evaluation, as referenced in the IEPA approved SAP/QAPP.

d. Describe the sampling devices used for sample collection and the basis for selecting the devices.

Upon decontamination, composite samples were derived by compositing separate aliquots of PTS collected from various locations within the centrifuge using a shovel, trowel, and stainless-steel mixing bowl.

e. Identify and discuss any deviations from your original sampling plan and strategy and the impact of these deviations on waste characterization.

There were no deviations from the SAP.

f. Explain why you believe the samples collected are non-biased and sufficiently represent the petitioned waste. In this explanation, fully address the potential for waste uniformity or spatial and temporal variability and how the strategy ensured collection of representative samples.

The SAP meets the requirements of non-biased representation of the PTS due to the number of samples collected, temporal variability, quality assurance, and the comprehensive analytical analysis of the samples.

The WWTP operates continually, and the petitioned sludge is continuously generated at the Preseparator Flume, API Separator, and DAF units. The strategy to address temporal variability involved collecting four samples at monthly intervals to encompass four time periods representing refinery conditions during production of Summer and Winter blend fuels. The strategy to address spatial variability was to collect samples from the dewatered contents of Tanks 585/586.

A review of the results shown on Tables 3a and 3b indicates that a relatively consistent range of concentrations was reported with the follow exception. One PCB congener (Aroclor-1248) was detected in one sample (PTS-04) at a concentration of 15 mg/kg, and at much lower concentration (5.9 mg/kg) in the associated duplicate. PCBs are not associated with the waste stream, and the single-event detection is an anomaly, and most likely a potential laboratory artifact. A discussion of how this was addressed during the DRAS evaluation is included in Part 5 item #25.

The quality control samples in the form of duplicate samples, matrix spikes and matrix spike duplicates meet the data usability requirements set by the laboratory.

SAMPLE SPECIFIC INFORMATION

4. How many samples of the petitioned waste were collected?

For this delisting effort, four (4) PTS samples, two (2) field duplicate samples, one (1) matrix spike, and one (1) matrix spike duplicate sample were collected. One composite sludge sample was collected at the centrifuge for four consecutive months beginning in July 2023. Two field duplicates, a matrix spike, and a matrix spike duplicate was collected at the first and third event in July 2023, September 2023, and October 2023.

Is the number of samples taken different from the number of samples agreed upon during the pre-petition scoping meeting? Explain the deviation.

The number of samples collected is as agreed upon during the pre-petition scoping meeting between IEPA, ERM, and ExxonMobil on August 04, 2022, and as presented and approved in the SAP.

5. For each individual sample collected, please provide the following sample-specific information (items 5a through 5g).

   a. For each sample included in item 4, provide the sample identification number (as it appears in your field logbook and other records), the date that the sample was taken, an indication as to what type of sample it is (waste sample versus quality control sample and whether or not it is a composite sample).

Type of Sample
[Mark one box only]

Sample Identification Number	Date Sample was Taken	Waste Sample	Quality Control Sample	Composite Sample	
				Yes	No
PTS-01-SL-20230727	07/27/2023	■	□	■	□
DUP-01-SL-20230727	07/27/2023	□	■	■	□
PTS-02-SL-20230830	08/30/2023	■	□	■	□
PTS-03-SL-20230926	09/26/2023	■	□	■	□
MS-03-SL-20230926	09/26/2023	□	■	■	□
MSD-03-SL-20230926	09/26/2023	□	■	■	□
PTS-04-SL-20231026	10/26/2023	■	□	■	□
DUP-04-SL-20231026	10/26/2023	□	■	■	□

   b. Describe how each sample was collected, and its point of collection from the petitioned waste. If a sample is a composite of grabs, provide the number of grab samples collected for the composite sample, the sampling location for each grab sample, the volume of each grab sample, and the volume of the composite sample.

   ExxonMobil personnel collected samples of the material centrifuged from tanks 585 and 586. An equal representation from both tanks 585 and 586 were sampled. Grab samples were collected and composited from the roll-off box containing the centrifuged material. Six grab samples were collected and composited during each sampling event, one from each of the four corners and two from the center of the roll-off box. The volume of each grab sample was approximately 0.5 liters, with the volume of the composite sample being approximately 3 liters. The grab samples were collected using a shovel and composited with a trowel, and stainless-steel mixing bowl; a sample of PTS derived from tank 585 was

collected in July 2023 and October 2023 and a sample of PTS derived from tank 586 was collected in August 2023 and September 2023.

c. Describe the general sampling location (e.g., which quadrant of a surface impoundment) and the specific sampling points (e.g., specific location in the quadrant). You may refer to numbered sampling points shown in a diagram.

The sampling location of PTS remained constant at the centrifuge roll-off box throughout the four consecutive months of sampling. There were no deviations from this sampling point.

d. Describe how each sample was composited (e.g., equipment used and manner of mixing).

The PTS was collected with a decontaminated shovel and placed into a decontaminated stainless-steel mixing bowl. The composite sample inside the stainless-steel mixing bowl was mixed with a decontaminated trowel. After stirring the composite together, the sample was placed into the sample jars.

e. Provide a physical description of each sample at time of collection (e.g., color, odor, whether phase separation occurred soon after collection).

The centrifuged sample material was brown to black in color with a slight petroleum odor. The sample material had no free liquid or hydrocarbon present and no phase separation occurred after collection.

f. For each composite sample, specify the time and date when the grab samples were collected and the time and date when the sample was composited, as applicable.

All grab samples were collected and composited on the same date. Immediately after the grab samples were collected, they were composited within the PTS-dedicated stainless-steel mixing bowl. The samples were then transferred to new laboratory-supplied bottles, as follows.

Sample Identification Number	Time and Date Grab Sample Was Collected and Stirred
PTS-01-SL-20230727	08:45, 07/27/2023
DUP-01-SL-20230727	08:50, 07/27/2023
PTS-02-SL-20230830	08:43, 08/30/2023
PTS-03-SL-20230926	09:35, 09/26/2023
PTS-04-SL-20231026	09:26, 10/26/2023
DUP-04-SL-20231026	09:26, 10/26/2023

g. Describe the handling and preparation techniques used for each sample (including types of containers used and techniques employed for container preparation) and types and amounts of preservatives used.

New, laboratory-supplied glass containers were used to collect the samples. Preservatives were not used in the bottles provided by the laboratory (neat), as appropriate for the analytical method of the PTS.

OTHER GENERAL INFORMATION

6. Describe the weather conditions during sampling (if conducted outdoors).

   July 27, 2023: Sunny, 83 degrees F.
   August 30, 2023: Sunny, 65 degrees F.
   September 26, 2023: Cloudy, 65 degrees F.
   October 16, 2023: Mostly Cloudy, 64 degrees F.

7. Describe any facility activities separate from sampling that occurred at the same time and might have affected sample representativeness.

   None.

8. Describe sampling device decontamination; and note when disposable devices were used for sample collection.

   Dedicated sampling devices including shovel, trowel, and a stainless-steel mixing bowl were used at each sampling event for the centrifuge). After each sampling event, the dedicated devices were decontaminated using Alconox, paper towels and distilled water. The dedicated sampling devices were then stored on site.

9. Were the chain-of-custody procedures specified in SW-846 followed?

   Yes **[Skip to item 11]**

   No **[Continue with item 10]**

10. Provide a description of the quality control procedures and documentation system used to track sample location and maintain sample integrity during transportation to the laboratory. Copies of the chain-of-custody forms may be provided but are not needed.

    Not Applicable.

LOCALIZED AREA OF CONTAMINATION

11. Have you collected samples to characterize a localized area of contamination (a "hot spot") within the petitioned waste?

    Yes **[Continue with item 12]**

    No **[Skip to item 16]**

12. Discuss your basis for believing a hot spot may or does exist (e.g., records of a one-time discharge of a concentrated material at a specific location).

    Not Applicable.

13. Describe the known or predicted location (on a diagram) and the dimensions (e.g., depth, width and length) of the hot spot.

    Not Applicable.

14. Identify the samples specifically collected to characterize the hot spot.

    Not Applicable.

15. Explain why the samples sufficiently represent the hot spot.

    Not Applicable.

MULTIPLE WASTE TREATMENT FACILITY

16. Have you collected samples to characterize a waste generated by a multiple waste treatment facility (MWTF)?

    Yes **[Continue with item 17]**

    No **[Skip to item 21]**

17. List and describe the untreated wastes that were treated and are represented by the treatment residue samples collected during the sampling period.

    Not Applicable.

18. Provide the percentage of total wastes treated annually that was represented by the sampling period.

    Not Applicable.

19. List and briefly describe the untreated wastes that also are treated at the facility but were not represented by the sampling period.

    Not Applicable.

20. Explain why the wastes not represented by the sampling period are not expected to contain any other hazardous constituents of concern, different levels of constituents of concern, or other different characteristics than that represented by the sampling period.

    Not Applicable.

WASTE ANALYSIS INFORMATION

21. Were sample analyses done by in-house staff?

    No

    a. Name and address of the organization(s) or company(s) responsible for sample analyses.

    Name: ALS Laboratory Group
    Street: 10450 Stancliff Rd. Suite 120
    City: Houston State: Texas Zip Code: 77099
    Telephone: 281-530-5656

    b. For each individual person (in-house and otherwise) who conducted analyses or was responsible for data reduction, validation, and laboratory quality control, please provide a resume of qualifications and the following information:

    Please refer to Appendix E, ALS Laboratory Group Statement of Qualifications and Houston Organizational Chart, for more information on the certified and accredited laboratory responsible for data reduction, validation, and laboratory quality control. Additional

information on laboratory personnel can be provided, if needed. Appendix B (QAPP) includes the Analytical Laboratory Quality Assurance Plan for ALS Laboratory Group.

22. Provide your signed laboratory data reporting forms from all analyses, including results from quality control analyses.

    Analytical reports, including results from quality control analyses, are included in Appendix F.

23. Provide the following information on each sample and each analysis.

    a. Sample identification numbers as logged during collection and as assigned by the laboratory.

       The Work Order Sample Summary of each analytical report summarizes this information. Analytical reports are located in Appendix F.

    b. Type of sample (e.g., waste sample, waste sample replicate, equipment blank, field blank).

       The Work Order Sample Summary of each analytical report summarizes the sample matrix. Samples with field identification of PTS are dewatered PTS samples. Those identified as DUP are duplicate samples. Analytical reports are located in Appendix F.

    c. Date of sample receipt by the laboratory.

       The Work Order Sample Summary of each analytical report indicates the collection date and time of each sample, in addition to the date and time of receipt by the laboratory. Analytical reports are located in Appendix F.

    d. The sample workup or preparation method and reference for the method (e.g., SW-846 Method 3500).

       The Analytical Results section of each analytical report summarizes this information. Analytical reports are located in Appendix F.

    e. The date of sample workup or preparation.

       The Analytical Results section of each analytical report summarizes this information. Analytical reports are located in Appendix F.

    f. The name of the person conducting the analysis.

       The Analytical Results section of each analytical report summarizes the initials of the analyst performing the analysis. Analytical reports are located in Appendix F.

    g. The date of extraction and analysis.

       The Analytical Results section of each analytical report summarizes this information. Analytical reports are located in Appendix F.

    h. The test method used and the source of the test method (e.g., SW-846 Method 8020).

       The Analytical Results section of each analytical report summarizes this information. Analytical reports are located in Appendix F.

    i. The specific constituent, parameter, or hazard for which analysis was conducted.

       The Analytical Results section of each analytical report summarizes this information. Analytical reports are located in Appendix F.

j. The test results, expressed in appropriate units (e.g., mg/L, mg/kg).

The analytical results are summarized in Tables 3a and 3b and the results section of each analytical report, located in Appendix F.

k. The basis for the analysis (e.g., wet/dry weight).

The sample results are reported as received. The analytical results are summarized in Tables 3a and 3b and the results section of each analytical report, located in Appendix F.

l. The quantitation limits.

The analytical results are summarized in Tables 3a and 3b and the results section of each analytical report, located in Appendix F.

24. Provide the names and model numbers of all equipment used during analysis.

The names and model numbers of all equipment used during the analysis are included in each analytical report, located in Appendix F.

25. Provide all other information necessary to fully interpret the test procedures or results.

In guidance for the RCRA delisting program, EPA has identified that a candidate waste must meet the following criteria for delisting:

1. *The waste is not hazardous by characteristic,*
2. *The waste does not meet any of the criteria under which the waste was listed as hazardous, and*
3. *There are no additional factors (including additional constituents) that could cause the waste to be a hazardous waste.*

ExxonMobil has evaluated the results of an extensive analytical testing program to confirm that the physical and chemical characteristics of the wastes subject to this petition meets these three criteria and will consequently support EPA's delisting decision.

To demonstrate that the waste is not characteristically hazardous, each of the PTS samples was submitted for analysis of Totals and Toxicity Characteristic Leaching Procedure (TCLP) for the constituents of concern identified in Table 2 and for Reactivity, Corrosivity, and Ignitability (RCI). All reported maximum concentrations were less than applicable hazardous waste criteria

To demonstrate that the PTS does not meet any of the criteria under which the wastes from which it was derived were listed as hazardous, and that no additional factors (e.g., constituents) cause the PTS to be hazardous, each of the samples were analyzed for a comprehensive analyte list consisting of all the constituents of concern listed in Table 2. The EPA Hazardous Waste Delisting Risk Assessment Software (DRAS) model[1] is used by the EPA and IEPA as a means to evaluate potential environmental risk from disposal of listed hazardous waste proposed for regulatory delisting, by modeling risk from assuming the waste is disposed in a mismanaged, unlined Subtitle D landfill, groundwater releases are not controlled, and 30 days of waste is always left uncovered at the surface, resulting in emissions to air and as well as runoff from the site. The model calculates individual and aggregate risks associated with each disposal scenario and back-calculates maximum allowable concentrations of individual constituents associated with the waste permissible for delisting. The exposure pathways evaluated by the model include human health

1 https://www.epa.gov/hw/hazardous-waste-delisting-risk-assessment-software-dras

nonindustrial direct contact (ingestion, inhalation, and dermal contact), groundwater protection assuming groundwater is a drinking water source, surface water including fish ingestion, and ecological effects. An evaluation of data collected in accordance with the project SAP and QAPP was conducted using the most recent EPA's DRAS V.4 Model. The overall objective of the analysis was to determine if the waste meets the risk requirements for delisting under Title 40 Code of Federal Regulations (40 CFR) Section 261.11(a)(3).

The DRAS model was run using the analytical data collected over four independent sampling events over the course of four months (including two duplicate samples collected during the first and fourth sampling events). These four months covered the switch from production of Summer blend gasoline (July and August) to Winter blend gasoline (September and October). Consistent with applicable regulations, the waste proposed for delisting was analyzed for a complete list of constituents of concern, for both total and TCLP (with the exception of PCBs and dioxin congeners) for all detected organic constituents and metals. Additionally, metals were analyzed by TCLP under acidic, neutral, and basic conditions per delisting requirements.

With the exception of the polychlorinated biphenyl (PCB) congener Aroclor-1248, all constituents detected in at least one sampling event were included in the DRAS modeling. One PCB congener (Aroclor-1248) was detected in one sample (PTS-04) at a concentration of 15 mg/kg, and at much lower concentration (5.9 mg/kg) in the associated duplicate. PCBs are not associated with the waste stream, and the single-event detection is an anomaly, and most likely a potential laboratory artifact. Although no specific data QC issues could be identified, the laboratory QC, including the laboratory control sample (LCS) and matrix spike/matrix spike duplicate (MS/MSD) utilized different congeners than 1248 in the QC. Without the use of the specific congener (1248) that was detected in the primary samples in the QC process it isn't possible to conclusively determine whether this detection can be attributed to a laboratory issue. The reported concentration of Aroclor-1248 (and therefore total PCBs) in sample PTS-01 (15 mg/kg) and its duplicate are significantly below the regulated level (50 mg/kg) and these concentrations are acceptable for disposal at a Subtitle D landfill under Toxic Substances and Control Act (TSCA) regulations.

For DRAS modeling, maximum reported concentrations or reporting limits (if ½ of the reporting limit exceeds maximum concentrations) were used for each constituent that was detected in at least one sample with the following clarifications:

- *For thallium, the maximum detected concentration was used for TCLP evaluation in the model. Thallium was detected in six of the nine samples at similar concentrations. Elevated detection limits observed in two of the samples (PTS-01 for low pH and the duplicate of PTS-01 for low pH and high pH) as a result of laboratory dilution are not considered representative of the thallium concentrations in the waste. Because thallium was detected in most of the samples at similar concentrations, the maximum detected concentration is more appropriate and representative of potential concentrations than the elevated reporting limits, and this was used in the modeling.*

- *For naphthalene, elevated detection limits of 0.05 mg/L were observed in two of six samples (PTS-01 and its duplicate). Detection limits for the other four samples (0.005 mg/L) were used in the modeling. Total naphthalene was not detected in PTS-01 or its duplicate.*

- *For chromium, the results were expressed as total chromium. Speciation was not conducted during the laboratory analysis. The USEPA's regional screening level[2] for chromium assumes that the trivalent to hexavalent chromium ratio is 1:6. This ratio was assumed for the purposes of modeling and calculating delisting levels.*

- *As recommended by the USEPA, total dioxins/furans detected in the site samples were converted to TCDD equivalents[3] using Toxicity Equivalency Factors (TEFs) provided by the USEPA for incorporation into the model. Concentrations of dioxins/furans expressed as TCDD equivalents ranged from 4.2E-7 mg/kg to 9.2E-6 mg/kg (0.00042 ug/kg to 0.0092 ug/kg) in the individual samples.*

- *For organic constituents for which TCLP data were not available (dioxins/furans), TCLP concentrations were modeled based on the maximum concentrations divided by 20, which is the EPA-recommended method for estimating maximum theoretical leachate concentrations (the so-called "Rule of 20").*

The site-specific inputs to the DRAS model include the volume of waste, the type of impoundment (Landfill or Surface Impoundment), the target cancer risk, the target hazard quotient (HQ), the Constituents of Concern and associated parameters, the maximum total concentration, and the maximum TCLP concentration. The following inputs were used in modeling for the Joliet refinery delisting:

Parameter	***Value***	***Justification***
Waste Volume	*4250 yd^3*	*2,500 tons/year avg, Maximum of 5,000 tons/yr. Maximum Tons/year converted to 4250 yd^3 assuming 1,400 kg/m^3 for average density of water sludge solids[4]*
Waste Management Type	*Landfill – 20 years*	*Solid Waste*
Target Risk	*$1x10^{-6}$*	*Default Risk Level for Region 5[5]*
Target Hazard Quotient	*1.0*	*Default Hazard Index for Region 5*
Constituents of Concern (COCs)	*Detected constituents*	*Present in waste proposed for delisting*
Total Concentration	*Maximum detected concentration or detection limit (mg/kg)*	*Delisting guidance*
TCLP Concentration	*Maximum TCLP Concentration (mg/L)*	*Delisting guidance*

2 https://www.epa.gov/risk/regional-screening-levels-rsls
3 https://www.epa.gov/sites/default/files/2013-09/documents/tefs-for-dioxin-epa-00-r-10-005-final.pdf
4 https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fhome.engineering.iastate.edu%2F~leeuwen%2FCE%2520523%2FSupplementary%2520Notes%2FSludge%2520Disposal.doc&wdOrigin=BROWSELINK
5 https://www.epa.gov/hw/hazardous-waste-delisting-risk-assessment-software-dras

The report of the modeling evaluation as described above is provided in Appendix G. The report consists of ten tables as described below:

Table 1 – Surface Pathway Risk

Table 2 – Groundwater Pathway Risk

Table 3 – Surface Pathway Hazard Quotient

Table 4 – Groundwater Pathway Hazard Quotient

Table 5 - Maximum Allowable Concentration for Surface Pathways

Table 6 – Maximum Allowable TCLP Concentration for Groundwater Pathways

Table 7 – Aggregate Risk and Hazard Quotient Results

Table 8 – Limiting Pathways

Table 9 – Pathways Exceeding Delisting Levels

Table 10 – Toxicity Characteristic Soil Saturation and Ecological Values

Table 9 of the report provides a summary of limiting site-specific delisting limits and shows individual constituents that exceed the applicable site-specific delisting limit. A review of Table 9 indicates that two constituents (arsenic and dioxin TEQs) exhibited maximum concentrations that exceeded limiting DRAS levels based on carcinogenic effects. Further discussion of these constituents is provided below.

<u>Arsenic</u>

Maximum TCLP concentrations of arsenic (0.038 mg/L) exceeded the limiting delisting level of 0.00283 for the groundwater pathway in the majority of the TCLP samples (10^{-6} individual carcinogenic risk level). However, arsenic is a naturally-occurring element normally found in the environment at concentrations that exceed cancer guidelines. The EPA's Maximum Contaminant Level (MCL) for arsenic, a promulgated federal water quality criteria for potable water systems, is 0.01 mg/l, almost an order of magnitude greater than the calculated TCLP delisting level for groundwater protection (assuming a $1E^{-6}$ carcinogenic risk level). The maximum observed TCLP concentration for arsenic was only 3.8 times the MCL for this constituent. Further, concentrations of arsenic are far below the promulgated hazardous waste criteria for this constituent of 5.0 mg/L.

Because arsenic is not associated with the waste stream (beyond naturally-occurring concentrations), the hazardous waste criteria is a more appropriate delisting level than the limiting levels calculated by the DRAS modeling. Alternatively, a 10^{-4} risk level may be applied to arsenic as a naturally-occurring carcinogenic compound. ERM identified that this alternate risk level for arsenic has previously been applied to a successful delisting in Illinois[6] by EPA Region 5 and IEPA.

<u>Dioxins/Furans</u>

[6] https://pcb.illinois.gov/documents/dsweb/Get/Document-95845/AS%202018-001%20petition%2009-21-2018.pdf

Maximum concentrations of total dioxin TEQs (9.2E-6 mg/kg, or 0.0092 µg/kg), exceeded the limiting delisting level for 1,3,7,8 TCDD for the fish ingestion pathway (5.5E-7 mg/kg) in three of the six samples (PTS-01, Duplicate of PTS-01, and Duplicate of PTS-4). The concentrations of dioxin/furan congeners detected in the waste stream samples are low and consistent with background concentrations. For reference, the ATSDR has set a guideline for acceptable dioxin/furan concentrations in residential soil of 0.05 µg/kg[7]. Dioxins/furans are not expected components of the waste and were not detected in the initial samples collected to evaluate whether to proceed with the delisting petition. The observed concentrations are likely associated with background levels.

Cumulative Risk and Hazard

An overall evaluation of cumulative risk and hazard from all pathways is provided in Table 7 of the DRAS report. The EPA and IEPA consider cumulative risk range within an acceptable range if it falls within 1E-6 and 1E-4, and a cumulative hazard index of 1.0. Carcinogenic risks are summed for all pathways and chemicals to give the total pathway risk provided in Table 7.

Carcinogenic risk is driven almost entirely by maximum concentrations of arsenic and TCDD equivalents, which, as previously discussed, are consistent with typical background levels. The total carcinogenic risk identified in the DRAS model is 3.83E-5, which is within the EPA's acceptable range of 1E-04 to 1E-06. Without the inclusion of arsenic and TCDD equivalents, the cumulative risk is 1.6E-6.

A cumulative hazard index of 2.38 was initially identified. The initial hazard index shown in the modeling is highly conservative as it assumes that all constituents elicit effects on the same target organs/systems. Because the initial hazard index exceeded 1.0, further evaluation of specific effects was conducted. The hazard index is driven almost entirely by antimony (HI = 1.43E-01), mercury [fish only pathway] (HI = 5.75E-01), TCDD Equivalents (HI = 4.6E-1), and thallium (HI = 8.040E-01). A total hazard index of 0.398 is calculated without the contribution of these constituents.

Consistent with the Technical Support Document for the Hazardous Waste Delisting Risk Assessment Software (DRAS)[8], further evaluation of the Hazard Index was conducted to ensure that the total Hazard Index is less than 1.0 when considering target organs/critical effects. Target Organs/Critical effects from Appendix A of the Technical Support document are identified below for the primary risk drivers.

Target Organs/ Critical Effects for Primary Hazard Index Contributors

Compound	Target Organ	Critical Effect
Antimony	Blood	*Blood glucose and cholesterol, decreased longevity*
Mercury	*Nervous System*	*Neurotoxicity*
TCDD Equivalents	*NA*	*NA*
Thallium	*Liver*	*Increased levels of serum glutamic-oxaloacetic transaminase and Lactate dehydrogenase*

[7] https://www.atsdr.cdc.gov/substances/dioxin/policy/Dioxin_Policy_Guidelines.pdf
[8] https://www.epa.gov/hw/technical-support-document-hazardous-waste-delisting-risk-assessment-software-dras

None of the primary hazard index contributors affect the same target organ/system. Additionally, an evaluation of the Hazard Index based on target organs/systems confirms that the total Hazard Index is <1.0 considering all detected constituents.

Because the total estimated cumulative risk and hazard index falls within acceptable ranges identified by the EPA and IEPA, the overall DRAS results support approval of the waste delisting.

26. For each quality control analysis that involved a matrix or a surrogate spike and spike duplicate analysis, provide the following information.

Because of the volume of information requested, please refer to the laboratory reports provided in Appendix F for answers 26a-6h.

a. The name of the spike analyte added.

b. The concentration of the spike analyte in the unspiked sample.

c. The amount of the spike analyte added.

d. The measured amount of the spike in both spiked samples.

e. The calculated percent recovery of the spike and method of calculation.

f. The acceptance criterion for recovery of each matrix spike.

g. The relative percent difference (RPD) between the duplicate results.

h. The acceptance criterion for the RPD.

27. Identify whether the waste analytical data was corrected based on quality control results (e.g., blank analysis) and explain how the correction was made.

Any corrections to the analytical data are indicated in the Case Narrative of the analytical report. Analytical reports are located in Appendix F. No additional corrections were made.

28. Explain any inconsistencies or deviations found in the reported analytical results. The discussion should include any observed analytical interferences and what actions were taken to resolve the problems.

Specific analytes were detected in the laboratory method blanks. The results in the project samples were either reported not detected or were reported at concentrations five times the method blank concentration. Therefore, no qualifiers were added to the data.

Due to the high liquid content of the sludge, MS/MSD recoveries were outside of laboratory control limits for specific analytes. Surrogate recoveries were outside of laboratory control limits for SVOCs. In general, the LCS/LCSD analyses were within control limits. Also, some spiking solutions were not included for the LCS/LCSD. Sample dilutions and reporting limits were adjusted as necessary to account for matrix interference.

According to the laboratory case narratives, the test results meet requirements of the current National Environmental Laboratory Accreditation Program (NELAP) standards, state requirements or programs where applicable.

29. If any calculations are necessary, (i.e., in use of the Oily Waste Extraction Procedure, for the Mobile Metal Concentration) please include all calculation sheets.

Not Applicable.

PART 6: DELISTING GROUNDWATER MONITORING INFORMATION

1. Show which of the following describes the management of the petitioned waste.

a. The petitioned waste is currently managed in a land-based waste management unit (on-site or off-site), and groundwater monitoring is needed under 40 CFR Part 264 or 265 or authorized State equivalent, or other Federal, state, or local requirements; or if groundwater monitoring information is otherwise available for the unit.

Not Applicable.

b. The petitioned waste was once managed (but is no longer) in a land-based waste management unit (on-site or off-site) and groundwater monitoring was needed under 40 CFR Part 264 or 265 or authorized State equivalent, or other Federal, state, or local requirements; or if groundwater monitoring information is otherwise available for the unit.

Not Applicable.

c. The petitioned waste is currently managed, or was once managed, in a land-based waste management unit, but groundwater monitoring requirement has been waived.

Not Applicable.

d. The petitioned waste is currently managed, or was once managed, in one or more land-based waste management units containing also significant amounts of other wastes, and you consider groundwater data from these non-dedicated units are immaterial in evaluating the petitioned waste's impact on groundwater quality.

Not Applicable.

e. None of the above management scenarios apply.

Yes.

2. Has the appropriate responsible party previously submitted groundwater monitoring information for the subject units to an EPA Regional office or an authorized State in response to 40 CFR Part 264 or 265 requirements (or authorized State equivalent)?

Yes **[Continue with item 3]**

No **[Skip to item 5]**

3. Do you wish that we directly get the groundwater monitoring information from the EPA Region or State?

Yes **[Complete item 4 and continue with item 6]**

No **[Skip to item 5]**

4. Indicate the EPA Regional or State contact for getting the groundwater monitoring information (include name of contact, affiliation, mailing address, and phone number).

Not Applicable.

5. Provide all available and relevant (e.g., for each unit used to manage the petitioned waste) groundwater monitoring information and reports which, at a minimum, should include:

   a. A description of site geology and hydrology.

      The near surface and surface stratigraphic units at the JFR consists predominantly of Quaternary age sediments. The general area has been affected by glacial movement during late pre-Illinois glacial episode (~600,000 years ago), Illinois glacial episode (~250,000 years ago), and late Wisconsin glacial episode (~22,000 years ago) through till and ice-marginal sediment deposits. The bedrock geology beneath the surficial deposits looks Silurian with dolomite, limestone, siltstone, and shale. Man made fill is present throughout most of the footprint of the JRF.

      Geologic and geomorphic processes that have occurred recently in and around the JRF include glaciation episodes and subsequent processes such as weathering, erosion, transportation (by wind and water), and deposition. Additionally, some of the processes around JRF are characterized as containing low morainic islands, glacial terraces, torrent bars, and dunes. There are four major aquifer systems below the JRF, they are the glacial drift, the shallow bedrock, the deep Cambrian-Ordovician bedrock, and the deep Cambrian bedrock. The effluent from JRF predominately affects the glacial drift aquifer system, also known as the Prairie Aquigroup, consists of only unconsolidated materials that overlie the bedrock. This unconsolidated material consists of permeable sand and gravel deposits.

   b. A description of the groundwater monitoring systems for the units in which the petitioned waste is (or was) managed.

      Not applicable. There are no ground water monitoring systems for the units in which the petitioned waste was managed.

   c. The results obtained from the analysis of groundwater samples.

      Not Applicable.

   d. A discussion of sampling and analytical procedures followed in getting and analyzing the groundwater samples.

      Not Applicable.

   e. Any additional information necessary to characterize the petitioned waste's impact on groundwater quality.

      Not Applicable.

   f. An analysis and discussion of whether the above-listed information and data that show contamination of the groundwater is attributable to the petitioned waste.

      Not Applicable.

   g. Is the unsaturated (vadose) zone monitored at any of the subject units?

      Yes **[Continue with item 7]**

      No **[Skip to item 8]**

6. Provide the following information on vadose zone monitoring (e.g., lysimeter information) in as much detail as possible (as requested for groundwater monitoring systems).

a. A description of regional, local, and unit-specific geology and hydrology, and soil characteristics.

Not Applicable.

b. A description of the monitoring system(s) (e.g., design and construction).

Not Applicable.

c. A description of the sampling and analytical procedures followed.

Not Applicable.

d. Analytical and QC data obtained from sample analysis.

Not Applicable.

e. An interpretation of the information and data presented.

Not Applicable.

7. Discuss whether groundwater contamination exists on the site and, if it does, identify the source. If the source is not the petitioned waste, explain, with supporting information, why the petitioned waste has not contributed to the contamination.

Not Applicable, there has not been groundwater contamination.

8. Provide documentation on the waiver or exemption of groundwater monitoring at the land-based waste management unit containing the petitioned waste.

Not Applicable.

9. Identify the units in question, provide estimates of the relative volumes of the petitioned and other wastes disposed in the units, and discuss in detail why you consider groundwater data from these non-dedicated units are immaterial in evaluating the petitioned waste's impact on groundwater quality.

Not Applicable.

10. Describe why groundwater monitoring is not needed for your petitioned waste.

The hazardous waste is not managed in a land-based unit.

TABLES

Table 1
Wastes Currently Generated at the ExxonMobil Joliet Refinery
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids
Channahon, Illinois

Waste	EPA Hazard Code	EPA Hazardous Waste Code
Aerosol Can Contents	I, T	D001, D035, D005, D039
Air Media	none	NA
Alky Defluorinator Catalyst	none	NA
Alky Desiccant	none	NA
Alky scrap	none	NA
Amine Filters	none	NA
Ammonia Ampules	C, T	D002, D009
Antifreeze/Ethylene Glycols	none	NA
Asbestos	none	NA
Asphalt Tank Bottoms	none	NA
Ballasts	none	NA
Biosolids/Lime Solids -Dewatered	none	NA
Boiler Feed Water Treatment Media (Anthracite)	none	NA
Boiler Washout Material	none	NA
BPR31420-44620 Unused Mixture	I	D001
Brine Pit Material	none	NA
BRU Fill	T	F037
Carbon Canisters	none	NA
CCR Catalyst	T	D018
CHD Catalyst	I,T	K171
Chloride Absorber Catalyst	T	D018
Citrus Cleaner	I	D001
COD Vials	C, T	D002, D007, D009, D011
Computer and Electronic Equipment	none	NA
Cooling Tower Plastic and Debris	none	NA
Corrosion Inhibitor Additive (Hitec 4313)	none	NA
D018 Vessel Sludge, Scale, and Debris	T	D018
Debris Contaminated w/ Catalyst Dust	I,T	K171
Debris contaminated with K170	T	K170
Desalter Sludge	T	D018
EZE-Clear CFE Detergent	none	NA
F037 Sludge	T	F037
F037 Soils	T	F037, K050
F037/K050 Sludge	T	K050, F037
FCC Catalyst Fines	none	NA
Fire Fighting Foam	none	NA
Fire Training Ground Soil	none	NA
Flammable Toxic Pharmaceuticals	I, T	D001, D005, D007, D022, D024, D026

NOTES:

T = Toxic
I = Ignitable
C = Corrosive
R = Reactive
E = Toxicity Characteristic

Table 1 (Cont'd)
Wastes Currently Generated at the ExxonMobil Joliet Refinery
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids
Channahon, Illinois

Waste	EPA Hazard Code	EPA Hazardous Waste Code
Flare Line Solids	none	NA
HDF Catalyst	I,T	K171
Heat Exchanger Sludge and Debris	T	K050, F037
Hydrobreak	none	NA
IPA Hand Sanitizer	I	D001
Lab Debris Waste	T	D007, D009
Lab Pack	NA	LABP
Labpack (Non-Haz)	none	NA
Lime Solids/ PTU Solids- Dewatered	none	NA
Medical Waste	none	NA
Mercury Contaminated Debris	T	D009
Methanol	I	D001, U154
Neutralized ASO (High pH)	C	D002
Non-Hazardous Soil	none	NA
Non-Hazardous Solids/Sludge	none	NA
Non- Hazardous Tank Solids	none	NA
Non-PCB Ballasts/Capacitors	none	NA
Paint Waste	I, T	D001, D035
Petroleum Coke mixed with Residue	none	NA
Primary Treatment Solids	T	F037, F038, K048, K051
PTR Catalyst	I,T	K171
PTR/CCR Filters	I, T	D001, D018
Rasching Rings (WM)	none	NA
Reclaimer Resin	none	NA
Refractory Firebrick and Metal Anchors	none	NA
Residual Oil and Debris	none	NA
Rich Amine	C	D002
River Dredge Spoils	none	NA
Rydlyme	C	D002
Sandblast and Sludge D002	C	D002
Sandblast with Chromium	T	D007
Sandblasting Sand	none	NA
Sandblasting Sand with Lead	T	D008
SGP Packing Material	none	NA
Silicone Fluid	none	NA
Sludge from 7-F-4 KOH Tank	none	NA
Sodium Hydroxide Solution	C	D002
SRU Converter Catalyst	none	NA

NOTES:

T = Toxic
I = Ignitable
C = Corrosive
R = Reactive
E = Toxicity Characteristic

Table 1 (Cont'd)
Wastes Currently Generated at the ExxonMobil Joliet Refinery
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids
Channahon, Illinois

Waste	EPA Hazard Code	EPA Hazardous Waste Code
Sulfix 9272 Scavenger	I	D001
Sulfur & Debris	none	NA
Tank 101 and 102 Sludge	T	K169
Tank 441	T	D018
Tank 505	T	D018
Tank 505 Solids	T	D018
Tank 524 Solids	T	F037
Tank 525 Sludge	T	F037
Tank 525 Solids	T	F037
Terpene Hydrocarbons	I	D001
Transformer Oil	none	NA
Treated Wood Weathered	none	NA
Universal Waste - Batteries	none	NA
Universal Waste - Lamps	none	NA
Universal Waste- Lithium Ion Batteries	none	NA
Universal Waste-Mercury Devices	none	NA
Unused Catalyst, Inert Support Unused Consumables	none	NA
Vessel Scale/Debris with Chromium	T	D007
Vessel Sludge & Scale w/Selenium	T	D010
Zeolite	none	NA

NOTES:

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Table 2
Comparison of Constituent Lists
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Primary Treatment Solids
Channahon, Illinois

CAS	Chemical Name	Chemicals Analyzed	EPA Region 5 Skinner List	261.21-24 Characteristics of Hazardous Waste	268.40 Treatment Standards for Waste Codes F037, F038, K048, K051	Appendix VII for Waste Codes F037, F038, K048, K051	Appendix VIII EPA RCRA Delisting Program Guidance for the Petitioner March 2000	Appendix IX EPA Region 6 RCRA Hazardous Waste Delisting Program Useful Information for the Petitioner Aug 2009	Comments
100-01-6	p-Nitroaniline	X					X	X	
100-02-7	p-Nitrophenol	X	X				X	X	
100-41-4	Ethylbenzene	X	X		X			X	
100-42-5	Styrene	X	X					X	
100-44-7	Benzyl chloride						X		Chemical not on EPA Region 5 Skinner List
100-51-6	Benzyl alcohol	X						X	
10061-01-5	cis-1,3-Dichloropropene	X						X	
10061-02-6	trans-1,3-Dichloropropene	X						X	
100-75-4	N-Nitrosopiperidine	X					X	X	
10102-43-9	Nitric oxide						X		Chemical not on EPA Region 5 Skinner List
10102-44-0	Nitrogen dioxide						X		Chemical not on EPA Region 5 Skinner List
10102-45-1	Thallium(I) nitrate						X		Chemical not on EPA Region 5 Skinner List
101-14-4	4,4'-Methylenebis(2-chloroaniline)						X		Chemical not on EPA Region 5 Skinner List
101-27-9	Barban						X		Chemical not on EPA Region 5 Skinner List
101-55-3	p-Bromophenyl phenyl ether						X	X	Chemical not on EPA Region 5 Skinner List
1024-57-3	Heptachlor epoxide	X					X	X	
1031-07-8	Endosulfan sulfate	X						X	
103-85-5	Phenylthiourea						X		Chemical not on EPA Region 5 Skinner List
105-67-9	2,4-Dimethylphenol	X	X				X	X	
10595-95-6	N-Nitrosomethylethylamine	X					X	X	
10605-21-7	Carbendazim						X		Chemical not on EPA Region 5 Skinner List
106-44-5	p-Cresol	X	X	X				X	
106-46-7	p-Dichlorobenzene	X	X	X			X	X	
106-47-8	p-Chloroaniline	X					X	X	
106-49-0	p-Toluidine						X		Chemical not on EPA Region 5 Skinner List
106-50-3	p-Phenylenediamine	X						X	
106-51-4	Quinone						X		Chemical not on EPA Region 5 Skinner List
106-89-8	Epichlorohydrin						X		Chemical not on EPA Region 5 Skinner List
106-93-4	Ethylene dibromide	X	X				X	X	
107-02-8	Acrolein	X					X	X	
107-05-1	Allyl chloride	X					X	X	
107-06-2	1,2-Dichloroethane	X	X	X			X	X	
107-10-8	Propylamine						X		Chemical not on EPA Region 5 Skinner List
107-12-0	Propanenitrile	X					X	X	
107-13-1	Acrylonitrile	X					X	X	
107-18-6	Allyl Alcohol						X		Chemical not on EPA Region 5 Skinner List
107-19-7	Propargyl alcohol						X		Chemical not on EPA Region 5 Skinner List
107-20-0	Chloroacetaldehyde						X		Chemical not on EPA Region 5 Skinner List
107-30-2	Chloromethyl methyl ether						X		Chemical not on EPA Region 5 Skinner List
107-49-3	Tetraethyl pyrophosphate						X		Chemical not on EPA Region 5 Skinner List
108-05-4	Vinyl acetate	X						X	
108-10-1	Methyl isobutyl ketone	X						X	
108-31-6	Maleic anhydride						X		Chemical not on EPA Region 5 Skinner List
108-39-4	m-Cresol	X	X	X				X	
108-45-2	1,3-Phenylenediamine						X		Chemical not on EPA Region 5 Skinner List
108-46-3	Resorcinol						X		Chemical not on EPA Region 5 Skinner List
108-60-1	Bis(2-chloro-1-methylethyl) ether	X						X	
108-88-3	Toluene	X	X		X		X	X	
108-90-7	Chlorobenzene	X	X	X			X	X	
108-95-2	Phenol	X	X		X		X	X	
109-06-8	2-Methylpyridine	X					X	X	
109-77-3	Malononitrile						X		Chemical not on EPA Region 5 Skinner List
110-57-6	trans-1,4-Dichloro-2-butene	X						X	
110-75-8	2-Chloroethyl vinyl ether						X		Chemical not on EPA Region 5 Skinner List
110-80-5	2-Ethoxyethanol						X		Chemical not on EPA Region 5 Skinner List
110-86-1	Pyridine	X	X	X			X	X	

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11096-82-5	Aroclor 1260	X						X	
11097-69-1	Aroclor 1254	X						X	
11104-28-2	Aroclor 1221	X						X	
11141-16-5	Aroclor 1232	X						X	
111-44-4	Bis(2-chloroethyl) ether	X					X	X	
1114-71-2	Pebulate						X		Chemical not on EPA Region 5 Skinner List
111-54-6	Ethylenebisdithiocarbamic acid						X		Chemical not on EPA Region 5 Skinner List
1116-54-7	N-Nitrosodiethanolamine						X		Chemical not on EPA Region 5 Skinner List
111-91-1	Bis(2-chloroethoxy)methane	X					X	X	
1120-71-4	1,3-Propane sultone						X		Chemical not on EPA Region 5 Skinner List
1129-41-5	Metolcarb						X		Chemical not on EPA Region 5 Skinner List
1134-23-2	Cycloate						X		Chemical not on EPA Region 5 Skinner List
114-26-1	Propoxur						X		Chemical not on EPA Region 5 Skinner List
115-02-6	Azaserine						X		Chemical not on EPA Region 5 Skinner List
115-29-7	Endosulfan						X		Chemical not on EPA Region 5 Skinner List
116-06-3	Aldicarb						X		Chemical not on EPA Region 5 Skinner List
117-81-7	Bis(2-ethylhexyl)phthalate	X	X		X		X	X	
117-84-0	Di-n-octyl phthalate	X					X	X	
118-74-1	Hexachlorobenzene	X		X			X	X	
118-79-6	2,4,6-Tribromophenol	X					X		
119-38-0	Isolane						X		Chemical not on EPA Region 5 Skinner List
119-90-4	3,3'-Dimethoxybenzidine						X		Chemical not on EPA Region 5 Skinner List
119-93-7	3,3'-Dimethylbenzidine	X					X		
120-12-7	Anthracene	X	X		X			X	

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120-54-7	Dipentamethylenethiuram tetrasulfide						X		Chemical not on EPA Region 5 Skinner List
120-58-1	Isosafrole	X					X	X	
120-71-8	p-Cresidine						X		Chemical not on EPA Region 5 Skinner List
120-82-1	1,2,4-Trichlorobenzene	X					X	X	
120-83-2	2,4-Dichlorophenol	X					X	X	
121-14-2	2,4-Dinitrotoluene	X		X			X	X	
121-44-8	Triethylamine						X		Chemical not on EPA Region 5 Skinner List
122-09-8	Phentermine	X					X	X	
122-39-4	Diphenylamine	X					X	X	
122-42-9	Propham						X		Chemical not on EPA Region 5 Skinner List
122-66-7	1,2-Diphenylhydrazine						X		Chemical not on EPA Region 5 Skinner List
123-33-1	Maleic hydrazide						X		Chemical not on EPA Region 5 Skinner List
123-63-7	Paraldehyde						X		Chemical not on EPA Region 5 Skinner List
123-91-1	1,4-Dioxane	X	X				X	X	
124-48-1	Chlorodibromomethane	X						X	
126-68-1	O,O,O-Triethyl phosphorothioate						X	X	Chemical not on EPA Region 5 Skinner List
12672-29-6	Aroclor 1248	X						X	
126-72-7	Tris(2,3-dibromopropyl) phosphate						X		Chemical not on EPA Region 5 Skinner List
12674-11-2	Aroclor 1016	X						X	
126-85-2	Mechlorethamine oxide						X		Chemical not on EPA Region 5 Skinner List
126-98-7	Methacrylonitrile	X					X	X	
126-99-8	Chloroprene	X					X	X	
127-18-4	Tetrachloroethylene	X	X	X			X	X	
12789-03-6	Chlordane, technical						X		Chemical not on EPA Region 5 Skinner List
128-03-0	Potassium dimethyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
128-04-1	Sodium dimethyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
129-00-0	Pyrene	X	X		X			X	
130-15-4	1,4-Naphthoquinone	X					X	X	
1303-28-2	Arsenic(V) pentoxide						X		Chemical not on EPA Region 5 Skinner List
131-11-3	Dimethyl phthalate	X	X				X	X	
1314-32-5	Thallium(III) oxide						X		Chemical not on EPA Region 5 Skinner List
1314-62-1	Vanadium pentoxide						X		Chemical not on EPA Region 5 Skinner List
1314-84-7	Zinc phosphide						X		Chemical not on EPA Region 5 Skinner List
131-52-2	Sodium pentachlorophenate						X		Chemical not on EPA Region 5 Skinner List
131-61-3	2,3,4,6-Tetrachlorophenol sodium salt						X		Chemical not on EPA Region 5 Skinner List
131-89-5	Dinex						X		Chemical not on EPA Region 5 Skinner List
1319-77-3	Cresol	X		X			X		
13256-22-9	N-Nitrososarcosine						X		Chemical not on EPA Region 5 Skinner List
132-64-9	Dibenzofuran	X						X	
1327-53-3	Arsenic(III) trioxide						X		Chemical not on EPA Region 5 Skinner List
1330-20-7	Xylene	X	X		X			X	
1335-32-6	Lead acetate						X		Chemical not on EPA Region 5 Skinner List
1336-36-3	Polychlorinated biphenyls	X					X	X	
1338-23-4	Methyl ethyl ketone peroxide						X		Chemical not on EPA Region 5 Skinner List
134-32-7	1-Naphthalenamine	X					X	X	
13463-39-3	Nickel carbonyl						X		Chemical not on EPA Region 5 Skinner List
136-30-1	Sodium dibutyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
136677-09-3	Chlorinated dibenzo-p-dioxins	X					X	X	
136677-10-6	Chlorinated dibenzofurans	X					X	X	
137-26-8	Thiram						X		Chemical not on EPA Region 5 Skinner List
137-29-1	Copper dimethyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
137-30-4	Ziram						X		Chemical not on EPA Region 5 Skinner List
137-41-7	Potassium N-methyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
137-42-8	Sodium methyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
13765-19-0	Calcium chromate						X		Chemical not on EPA Region 5 Skinner List
1402-68-2	Aflatoxins						X		Chemical not on EPA Region 5 Skinner List

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140-57-8	Aramite	X					X	X	
14324-55-1	Ethyl ziram						X		Chemical not on EPA Region 5 Skinner List
143-33-9	Sodium cyanide						X		Chemical not on EPA Region 5 Skinner List
143-50-0	Chlordecone	X					X	X	
144-34-3	Selenium dimethyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
14484-64-1	Ferbam						X		Chemical not on EPA Region 5 Skinner List
145-73-3	Endothall						X		Chemical not on EPA Region 5 Skinner List
1464-53-5	Diepoxybutane						X		Chemical not on EPA Region 5 Skinner List
148-18-5	Sodium diethyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
148-82-3	Melphalan						X		Chemical not on EPA Region 5 Skinner List
14901-08-7	Cycasin						X		Chemical not on EPA Region 5 Skinner List
15123-92-9	Thallium(I) selenite						X		Chemical not on EPA Region 5 Skinner List
151-50-8	Potassium cyanide						X		Chemical not on EPA Region 5 Skinner List
151-56-4	Aziridine						X		Chemical not on EPA Region 5 Skinner List
152-16-9	Schradan						X		Chemical not on EPA Region 5 Skinner List
15339-36-3	Manganese dimethyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
1563-38-8	2,3-Dihydro-2,2-dimethyl-7-benzofuranol						X		Chemical not on EPA Region 5 Skinner List
1563-66-2	Carbofuran						X		Chemical not on EPA Region 5 Skinner List
156-60-5	trans-1,2-Dichloroethylene	X					X	X	
1615-80-1	N,N'-Diethylhydrazine						X		Chemical not on EPA Region 5 Skinner List
1634-02-2	Tetrabutylthiuram disulfide						X		Chemical not on EPA Region 5 Skinner List
1634-04-4	Methyl tertiary butyl ether		X						Not sampled due to knowledge of the refinery processes and wastes
1646-88-4	Aldicarb sulfone						X		Chemical not on EPA Region 5 Skinner List
16543-55-8	N-Nitrosonornicotine						X		Chemical not on EPA Region 5 Skinner List
16752-77-5	Methomyl						X		Chemical not on EPA Region 5 Skinner List
16984-48-8	Fluoride	X							
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	X					X	X	
17702-57-7	Formparanate						X		Chemical not on EPA Region 5 Skinner List
17804-35-2	Benomyl						X		Chemical not on EPA Region 5 Skinner List
18496-25-8	Sulfide	X						X	
18883-66-4	Streptozotocin						X		Chemical not on EPA Region 5 Skinner List
1888-71-7	Hexachloropropene	X					X	X	
189-55-9	Dibenzo(a,i)pyrene						X		Chemical not on EPA Region 5 Skinner List
189-64-0	Dibenzo(a,h)pyrene						X		Chemical not on EPA Region 5 Skinner List
191-24-2	Benzo(g,h,i)perylene	X						X	
192-65-4	Dibenzo(a,e)pyrene						X		Chemical not on EPA Region 5 Skinner List
1929-77-7	Vernolate						X		Chemical not on EPA Region 5 Skinner List
193-39-5	Indeno(1,2,3-cd)pyrene	X	X				X	X	
194-59-2	7H-Dibenzo[c,g]carbazole						X		Chemical not on EPA Region 5 Skinner List
2008-41-5	Butylate						X		Chemical not on EPA Region 5 Skinner List
2032-65-7	Methiocarb						X		Chemical not on EPA Region 5 Skinner List
205-82-3	Benzo(j)fluoranthene						X		Chemical not on EPA Region 5 Skinner List
205-99-2	Benzo(b)fluoranthene	X	X				X	X	
206-44-0	Fluoranthene	X	X				X	X	
207-08-9	Benzo(k)fluoranthene	X	X				X	X	
20816-12-0	Osmium tetroxide						X		Chemical not on EPA Region 5 Skinner List
20830-81-3	Daunomycin						X		Chemical not on EPA Region 5 Skinner List
20859-73-8	Aluminum phosphide						X		Chemical not on EPA Region 5 Skinner List
208-96-8	Acenaphthylene	X						X	
218-01-9	Chrysene	X	X		X	X	X	X	
2212-67-1	Molinate						X		Chemical not on EPA Region 5 Skinner List
224-42-0	Dibenz(a,j)acridine						X		Chemical not on EPA Region 5 Skinner List
225-51-4	Benzo(c)acridine						X		Chemical not on EPA Region 5 Skinner List
22781-23-3	Bendiocarb						X		Chemical not on EPA Region 5 Skinner List
22961-82-6	Bendiocarb phenol						X		Chemical not on EPA Region 5 Skinner List

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2303-16-4	Diallate	X					X	X	
2303-17-5	Triallate						X		Chemical not on EPA Region 5 Skinner List
23135-22-0	Oxamyl						X		Chemical not on EPA Region 5 Skinner List
23422-53-9	Formetanate hydrochloride						X		Chemical not on EPA Region 5 Skinner List
23564-05-8	Thiophanate-methyl						X		Chemical not on EPA Region 5 Skinner List
23950-58-5	Pronamide	X					X	X	
25154-54-5	Dinitrobenzene						X		Chemical not on EPA Region 5 Skinner List
25265-76-3	Phenylenediamine						X		Chemical not on EPA Region 5 Skinner List
25321-22-6	Dichlorobenzene						X		Chemical not on EPA Region 5 Skinner List
25322-20-7	Tetrachloroethane						X		Chemical not on EPA Region 5 Skinner List
25323-30-2	Dichloroethylene						X		Chemical not on EPA Region 5 Skinner List
25376-45-8	Toluenediamine						X		Chemical not on EPA Region 5 Skinner List
25735-29-9	Trichloropropane						X		Chemical not on EPA Region 5 Skinner List
2631-37-0	Promecarb						X		Chemical not on EPA Region 5 Skinner List
26419-73-8	Tirpate						X		Chemical not on EPA Region 5 Skinner List
26471-62-5	Toluene diisocyanate						X		Chemical not on EPA Region 5 Skinner List
26545-73-3	Dichloropropanol						X		Chemical not on EPA Region 5 Skinner List
26638-19-7	Dichloropropane						X		Chemical not on EPA Region 5 Skinner List
26952-23-8	Dichloropropene						X		Chemical not on EPA Region 5 Skinner List
2763-96-4	5-(Aminomethyl)-3-isoxazolol						X		Chemical not on EPA Region 5 Skinner List
297-97-2	Thionazin	X					X	X	
298-00-0	Methyl parathion	X					X	X	
298-02-2	Phorate	X					X	X	
298-04-4	Disulfoton	X					X	X	
301-04-2	Lead(II) acetate						X		Chemical not on EPA Region 5 Skinner List
302-01-2	Hydrazine						X		Chemical not on EPA Region 5 Skinner List
303-34-4	Lasiocarpine						X		Chemical not on EPA Region 5 Skinner List
30402-14-3	Tetrachlorodibenzofuran	X					X		
30402-15-4	Pentachlorodibenzofuran	X					X		
305-03-3	Chlorambucil						X		Chemical not on EPA Region 5 Skinner List
30558-43-1	Oxamyl oxime						X		Chemical not on EPA Region 5 Skinner List
309-00-2	Aldrin	X					X	X	
311-45-5	Paraoxon						X		Chemical not on EPA Region 5 Skinner List
315-18-4	Mexacarbate						X		Chemical not on EPA Region 5 Skinner List
319-84-6	Alpha Lindane	X						X	
319-85-7	Beta Lindane	X						X	
319-86-8	Delta Lindane	X						X	
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxir	X					X		
3288-58-2	O,O-Diethyl S-methyl dithiophosphate						X		Chemical not on EPA Region 5 Skinner List
33213-65-9	Endosulfan II	X						X	
34465-46-8	Hexachlorodibenzo-p-dioxin	X					X		
353-50-4	Carbonic difluoride						X		Chemical not on EPA Region 5 Skinner List
357-57-3	Brucine						X		Chemical not on EPA Region 5 Skinner List
36088-22-9	Pentachlorodibenzo-p-dioxin	X					X		
3689-24-5	Sulfotep	X					X	X	
37871-00-4	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	X					X		
38998-75-3	1,2,3,4,6,7,8-Heptachlorodibenzofuran	X					X		
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	X					X		
39196-18-4	Thiofanox						X		Chemical not on EPA Region 5 Skinner List
39638-32-9	Bis(2-chloroisopropyl) ether						X		Chemical not on EPA Region 5 Skinner List
409314-70-1	Trichloromethanethiol						X		Chemical not on EPA Region 5 Skinner List
4170-30-3	Crotonaldehyde						X		Chemical not on EPA Region 5 Skinner List
41903-57-5	Tetrachlorodibenzo-p-dioxin	X					X		
4549-40-0	N-Nitrosomethylvinylamine						X		Chemical not on EPA Region 5 Skinner List
460-19-5	Cyanogen						X		Chemical not on EPA Region 5 Skinner List
465-73-6	Isodrin	X					X	X	

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Channahon, Illinois

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492-80-8	Auramine						X		Chemical not on EPA Region 5 Skinner List
494-03-1	Chlornaphazine						X		Chemical not on EPA Region 5 Skinner List
496-72-0	3,4-Diaminotoluene						X		Chemical not on EPA Region 5 Skinner List
50-00-0	Formaldehyde						X		Chemical not on EPA Region 5 Skinner List
50-07-7	Mitomycin C						X		Chemical not on EPA Region 5 Skinner List
50-18-0	Cyclophosphamide						X		Chemical not on EPA Region 5 Skinner List
50-29-3	p,p'-DDT	X					X	X	
50-32-8	Benzo(a)pyrene	X	X		X	X	X	X	
504-24-5	4-Aminopyridine						X		Chemical not on EPA Region 5 Skinner List
50-55-5	Reserpine						X		Chemical not on EPA Region 5 Skinner List
505-60-2	Mustard gas						X		Chemical not on EPA Region 5 Skinner List
506-61-6	Potassium silver cyanide						X		Chemical not on EPA Region 5 Skinner List
506-64-9	Silver cyanide						X		Chemical not on EPA Region 5 Skinner List
506-68-3	Cyanogen bromide						X		Chemical not on EPA Region 5 Skinner List
506-77-4	Cyanogen chloride						X		Chemical not on EPA Region 5 Skinner List
509-14-8	Tetranitromethane						X		Chemical not on EPA Region 5 Skinner List
510-15-6	Chlorobenzilate	X					X	X	
51026-28-9	Potassium methyldithiocarbamate						X		Chemical not on EPA Region 5 Skinner List
51-28-5	2,4-Dinitrophenol	X	X				X	X	
51-43-4	Epinephrine						X		Chemical not on EPA Region 5 Skinner List
51-52-5	Propylthiouracil						X		Chemical not on EPA Region 5 Skinner List
51-75-2	Bis(2-chloroethyl)methylamine						X		Chemical not on EPA Region 5 Skinner List
51-79-6	Urethane						X		Chemical not on EPA Region 5 Skinner List
52-24-4	Thiotepa						X		Chemical not on EPA Region 5 Skinner List
52-85-7	Famphur	X					X	X	
52888-80-9	Prosulfocarb						X		Chemical not on EPA Region 5 Skinner List
533-74-4	Dazomet						X		Chemical not on EPA Region 5 Skinner List
5344-82-1	1-(o-Chlorophenyl)thiourea						X		Chemical not on EPA Region 5 Skinner List
534-52-1	4,6-Dinitro-o-cresol	X					X	X	
53469-21-9	Aroclor 1242	X						X	
53535-27-6	Tetrachlorophenol potassium salt						X		Chemical not on EPA Region 5 Skinner List
53-70-3	Dibenz(a,h)anthracene	X	X				X	X	
53-96-3	2-Acetylaminofluorene	X					X	X	
540-73-8	1,2-Dimethylhydrazine						X		Chemical not on EPA Region 5 Skinner List
54-11-5	Nicotine						X		Chemical not on EPA Region 5 Skinner List
541-53-7	Dithiobiuret						X		Chemical not on EPA Region 5 Skinner List
541-73-1	1,3-Dichlorobenzene	X	X				X	X	
542-62-1	Barium cyanide						X		Chemical not on EPA Region 5 Skinner List
542-75-6	1,3-Dichloropropene						X		Chemical not on EPA Region 5 Skinner List
542-76-7	3-Chloropropionitrile						X		Chemical not on EPA Region 5 Skinner List
542-88-1	Bis(chloromethyl) ether						X		Chemical not on EPA Region 5 Skinner List
544-92-3	Copper(I) cyanide						X		Chemical not on EPA Region 5 Skinner List
55-18-5	N-Nitrosodiethylamine	X					X	X	
55285-14-8	Carbosulfan						X		Chemical not on EPA Region 5 Skinner List
55406-53-6	3-Iodo-2-propynyl butylcarbamate						X		Chemical not on EPA Region 5 Skinner List
55-63-0	Nitroglycerin						X		Chemical not on EPA Region 5 Skinner List
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	X						X	
55684-94-1	Hexachlorodibenzofuran	X					X		
557-19-7	Nickel(II) cyanide						X		Chemical not on EPA Region 5 Skinner List
557-21-1	Zinc cyanide						X		Chemical not on EPA Region 5 Skinner List
55-91-4	Diisopropyl fluorophosphate						X		Chemical not on EPA Region 5 Skinner List
56-04-2	Methylthiouracil						X		Chemical not on EPA Region 5 Skinner List
56-23-5	Carbon tetrachloride	X		X			X	X	
563-68-8	Thallium(I) acetate						X		Chemical not on EPA Region 5 Skinner List
56-38-2	Parathion	X					X	X	
56-49-5	3-Methylcholanthrene	X					X	X	

Table 2
Comparison of Constituent Lists
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids
Channahon, Illinois

CAS	Chemical Name	Chemicals Analyzed	EPA Region 5 Skinner List	261.21-24 Characteristics of Hazardous Waste	268.40 Treatment Standards for Waste Codes F037, F038, K048, K051	Appendix VII for Waste Codes F037, F038, K048, K051	Appendix VIII EPA RCRA Delisting Program Guidance for the Petitioner March 2000	Appendix IX EPA Region 6 RCRA Hazardous Waste Delisting Program Useful Information for the Petitioner Aug 2009	Comments
56-53-1	Diethylstilbestrol						X		Chemical not on EPA Region 5 Skinner List
56-55-3	Benzo(a)anthracene	X	X		X		X	X	
56-57-5	4-Nitroquinoline 1-oxide	X						X	
57-12-5	Cyanide	X	X		X		X	X	
57-14-7	1,1-Dimethylhydrazine						X		Chemical not on EPA Region 5 Skinner List
57-24-9	Strychnine						X		Chemical not on EPA Region 5 Skinner List
57-47-6	Physostigmine						X		Chemical not on EPA Region 5 Skinner List
57-64-7	Physostigmine salicylate						X		Chemical not on EPA Region 5 Skinner List
57-74-9	Chlordane	X		X			X	X	
57-97-6	7,12-Dimethylbenz[a]anthracene	X					X	X	
58-89-9	Lindane	X		X			X	X	
58-90-2	2,3,4,6-Tetrachlorophenol	X					X	X	
591-08-2	1-Acetyl-2-thiourea						X		Chemical not on EPA Region 5 Skinner List
591-78-6	2-Hexanone	X						X	
592-01-8	Calcium cyanide						X		Chemical not on EPA Region 5 Skinner List
59-50-7	p-Chloro-m-cresol						X	X	Chemical not on EPA Region 5 Skinner List
5952-26-1	Diethylene glycol, dicarbamate						X		Chemical not on EPA Region 5 Skinner List
59669-26-0	Thiodicarb						X		Chemical not on EPA Region 5 Skinner List
598-31-2	Bromoacetone						X		Chemical not on EPA Region 5 Skinner List
59-89-2	N-Nitrosomorpholine	X					X	X	
60-11-7	4-Dimethylaminoazobenzene	X					X	X	
60-34-4	Methyl hydrazine						X		Chemical not on EPA Region 5 Skinner List
60-51-5	Dimethoate	X					X	X	
60-57-1	Dieldrin	X					X	X	
606-20-2	2,6-Dinitrotoluene	X					X	X	
608-93-5	Pentachlorobenzene	X					X	X	
615-53-2	N-Nitroso-N-methylurethane						X		Chemical not on EPA Region 5 Skinner List
61-82-5	Amitrole						X		Chemical not on EPA Region 5 Skinner List
621-64-7	N-Nitrosodi-n-propylamine						X	X	Chemical not on EPA Region 5 Skinner List
62-38-4	Phenylmercury acetate						X		Chemical not on EPA Region 5 Skinner List
62-44-2	Phenacetin	X					X	X	
624-83-9	Methyl isocyanate						X		Chemical not on EPA Region 5 Skinner List
62-50-0	Ethyl methanesulfonate	X					X	X	
62-53-3	Aniline	X					X	X	
62-55-5	Thioacetamide						X		Chemical not on EPA Region 5 Skinner List
62-56-6	Thiourea						X		Chemical not on EPA Region 5 Skinner List
62-74-8	Sodium fluoroacetate						X		Chemical not on EPA Region 5 Skinner List
62-75-9	N-Nitrosodimethylamine	X					X	X	
628-86-4	Mercury fulminate						X		Chemical not on EPA Region 5 Skinner List
630-10-4	Selenourea						X		Chemical not on EPA Region 5 Skinner List
630-20-6	1,1,1,2-Tetrachloroethane	X					X	X	
63-25-2	Carbaryl						X		Chemical not on EPA Region 5 Skinner List
6358-53-8	Citrus Red No. 2						X		Chemical not on EPA Region 5 Skinner List
636-21-5	o-Toluidine hydrochloride						X		Chemical not on EPA Region 5 Skinner List
64-00-6	m-Cumenyl methylcarbamate						X		Chemical not on EPA Region 5 Skinner List
640-19-7	Fluoroacetamide						X		Chemical not on EPA Region 5 Skinner List
64-18-6	Formic acid						X		Chemical not on EPA Region 5 Skinner List
644-64-4	Dimetilan						X		Chemical not on EPA Region 5 Skinner List
6533-73-9	Thallium(I) carbonate						X		Chemical not on EPA Region 5 Skinner List
66-27-3	Methyl methanesulfonate	X					X	X	
66-75-1	Uracil mustard						X		Chemical not on EPA Region 5 Skinner List
67-64-1	Acetone	X						X	
67-66-3	Chloroform	X	X	X			X	X	
67-72-1	Hexachloroethane	X		X			X	X	
68411-45-0	Chlorinated benzenes						X		Chemical not on EPA Region 5 Skinner List
684-93-5	N-Nitroso-N-methylurea						X		Chemical not on EPA Region 5 Skinner List

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692-42-2	Diethylarsine						X		Chemical not on EPA Region 5 Skinner List
696-28-6	Dichlorophenylarsine						X		Chemical not on EPA Region 5 Skinner List
7005-72-3	p-Chlorophenyl phenyl ether	X						X	
70-25-7	N-Methyl-N'-nitro-N-nitrosoguanidine						X		Chemical not on EPA Region 5 Skinner List
70-30-4	Hexachlorophene	X					X	X	
71-43-2	Benzene	X	X	X	X	X	X	X	
71-55-6	1,1,1-Trichloroethane	X	X				X	X	
72-20-8	Endrin	X		X			X	X	
72-43-5	Methoxychlor	X		X			X	X	
72-54-8	p,p'-DDD	X					X	X	
72-55-9	p,p'-DDE	X					X	X	
72-57-1	Trypan blue						X		Chemical not on EPA Region 5 Skinner List
7421-93-4	Endrin aldehyde	X						X	
7439-92-1	Lead	X	X	X	X	X	X	X	
7439-97-6	Mercury	X	X	X			X	X	
7440-02-0	Nickel	X	X		X		X	X	
7440-22-4	Silver	X	X	X			X	X	
7440-28-0	Thallium	X					X	X	
7440-31-5	Tin	X						X	
7440-36-0	Antimony	X	X				X	X	
7440-38-2	Arsenic	X	X	X			X	X	
7440-39-3	Barium	X	X	X			X	X	
7440-41-7	Beryllium	X	X				X	X	
7440-43-9	Cadmium	X	X	X			X	X	
7440-47-3	Chromium	X	X	X	X	X	X	X	
7440-48-4	Cobalt	X	X					X	
7440-50-8	Copper	X						X	
7440-62-2	Vanadium	X	X					X	
7440-66-6	Zinc	X	X					X	
7446-18-6	Thallium(I) sulfate						X		Chemical not on EPA Region 5 Skinner List
7446-27-7	Lead(II) phosphate						X		Chemical not on EPA Region 5 Skinner List
74-83-9	Methyl bromide	X					X	X	
74-87-3	Chloromethane	X					X	X	
74-88-4	Methyl iodide	X					X	X	
7488-56-4	Selenium disulfide						X		Chemical not on EPA Region 5 Skinner List
74-90-8	Hydrogen cyanide						X		Chemical not on EPA Region 5 Skinner List
74-93-1	Methyl mercaptan						X		Chemical not on EPA Region 5 Skinner List
74-95-3	Dibromomethane	X					X	X	
75-00-3	Chloroethane	X					X	X	
75-01-4	Vinyl chloride	X		X			X	X	
75-05-8	Acetonitrile	X					X	X	
75-09-2	Methylene chloride	X					X	X	
75-15-0	Carbon disulfide	X	X				X	X	
75-21-8	Ethylene oxide						X		Chemical not on EPA Region 5 Skinner List
75-25-2	Tribromomethane	X					X	X	
75-27-4	Dichlorobromomethane	X						X	
75-34-3	1,1-Dichloroethane	X	X				X	X	
75-35-4	1,1-Dichloroethylene	X		X			X	X	
75-36-5	Acetyl chloride						X		Chemical not on EPA Region 5 Skinner List
75-44-5	Phosgene						X		Chemical not on EPA Region 5 Skinner List
75-55-8	Propyleneimine						X		Chemical not on EPA Region 5 Skinner List
75-60-5	Cacodylic acid						X		Chemical not on EPA Region 5 Skinner List
75-69-4	CFC-11	X					X	X	
75-71-8	CFC-12	X					X	X	
757-58-4	Hexaethyl tetraphosphate						X		Chemical not on EPA Region 5 Skinner List
75-86-5	Acetone cyanohydrin						X		Chemical not on EPA Region 5 Skinner List

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Primary Treatment Solids
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75-87-6	Chloral						X		Chemical not on EPA Region 5 Skinner List
759-73-9	N-Nitroso-N-ethylurea						X		Chemical not on EPA Region 5 Skinner List
759-94-4	S-Ethyl dipropylthiocarbamate						X		Chemical not on EPA Region 5 Skinner List
76-01-7	Pentachloroethane	X					X	X	
764-41-0	1,4-Dichloro-2-butene						X		Chemical not on EPA Region 5 Skinner List
76-44-8	Heptachlor	X		X			X	X	
765-34-4	Glycidylaldehyde						X		Chemical not on EPA Region 5 Skinner List
7664-39-3	Hydrofluoric acid						X		Chemical not on EPA Region 5 Skinner List
77-47-4	Hexachlorocyclopentadiene	X					X	X	
77-78-1	Dimethyl sulfate						X		Chemical not on EPA Region 5 Skinner List
7778-39-4	Arsenic acid						X		Chemical not on EPA Region 5 Skinner List
7778-73-6	Potassium pentachlorophenate						X		Chemical not on EPA Region 5 Skinner List
7782-41-4	Fluorine						X		Chemical not on EPA Region 5 Skinner List
7782-49-2	Selenium	X	X	X			X	X	
7783-00-8	Selenious acid (H2SeO3)						X		Chemical not on EPA Region 5 Skinner List
7783-06-4	Hydrogen sulfide						X		Chemical not on EPA Region 5 Skinner List
7791-12-0	Thallium(I) chloride						X		Chemical not on EPA Region 5 Skinner List
78-00-2	Tetraethyllead						X		Chemical not on EPA Region 5 Skinner List
7803-51-2	Phosphine						X		Chemical not on EPA Region 5 Skinner List
7803-55-6	Ammonium vanadate						X		Chemical not on EPA Region 5 Skinner List
78-59-1	Isophorone	X						X	
78-83-1	Isobutanol	X					X	X	
78-87-5	1,2-Dichloropropane	X					X	X	
78-93-3	Methyl ethyl ketone	X	X	X			X	X	
79-00-5	1,1,2-Trichloroethane	X					X	X	
79-01-6	Trichloroethylene	X	X	X			X	X	
79-06-1	Acrylamide						X		Chemical not on EPA Region 5 Skinner List
79-19-6	Thiosemicarbazide						X		Chemical not on EPA Region 5 Skinner List
79-22-1	Methyl chlorocarbonate						X		Chemical not on EPA Region 5 Skinner List
79-34-5	1,1,2,2-Tetrachloroethane	X					X	X	
79-44-7	Dimethylcarbamoyl chloride						X		Chemical not on EPA Region 5 Skinner List
79-46-9	2-Nitropropane						X		Chemical not on EPA Region 5 Skinner List
8001-35-2	Toxaphene	X		X			X	X	
8001-58-9	Creosote						X		Chemical not on EPA Region 5 Skinner List
80-62-6	Methyl methacrylate	X					X	X	
81-07-2	Saccharin						X		Chemical not on EPA Region 5 Skinner List
81-81-2	Warfarin						X		Chemical not on EPA Region 5 Skinner List
823-40-5	2,6-Diaminotoluene						X		Chemical not on EPA Region 5 Skinner List
82-68-8	Pentachloronitrobenzene	X					X	X	
83-32-9	Acenaphthene	X	X		X			X	
84-66-2	Diethyl phthalate	X	X				X	X	
84-74-2	Di-n-butyl phthalate	X	X		X		X	X	
85-01-8	Phenanthrene	X	X		X			X	
85-44-9	Phthalic anhydride						X		Chemical not on EPA Region 5 Skinner List
85-68-7	Butyl benzyl phthalate	X					X	X	
86-30-6	N-Nitrosodiphenylamine	X						X	
86-73-7	Fluorene	X	X		X			X	
86-88-4	Alpha Naphthylthiourea						X		Chemical not on EPA Region 5 Skinner List
87-65-0	2,6-Dichlorophenol	X					X	X	
87-68-3	Hexachlorobutadiene	X		X			X	X	
87-86-5	Pentachlorophenol	X		X			X	X	
88-06-2	2,4,6-Trichlorophenol	X		X			X	X	
88-74-4	o-Nitroaniline	X						X	
88-75-5	o-Nitrophenol	X						X	
88-85-7	Dinoseb	X					X	X	
90-04-0	o-Anisidine						X		Chemical not on EPA Region 5 Skinner List

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Primary Treatment Solids
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91-20-3	Naphthalene	X	X		X		X	X	
91-22-5	Quinoline		X						Not sampled due to knowledge of the refinery processes and wastes
91-57-6	2-Methylnaphthalene	X						X	
91-58-7	2-Chloronaphthalene	X					X	X	
91-59-8	2-Naphthalenamine	X					X	X	
91-80-5	Methapyrilene	X					X	X	
91-94-1	3,3'-Dichlorobenzidine	X					X	X	
924-16-3	N-Nitrosodi-n-butylamine	X					X	X	
92-67-1	4-Aminobiphenyl	X					X	X	
92-87-5	Benzidine						X		Chemical not on EPA Region 5 Skinner List
930-55-2	N-Nitrosopyrrolidine	X					X	X	
93-72-1	Silvex	X		X			X	X	
93-76-5	(2,4,5-Trichlorophenoxy)acetic acid	X					X	X	
94-58-6	Dihydrosafrole						X		Chemical not on EPA Region 5 Skinner List
94-59-7	Safrole	X					X	X	
94-75-7	(2,4-Dichlorophenoxy)acetic acid	X		X			X	X	
95-06-7	Sulfallate						X		Chemical not on EPA Region 5 Skinner List
95-48-7	o-Cresol	X	X	X				X	
95-50-1	o-Dichlorobenzene	X	X				X	X	
95-53-4	o-Toluidine	X					X	X	
95-54-5	1,2-Phenylenediamine						X		Chemical not on EPA Region 5 Skinner List
95-57-8	o-Chlorophenol	X					X	X	
95-68-1	2,4-Dimethylaniline						X		Chemical not on EPA Region 5 Skinner List
95-80-7	2,4-Toluenediamine						X		Chemical not on EPA Region 5 Skinner List
95-94-3	1,2,4,5-Tetrachlorobenzene	X					X	X	
95-95-4	2,4,5-Trichlorophenol	X		X			X	X	
959-98-8	Alpha Endosulfan	X						X	
96-12-8	1,2-Dibromo-3-chloropropane						X	X	Chemical not on EPA Region 5 Skinner List
96-18-4	1,2,3-Trichloropropane						X	X	Chemical not on EPA Region 5 Skinner List
96-45-7	Ethylene thiourea						X		Chemical not on EPA Region 5 Skinner List
97-63-2	Ethyl methacrylate	X					X	X	
97-74-5	Bis(dimethylthiocarbamoyl) sulfide						X		Chemical not on EPA Region 5 Skinner List
97-77-8	Disulfiram						X		Chemical not on EPA Region 5 Skinner List
98-05-5	Benzenearsonic acid						X		Chemical not on EPA Region 5 Skinner List
98-07-7	Benzotrichloride						X		Chemical not on EPA Region 5 Skinner List
98-86-2	Acetophenone	X					X	X	
98-87-3	Benzal chloride						X		Chemical not on EPA Region 5 Skinner List
98-95-3	Nitrobenzene	X		X			X	X	
99-09-2	m-Nitroaniline	X						X	
99-35-4	1,3,5-Trinitrobenzene						X	X	Chemical not on EPA Region 5 Skinner List
99-55-8	2-Methyl-5-nitroaniline	X					X	X	
99-65-0	m-Dinitrobenzene	X						X	
NA	ı-Dichlorophenoxy)acetic acid, salts and es	X					X		
NA	4,6-Dinitro-o-cresol and salts	X					X		
NA	Chlorinated naphthalene	X					X		
NA	Chlorinated phenol	X					X		
NA	Chloroalkyl ethers						X		Chemical not on EPA Region 5 Skinner List
NA	Corrosivity per 40CFR 261.22	X		X					
NA	Endrin and metabolites	X					X		Chemical not on EPA Region 5 Skinner List
NA	ıylenebisdithiocarbamic acid, salts and esters						X		Chemical not on EPA Region 5 Skinner List
NA	Ignitability per 40 CFR 261.21	X		X					
NA	Nicotine and salts						X		Chemical not on EPA Region 5 Skinner List
NA	Phthalic acid esters	X					X		
NA	Polychlorinated dibenzofurans	X					X	X	
NA	Polychlorinated dibenzo-p-dioxins	X					X	X	

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CAS	Chemical Name	Chemicals Analyzed	EPA Region 5 Skinner List	261.21-24 Characteristics of Hazardous Waste	268.40 Treatment Standards for Waste Codes F037, F038, K048, K051	Appendix VII for Waste Codes F037, F038, K048, K051	Appendix VIII EPA RCRA Delisting Program Guidance for the Petitioner March 2000	Appendix IX EPA Region 6 RCRA Hazardous Waste Delisting Program Useful Information for the Petitioner Aug 2009	Comments
NA	Reactivity per 40CFR 261.23	X		X					
NA	Saccharin and salts						X		Chemical not on EPA Region 5 Skinner List
NA	Strychnine and salts						X		Chemical not on EPA Region 5 Skinner List
NA	Total Cyanides	X					X		
NA	Total Halomethanes						X		Chemical not on EPA Region 5 Skinner List
NA	Total Nitrosamines						X		Chemical not on EPA Region 5 Skinner List
NA	Warfarin and salts						X		Chemical not on EPA Region 5 Skinner List

NOTES:
X - Denotes chemical was analyzed or included on the referenced list.

Table 3a
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- Totals
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	Unit						
SW6020A							
Antimony	mg/kg dw	2.84	2.81	10.3	6.24	7.67	7.51
Arsenic	mg/kg dw	8.84	8.54	6.60	8.06	6.14	6.15
Barium	mg/kg dw	198	194	141	177	187	198
Beryllium	mg/kg dw	0.312 J	0.273 J	0.143 J	0.183J	0.122 J	0.120 J
Cadmium	mg/kg dw	1.08	1.11	0.406 J	0.604J	0.526 J	0.483 J
Chromium	mg/kg dw	59.6	59.1	44.0	44.7	29.6	29.3
Cobalt	mg/kg dw	9.20	9.32	5.89	6.04	3.60	3.54
Copper	mg/kg dw	52.9	51.3	38.5	40.9	23.6	23.5
Lead	mg/kg dw	32.1	31.0	15.2	14.9	12.3	12.1
Nickel	mg/kg dw	67.4	63.8	72.4	70.1	43.1	42.2
Selenium	mg/kg dw	53.4	51.4	67.1	54.2	42.0	43.5
Silver	mg/kg dw	0.546 J	0.560 J	0.174 J	0.341J	0.152 J	0.150 J
Thallium	mg/kg dw	<0.970	<0.966	--	< 0.868	< 0.869	< 0.862
Tin	mg/kg dw	8.60	8.58	6.93	8.73	6.33	6.30
Vanadium	mg/kg dw	114	107	155	139	86.3	84.8
Zinc	mg/kg dw	2320	2230	2110	4790	1700	1660
SW7471B							
Mercury	mg/kg dw	1.24	1.28	3.16	1.74	1.12	0.944
SW8081							
4,4'-DDD	mg/kg dw	<0.065	<0.065	< 0.30	< 0.030	0.022 J	< 0.12
4,4'-DDE	mg/kg dw	0.045 J	0.074	--	0.080P	--	--
4,4'-DDT	mg/kg dw	<0.065	0.010 J	--	0.0050J	--	--
Aldrin	mg/kg dw	<0.033	<0.033	--	< 0.015	--	--
alpha-BHC/HCH	mg/kg dw	0.0083 J	0.011 J	< 0.15	< 0.015	< 0.060	< 0.059
beta-BHC/HCH	mg/kg dw	<0.033	<0.033	--	0.0078J	--	--
Chlordane, Total	mg/kg dw	<0.33	<0.33	< 1.5	< 0.15	< 0.60	< 0.59
Chlorinated camphene/ Toxaphene	mg/kg dw	<0.33	<0.33	< 1.5	< 0.15	< 0.60	< 0.59
cis-Heptachlor epoxide	mg/kg dw	<0.033	<0.033	< 0.15	< 0.015	< 0.060	< 0.059
delta-BHC/HCH	mg/kg dw	<0.033	<0.033	--	0.0065J	--	--
Dieldrin	mg/kg dw	<0.065	<0.065	--	< 0.030	--	--
Endosulfan I (Alpha)	mg/kg dw	<0.033	<0.033	--	< 0.015	--	--
Endosulfan II (Beta)	mg/kg dw	<0.065	<0.065	--	< 0.030	--	--
Endosulfan sulfate	mg/kg dw	<0.065	<0.065	--	< 0.030	--	--
Endrin	mg/kg dw	0.015 J	0.023 J	< 0.30	0.011J	< 0.12	< 0.12
Endrin aldehyde	mg/kg dw	<0.065	<0.065	--	0.013J	--	--
gamma-BHC/HCH (Lindane)	mg/kg dw	<0.033	<0.033	< 0.15	0.0036J	< 0.060	< 0.059
Heptachlor	mg/kg dw	<0.033	<0.033	< 0.15	< 0.015	< 0.060	< 0.059
Methoxychlor	mg/kg dw	<0.33	<0.33	< 1.5	< 0.15	< 0.60	< 0.59
SW8151A							
2,4,5-TP (Silvex)	mg/kg dw	<9.6	<10	< 0.91	<0.0071	<0.0037	<0.015
2,4-Dichlorophenoxyacetic acid	mg/kg dw	--	--	< 0.91	<0.11	<0.060	<0.24
2,4-DB (1C)	mg/kg dw	--	--	--	<0.11	<0.060	<0.24
Dichlorprop (1C)	mg/kg dw	--	--	--	<0.85	<0.045	<0.18
Dalapon (2C)	mg/kg dw	--	--	--	<0.47	<0.24	<0.98
Dicamba (1C)	mg/kg dw	--	--	--	<0.13	<0.070	<0.28
Dinoseb (1C)	mg/kg dw	--	--	--	<0.085	<0.045	<0.18
MCPP (1C)	mg/kg dw	--	--	--	<36	<19	<76
MCPA (1C)	mg/kg dw	--	--	--	<7.2	<3.8	<15
Pentachlorophenol (1C)	mg/kg dw	--	--	--	<0.0031	<0.0016	<0.0066
8290A							
2,3,7,8-Tetrachlorodibenzodioxin	mg/kg-dw	<0.00000494	<0.00000485	<0.00000458	<0.00000168	<0.00000439	<0.00000444
1,2,3,7,8-Pentachlorodibenzo-P-dioxin	mg/kg-dw	0.00000250JK	<0.0000242	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,6,7,8-Hexachlorodibenzo-P-dioxin	mg/kg-dw	0.00000566JK	0.00000613J	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,4,7,8-Hexachlorodibenzo-P-dioxin	mg/kg-dw	0.00000274JK	<0.0000242	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,7,8,9-Hexachlorodibenzo-P-dioxin	mg/kg-dw	0.00000686J	0.00000414JK	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,4,6,7,8-Heptachlorodibenzo-P-dioxin	mg/kg-dw	0.000145	0.000176	0.0000337	0.0000249	0.0000396	0.000370 K
Octachlorodibenzodioxin	mg/kg-dw	0.00165	0.00198	0.000285	0.000223	0.000364	0.000429 K
2,3,7,8-tetrachlorodibenzofuran	mg/kg-dw	<0.00000494	<0.00000485	<0.00000458	<0.00000168	<0.00000439	<0.00000444
1,2,3,7,8-Pentachlorodibenzofuran	mg/kg-dw	<0.0000247	<0.0000242	<0.0000229	<0.00000840	<0.0000219	<0.0000222
2,3,4,7,8-Pentachlorodibenzofuran	mg/kg-dw	<0.0000247	<0.0000242	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,6,7,8-Hexachlorodibenzofuran	mg/kg-dw	0.00000763J	0.00000573JK	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,7,8,9-Hexachlorodibenzofuran	mg/kg-dw	0.00000649J	0.00000254JK	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,4,7,8-Hexachlorodibenzofuran	mg/kg-dw	0.00000430JK	0.00000498JK	<0.0000229	<0.00000840	<0.0000219	<0.0000222
2,3,4,6,7,8-Hexachlorodibenzofuran	mg/kg-dw	0.00000434J	0.00000270JK	<0.0000229	<0.00000840	<0.0000219	<0.0000222
1,2,3,4,6,7,8-Heptachlorodibenzo-para-dioxin	mg/kg-dw	0.0000880	0.0000781	<0.0000229	0.0000108	<0.0000219	<0.0000222
1,2,3,4,7,8,9-Heptachlorodibenzo-para-dioxin	mg/kg-dw	0.00000687J	0.00000479JK	<0.0000229	<0.00000840	<0.0000219	<0.0000222
Octachlorodibenzo-p-Dioxin	mg/kg-dw	0.000160	0.000212	<0.00000458	0.0000327	0.0000506	0.0000524
Trichlorophenoxyacetic Acid, 2,4,5-	mg/kg-dw	<9.6	<10	--	--	--	--

Table 3a
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- Totals
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	Unit						
Total Tetra-Dioxins	mg/kg-dw	<0.00000494	<0.00000485	<0.00000458	<0.00000168	<0.00000439	<0.00000444
Total Penta-Dioxins	mg/kg-dw	<0.0000247	<0.0000242	<0.0000229	<0.00000840	<0.0000219	<0.0000222
Total Hexa-Dioxins	mg/kg-dw	0.0000322	0.00001291	<0.0000229	<0.00000840	<0.0000219	<0.0000222
Total Hepta-Dioxins	mg/kg-dw	0.000321	0.000385	0.0000690	0.000061	0.0000512	<0.0000222
Total Tetra-Furans	mg/kg-dw	<0.00000494	<0.00000485	<0.0000229	<0.00000168	<0.00000439	<0.00000444
Total Penta-Furans	mg/kg-dw	<0.0000247	<0.0000242	<0.0000229	<0.00000840	<0.0000219	<0.0000222
Total Hexa-Furans	mg/kg-dw	0.0000372	0.00001871	<0.0000229	<0.00000840	<0.0000219	<0.0000222
Total Hepta-Furans	mg/kg-dw	0.000205	0.0000796	<0.0000229	0.0000258	0.0000628	<0.0000222
PCBs							
Aroclor 1016	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1221	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1232	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1242	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1248	mg/kg dw	<0.16	<0.16	--	<1.8	15	5.9
Aroclor 1254	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1260	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1262	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
Aroclor 1268	mg/kg dw	<0.16	<0.16	--	<1.8	<0.45	<0.54
PCBs, Total	mg/kg dw	<0.16	<0.16	--	<1.8	15	5.9
SW8260							
1,1,1,2-Tetrachloroethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,1,1-Trichloroethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,1,2,2-Tetrachloroethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,1,2-Trichloroethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,1-Dichloroethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,1-Dichloroethene	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
1,2-Dichlorobenzene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,2-Dichloroethane	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
1,2-Dichloropropane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,3-Dichlorobenzene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
1,4-Dichlorobenzene	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
1,4-Dioxane	mg/kg dw	<0.26	<0.25	--	< 0.24	--	--
2-Butanone (Methyl ethyl ketone)	mg/kg dw	<0.026	<0.025	< 2.4	< 0.024	< 0.023	< 0.024
2-Hexanone	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
4-Methyl-2-pentanone	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Acetone	mg/kg dw	0.93	0.97	< 4.9	< 0.048	< 0.046	< 0.048
Acetonitrile	mg/kg dw	<0.13	<0.13	--	< 0.12	--	--
Acrolein	mg/kg dw	<0.051	<0.050	--	< 0.048	--	--
Acrylonitrile	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Allyl chloride	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Benzene	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
beta-Chloroprene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Bromodichloromethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Bromoform	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Bromomethane	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Carbon disulfide	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Carbon tetrachloride	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
Chlorobenzene	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
Chloroethane	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Chloroform	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
Chloromethane	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
cis-1,3-Dichloropropene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Dibromochloromethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Dibromomethane	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Dichlorodifluoromethane (Freon 12)	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Ethyl methacrylate	mg/kg dw	0.42	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
Ethylbenzene	mg/kg dw	1.2	0.50	0.17 J	< 0.012	< 0.012	0.026
Ethylene dibromide	mg/kg dw	<0.026	< 0.0063	--	< 0.012	--	--
Isobutyl alcohol	mg/kg dw	<0.26	<0.25	--	< 0.24	--	--
Methacrylonitrile	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Methyl iodide	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Methyl methacrylate	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Methylene chloride	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Propionitrile	mg/kg dw	<0.13	<0.13	--	< 0.12	--	--
Styrene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Tetrachloroethene	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
Toluene	mg/kg dw	0.46	0.21	0.20 J	< 0.012	< 0.012	< 0.012
trans-1,2-Dichloroethene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
trans-1,3-Dichloropropene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--

Table 3a
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- Totals
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	Unit						
trans-1,4-Dichlorobutene	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Trichloroethene	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.012
Trichlorofluoromethane (Freon 11)	mg/kg dw	<0.013	<0.013	--	< 0.012	--	--
Vinyl acetate	mg/kg dw	<0.026	<0.025	--	< 0.024	--	--
Vinyl chloride	mg/kg dw	<0.013	<0.013	< 1.2	< 0.012	< 0.012	< 0.0024
Xylene, Total	mg/kg dw	6.7	6.9	1.0 J	0.083	0.40	0.37
SW8270							
1,2,4,5-Tetrachlorobenzene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
1,2,4-Trichlorobenzene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
1,3-Dinitrobenzene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
1,4-Dioxane	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
1,4-Naphthoquinone	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,2'-Oxybis(1-chloropropane)	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,3,4,6-Tetrachlorophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,4,5-Trichlorophenol	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
2,4,6-Trichlorophenol	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
2,4-Dichlorophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,4-Dimethylphenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,4-Dinitrophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,4-Dinitrotoluene	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
2,6-Dichlorophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2,6-Dinitrotoluene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2-Acetylaminofluorene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2-Chloronaphthalene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2-Chlorophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2-Methylnaphthalene	mg/kg dw	4.9	5.6	4.8	7.6	7.2	4.3
2-Nitroaniline	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2-Nitrophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
2-Picoline	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
3,3'-Dichlorobenzidine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
3-Methylcholanthrene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
3-Nitroaniline	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
4-Aminobiphenyl	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
4-Chlorophenyl phenyl ether	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
4-Dimethylaminoazobenzene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
4-Nitrophenol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
4-Nitroquinoline-1-oxide	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
5-Nitro-o-toluidine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
7,12-Dimethylbenz(a)anthracene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
A,A-Dimethylphenethylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Acenaphthene	mg/kg dw	4.7	5.6	< 3.0	< 6.0	< 3.0	6.5
Acenaphthylene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Acetophenone	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
alpha-Naphthylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Aniline	mg/kg dw	<3.3	<3.3	--	1.0 J	--	--
Anthracene	mg/kg dw	3.4	5.0	1.5 J	7.2	< 3.0	7.7
Aramite	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Benzo(a)anthracene	mg/kg dw	3.2 J	4.5	2.8 J	8.5	< 3.0	7.3
Benzo(a)pyrene	mg/kg dw	1.7 J	2.0 J	1.4 J	3.9 J	< 3.0	3.2
Benzo(b)fluoranthene	mg/kg dw	0.71 J	0.92 J	< 3.0	1.1 J	< 3.0	0.70 J
Benzo(g,h,i)perylene	mg/kg dw	0.76 J	0.93 J	< 3.0	2.0 J	< 3.0	1.6 J
Benzo(k)fluoranthene	mg/kg dw	0.59 J	0.67 J	< 3.0	1.8 J	< 3.0	1.3 J
Benzyl alcohol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Benzyl butyl phthalate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
beta-Naphthylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Bis(2-chloroethoxy)methane	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Bis(2-ethylhexyl)phthalate	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Chlorobenzilate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Chrysene	mg/kg dw	4.5	5.9	4.7	12	< 3.0	9.5
Cresol	mg/kg dw	--	--	1.1 J	--	1.3 J	1.6 J
Diallate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dibenzo(a,h)anthracene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dibenzofuran	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dibutyl phthalate	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Dichloroethyl ether	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Diethyl phthalate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dimethoate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dimethyl phthalate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dinitro-o-cresol	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--

Table 3a
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- Totals
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		**PTS-01-SL-20230727**	**DUP-01-SL-20230727**	**PTS-02-SL-20230830**	**PTS-03-SL-20230926**	**PTS-04-SL-20231026**	**DUP-04-SL-20231026**
Sample Date		**27 Jul 2023**	**27 Jul 2023**	**30 Aug 2023**	**26 Sep 2023**	**26 Oct 2023**	**26 Oct 2023**
Analyte	Unit						
Di-n-octyl phthalate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Dinoseb	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Diphenylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Disulfoton	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Ethyl methanesulfonate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Famphur	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Fluoranthene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Fluorene	mg/kg dw	6.6	8.0	< 3.0	8.8	< 3.0	8.0
Hexachlorobenzene	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Hexachlorobutadiene	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Hexachlorocyclopentadiene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Hexachloroethane	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Hexachlorophene	mg/kg dw	<33	<3.3	--	< 60	--	--
Hexachloropropene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Indeno(1,2,3-cd)pyrene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Isodrin	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Isophorone	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Isosafrole	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Kepone	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
m,p-cresol	mg/kg dw	2.9 J	4.0	1.1	4.2 J	1.3 J	1.6 J
Methapyrilene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Methyl methanesulfonate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Methyl parathion	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Naphthalene	mg/kg dw	<3.3	<3.3	< 3.0	1.3 J	0.85 J	< 3.0
Nitrobenzene	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
n-Nitrosodiethylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosodimethylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosodi-n-butylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosodiphenylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosomethylethylamine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosomorpholine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosopiperidine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
n-Nitrosopyrrolidine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
o-Cresol	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
o-Tolidine	mg/kg dw	<3.3	< 1.7	--	< 6.0	--	--
o-Toluidine	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Parathion	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
p-Chloroaniline	mg/kg dw	< 1.7	< 1.7	--	< 6.0	--	--
Pentachlorobenzene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Pentachloroethane	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Pentachloronitrobenzene	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Pentachlorophenol	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Phenacetin	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Phenanthrene	mg/kg dw	16	22	4.8	33	< 3.0	28
Phenol	mg/kg dw	1.5 J	1.9 J	< 3.0	2.3 J	0.88 J	1.5 J
Phorate	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
p-Nitroaniline	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
p-Phenylene diamine	mg/kg dw	< 1.7	< 1.7	--	< 6.0	--	--
Propyzamide	mg/kg dw	< 1.7	< 1.7	--	< 6.0	--	--
Pyrene	mg/kg dw	7.3	9.1	8.3	20	< 3.0	14
Pyridine	mg/kg dw	<3.3	<3.3	< 3.0	< 6.0	< 3.0	< 3.0
Safrole	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Tetraethyl Dithiopyrophosphate (TEDP)	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Thionazin	mg/kg dw	<3.3	<3.3	--	< 6.0	--	--
Leached Sulfide							
Sulfide	mg/kg dw	<9.92	<9.97		<8.97	<8.99	<8.93
Reactive Cyanide							
Reactive Cyanide	mg/kg	<100	<100	<100	<100	<100	<100
Reactive Sulfide							
Reactive Sulfide	mg/kg	<100	<100	<100	<100	<100	<100
CYANIDE BY SW-846 9014							
Cyanide	mg/kg dw	<3.93	<3.91	<3.47	<3.52	<3.53	<3.41
Flashpoint							
Flashpoint	°F	>212	>212	>212	>212	>212	>212
PH Soil by SW9045D							
pH	pH Units	7.94	7.88	7.44	7.08	7.40	7.39
Temp Deg C @pH	°C	24.2	24.2	21.8	19.9	22.8	23.0

Table 3a
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- Totals
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		**PTS-01-SL-20230727**	**DUP-01-SL-20230727**	**PTS-02-SL-20230830**	**PTS-03-SL-20230926**	**PTS-04-SL-20231026**	**DUP-04-SL-20231026**
Sample Date		**27 Jul 2023**	**27 Jul 2023**	**30 Aug 2023**	**26 Sep 2023**	**26 Oct 2023**	**26 Oct 2023**
Analyte	Unit						
Anions by SW9045D							
Fluoride	mg/kg dw	3.57	<1.90	--	3.78	4.74	4.56
Moisture - ASTM D2216							
Percent Moisture	%	49.6	49.9	45.6	44.3	44.4	44.1

NOTES:
J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
mg/kg dw- milligrams per killograms - Dry weight corrected
-- indicates sample was not analyzed for the constituent
< indicates not detected at the laboratory's sample Reporting Limit

Table 3b
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- TCLP
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	Unit						
SW6020-TCLP							
Antimony	mg/L	0.0101 J	0.0103 J	0.0367 J	0.0353 J	0.0416 J	0.0349 J
Arsenic	mg/L	0.0380 J	0.0243 J	0.0138 J	0.00684 J	0.00791 J	0.00757 J
Barium	mg/L	2.40	1.21	0.515	0.213	0.463	0.413
Beryllium	mg/L	< 0.0200	< 0.0200	< 0.0200	< 0.0200	< 0.0200	< 0.0200
Cadmium	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Chromium	mg/L	0.0312 J	0.0156 J	0.00480 J	< 0.0500	< 0.0500	< 0.0500
Cobalt	mg/L	0.0477 J	0.0322 J	0.0298 J	0.00716 J	0.00791 J	0.00695 J
Copper	mg/L	< 0.0200	0.0146 J	< 0.0200	< 0.0200	< 0.0200	< 0.0200
Lead	mg/L	0.0170 J	0.0137 J	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Nickel	mg/L	0.189	0.138	0.152	0.0717	0.0811	0.0741
Selenium	mg/L	0.0491J	0.0643	0.0346 J	0.0327 J	0.0890	0.0826
Silver	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Thallium	mg/L	< 0.0200	< 0.0200	--	0.00677 J	--	--
Tin	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Vanadium	mg/L	0.00621 J	0.0128 J	< 0.0500	0.0102 J	0.0196 J	0.0160 J
Zinc	mg/L	6.26	2.91	1.76	0.451	0.757	0.527
SW7470A-TCLP							
Mercury	mg/L	0.0000630	0.0000570	< 0.000200	< 0.000200	< 0.000200	< 0.000200
SW6020-TCLP pH 7							
Antimony	mg/L	0.0167 J	0.0435 J	0.0397 J	0.0348 J	0.00207 J	0.00172 J
Arsenic	mg/L	0.00528 J	< 0.0500	< 0.0500	0.00676 J	0.000872 J	0.000927 J
Barium	mg/L	0.0645 J	0.0682 J	0.0888 J	0.0861 J	0.0212	0.0226
Beryllium	mg/L	< 0.0200	< 0.0200	< 0.0200	< 0.0200	< 0.00200	< 0.00200
Cadmium	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.00500	< 0.00500
Chromium	mg/L	0.0150 J	0.0357 J	0.00863 J	0.00430 J	0.000517 J	0.000610 J
Cobalt	mg/L	0.00356 J	0.00375 J	0.00453 J	0.00359 J	0.000222 J	< 0.00500
Copper	mg/L	< 0.0200	< 0.0200	< 0.0200	< 0.0200	< 0.00200	< 0.00200
Lead	mg/L	0.00653 J	0.0104 J	< 0.0500	< 0.0500	< 0.00500	< 0.00500
Nickel	mg/L	0.0173 J	0.0171 J	0.0220 J	0.0196 J	0.00167 J	0.00145 J
Selenium	mg/L	0.0523 J	0.0516	0.0162 J	0.0310 J	0.00574 J	0.00647
Silver	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.00500	< 0.00500
Thallium	mg/L	0.00804 J	0.00259 J	--	0.00960 J	--	--
Tin	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.00500	< 0.00500
Vanadium	mg/L	0.0188 J	0.0156 J	0.0143 J	0.00809 J	< 0.00500	0.000734 J
Zinc	mg/L	0.0293 J	0.0259 J	< 0.0500	< 0.0500	0.00267 J	< 0.00500
SW7470A-TCLP pH 7							
Mercury	mg/L	< 0.000200	< 0.000200	< 0.000200	< 0.000200	< 0.000200	< 0.000200
SW6020-TCLP pH 10							
Antimony	mg/L	0.0327 J	0.0276 J	0.0829	0.0599	0.0375 J	0.0405 J
Arsenic	mg/L	0.0235 J	0.0178 J	0.0107 J	0.0112 J	0.0115 J	0.0158 J
Barium	mg/L	0.0292 J	0.0288 J	< 0.200	0.0248 J	0.163 J	0.168 J
Beryllium	mg/L	< 0.0200	< 0.0200	< 0.0200	< 0.0200	< 0.0200	< 0.0200
Cadmium	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Chromium	mg/L	0.0302 J	0.0180 J	0.00908 J	0.00950 J	0.0172 J	0.00945 J
Cobalt	mg/L	0.00943 J	0.00827 J	0.00488 J	0.00584 J	0.00408 J	0.00448 J
Copper	mg/L	0.0187 J	0.0177 J	< 0.0200	< 0.0200	< 0.0200	< 0.0200
Lead	mg/L	0.00909 J	0.00692 J	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Nickel	mg/L	0.0348 J	0.0284 J	0.0194 J	0.0219 J	0.0324 J	0.0356 J
Selenium	mg/L	0.134	0.0960	0.142	0.189	0.169	0.207
Silver	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Thallium	mg/L	0.00959 J	< 0.0500	--	0.00959 J	--	--
Tin	mg/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Vanadium	mg/L	0.155	0.126	0.122	0.0961	0.119	0.177
Zinc	mg/L	0.179	0.158	0.0604	< 0.0500	0.0294 J	0.0270 J
SW7470A-TCLP pH 10							

Table 3b
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- TCLP
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	**Unit**						
Mercury	mg/L	0.0000550	0.0000570	0.000124 J	< 0.000200	< 0.000200	< 0.000200
SW8081-TCLP							
4,4'-DDD	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
4,4'-DDE	mg/L	< 0.00010	< 0.00010	--	< 0.00010	--	--
4,4'-DDT	mg/L	< 0.00010	< 0.00010	--	< 0.00010	--	--
Aldrin	mg/L	< 0.000050	< 0.000050	--	< 0.000050	--	--
alpha-BHC/HCH	mg/L	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050
beta-BHC/HCH	mg/L	< 0.000050	< 0.000050	--	< 0.000050	--	--
Chlordane, Total	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Chlorinated camphene/ Toxaphene	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
cis-Heptachlor epoxide	mg/L	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050
delta-BHC/HCH	mg/L	< 0.000050	< 0.000050	--	< 0.000050	--	--
Dieldrin	mg/L	< 0.00010	< 0.00010	--	< 0.00010	--	--
Endosulfan I (Alpha)	mg/L	< 0.000050	< 0.000050	--	< 0.000050	--	--
Endosulfan II (Beta)	mg/L	< 0.00010	< 0.00010	--	< 0.00010	--	--
Endosulfan sulfate	mg/L	< 0.00010	< 0.00010	--	< 0.00010	--	--
Endrin	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Endrin aldehyde	mg/L	< 0.00010	< 0.00010	--	< 0.00010	--	--
gamma-BHC/HCH (Lindane)	mg/L	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050
Heptachlor	mg/L	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050
Methoxychlor	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
SW8151-TCLP							
2,4,5-TP (Silvex)	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
2,4-Dichlorophenoxyacetic acid	mg/L	0.00024	0.00013 J	< 0.00020	< 0.00020	< 0.00020	< 0.00020
SW8260-TCLP							
1,1,1,2-Tetrachloroethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,1,1-Trichloroethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,1,2,2-Tetrachloroethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,1,2-Trichloroethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,1-Dichloroethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,1-Dichloroethene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,2-Dichlorobenzene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,2-Dichloroethane	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,2-Dichloropropane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,3-Dichlorobenzene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
1,4-Dichlorobenzene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,4-Dioxane	mg/L	< 2.0	< 2.0	--	< 2.0	--	--
2-Butanone (Methyl ethyl ketone)	mg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
2-Hexanone	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
4-Methyl-2-pentanone	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Acetone	mg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Acetonitrile	mg/L	< 1.0	< 1.0	--	< 1.0	--	--
Acrolein	mg/L	< 0.40	< 0.40	--	< 0.40	--	--
Acrylonitrile	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Allyl chloride	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Benzene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
beta-Chloroprene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Bromodichloromethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Bromoform	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Bromomethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Carbon disulfide	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Carbon tetrachloride	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chlorobenzene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chloroethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Chloroform	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chloromethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--

Table 3b
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- TCLP
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	**Unit**						
cis-1,3-Dichloropropene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Dibromochloromethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Dibromomethane	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Dichlorodifluoromethane (Freon 12)	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Ethyl methacrylate	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ethylbenzene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ethylene dibromide	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Isobutyl alcohol	mg/L	< 2.0	< 2.0	--	< 2.0	--	--
Methacrylonitrile	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Methyl iodide	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Methyl methacrylate	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Methylene chloride	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Propionitrile	mg/L	< 1.0	< 1.0	--	< 1.0	--	--
Styrene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Tetrachloroethene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Toluene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
trans-1,2-Dichloroethene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
trans-1,3-Dichloropropene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
trans-1,4-Dichlorobutene	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Trichloroethene	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Trichlorofluoromethane (Freon 11)	mg/L	< 0.10	< 0.10	--	< 0.10	--	--
Vinyl acetate	mg/L	< 0.20	< 0.20	--	< 0.20	--	--
Vinyl chloride	mg/L	< 0.040	< 0.040	< 0.040	< 0.040	< 0.040	< 0.040
Xylene, Total	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
SW8270-TCLP							
1,2,4,5-Tetrachlorobenzene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
1,2,4-Trichlorobenzene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
1,3-Dinitrobenzene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
1,4-Dioxane	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
1,4-Naphthoquinone	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,2'-Oxybis(1-chloropropane)	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,3,4,6-Tetrachlorophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,4,5-Trichlorophenol	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
2,4,6-Trichlorophenol	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
2,4-Dichlorophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,4-Dimethylphenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,4-Dinitrophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,4-Dinitrotoluene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
2,6-Dichlorophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2,6-Dinitrotoluene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2-Acetylaminofluorene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2-Chloronaphthalene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2-Chlorophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2-Methylnaphthalene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
2-Nitroaniline	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2-Nitrophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
2-Picoline	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
3,3'-Dichlorobenzidine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
3-Methylcholanthrene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
3-Nitroaniline	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
4-Aminobiphenyl	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
4-Chlorophenyl phenyl ether	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
4-Dimethylaminoazobenzene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
4-Nitrophenol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
4-Nitroquinoline-1-oxide	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
5-Nitro-o-toluidine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--

Table 3b
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- TCLP
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	Unit						
7,12-Dimethylbenz(a)anthracene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
A,A-Dimethylphenethylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Acenaphthene	mg/L	< 0.050	< 0.050	< 0.0050	0.0011 J	< 0.0050	0.0011 J
Acenaphthylene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Acetophenone	mg/L	< 0.050	< 0.050	--	0.0013 J	--	--
alpha-Naphthylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Aniline	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Anthracene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Aramite	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Benzo(a)anthracene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Benzo(a)pyrene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Benzo(b)fluoranthene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Benzo(g,h,i)perylene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Benzo(k)fluoranthene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Benzyl alcohol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Benzyl butyl phthalate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
beta-Naphthylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Bis(2-chloroethoxy)methane	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Bis(2-ethylhexyl)phthalate	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Chlorobenzilate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Chrysene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Cresol	mg/L	--	--	< 0.0050	---	< 0.0050	< 0.0050
Diallate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dibenzo(a,h)anthracene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dibenzofuran	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dibutyl phthalate	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Dichloroethyl ether	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Diethyl phthalate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dimethoate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dimethyl phthalate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dinitro-o-cresol	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Di-n-octyl phthalate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Dinoseb	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Diphenylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Disulfoton	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Ethyl methanesulfonate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Famphur	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Fluoranthene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Fluorene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	0.00067 J	0.00086 J
Hexachlorobenzene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Hexachlorobutadiene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Hexachlorocyclopentadiene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Hexachloroethane	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Hexachlorophene	mg/L	< 0.25	< 0.25	--	< 0.025	--	--
Hexachloropropene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Indeno(1,2,3-cd)pyrene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Isodrin	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Isophorone	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Isosafrole	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Kepone	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
m,p-cresol	mg/L	< 0.050	< 0.050	< 0.0050	0.0026 J	< 0.0050	< 0.0050
Methapyrilene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Methyl methanesulfonate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Methyl parathion	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Naphthalene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nitrobenzene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050

Table 3b
ExxonMobil, Joliet Refinery - PTS Delisting
Primary Treatment Solids Analytical Results- TCLP
Channahon, Illinois

Location ID		PTS-01	PTS-01	PTS-02	PTS-03	PTS-04	PTS-04
Sample ID		PTS-01-SL-20230727	DUP-01-SL-20230727	PTS-02-SL-20230830	PTS-03-SL-20230926	PTS-04-SL-20231026	DUP-04-SL-20231026
Sample Date		27 Jul 2023	27 Jul 2023	30 Aug 2023	26 Sep 2023	26 Oct 2023	26 Oct 2023
Analyte	Unit						
n-Nitrosodiethylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosodimethylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosodi-n-butylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosodiphenylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosomethylethylamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosomorpholine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosopiperidine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
n-Nitrosopyrrolidine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
o-Cresol	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
o-Tolidine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
o-Toluidine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Parathion	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
p-Chloroaniline	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Pentachlorobenzene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Pentachloroethane	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Pentachloronitrobenzene	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Pentachlorophenol	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Phenacetin	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Phenanthrene	mg/L	< 0.050	< 0.050	< 0.0050	0.0010 J	0.0010 J	0.0011 J
Phenol	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Phorate	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
p-Nitroaniline	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
p-Phenylene diamine	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Propyzamide	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Pyrene	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Pyridine	mg/L	< 0.050	< 0.050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Safrole	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Tetraethyl Dithiopyrophosphate (TEDP)	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--
Thionazin	mg/L	< 0.050	< 0.050	--	< 0.0050	--	--

NOTES:
J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
mg/L - milligrams per Liter
-- indicates sample was not analyzed for the constituent
< indicates not detected at the laboratory's sample Reporting Limit listed.

FIGURES

N

0 800 1600

SCALE FEET

LEGEND

WWTP

Figure 1
Site Location Map
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois

Environmental Resources Management
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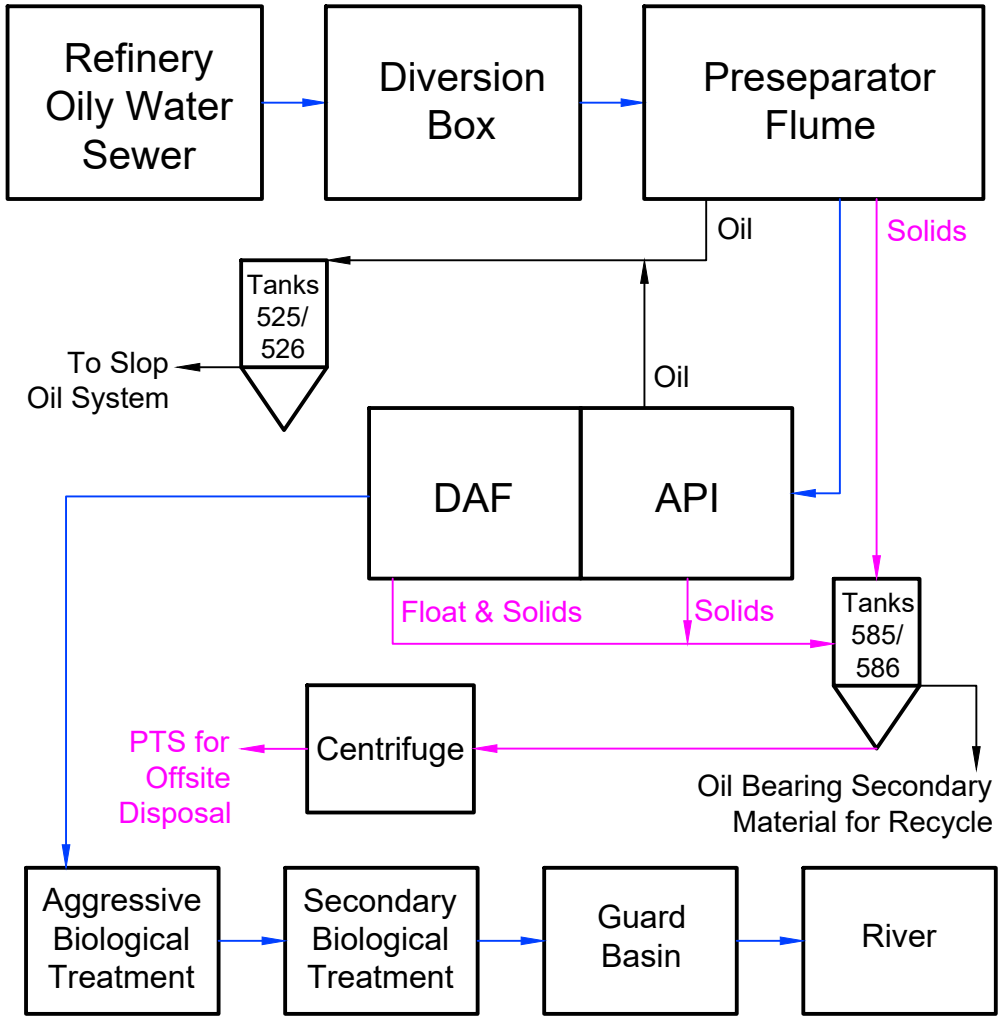


Figure 2a
Flow Chart of Wastewater Treatment Plant (WWTP)
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois

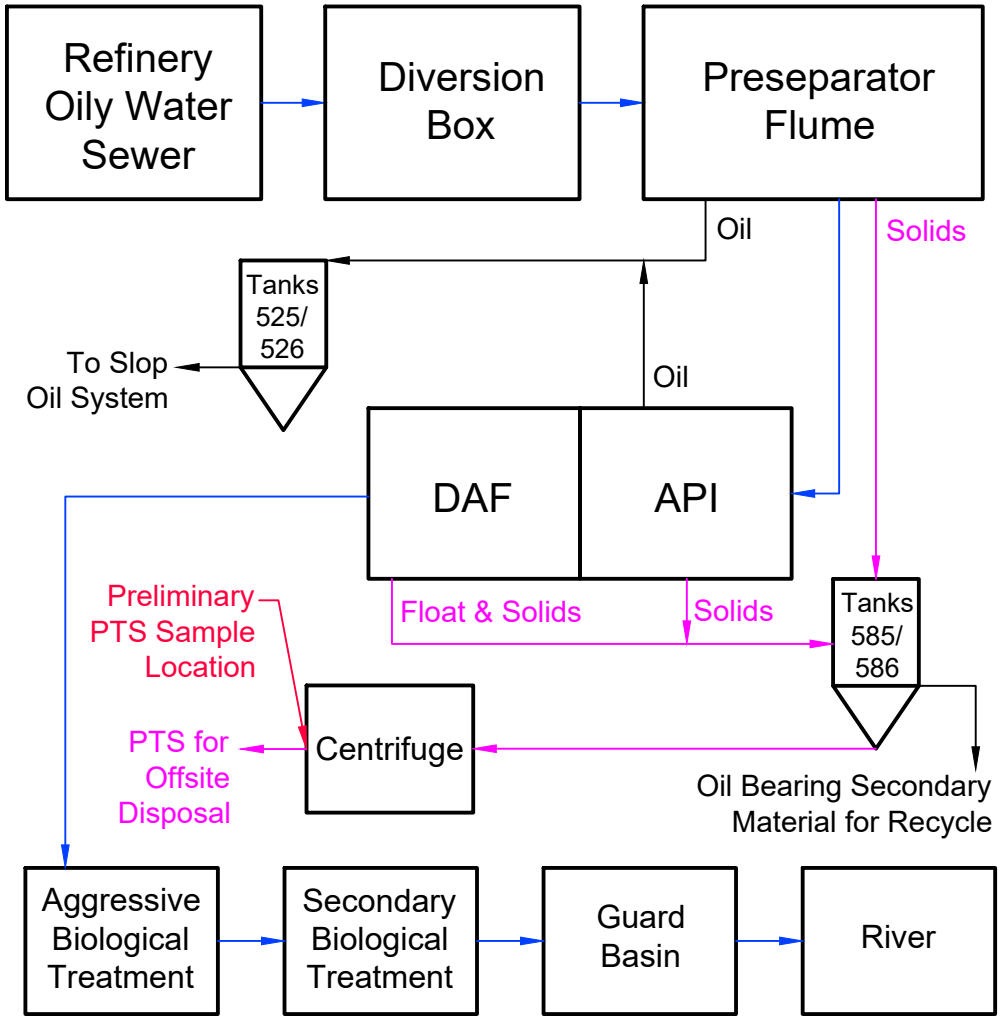


Figure 2b
Flow Chart of WWTP with Point of Generation
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois

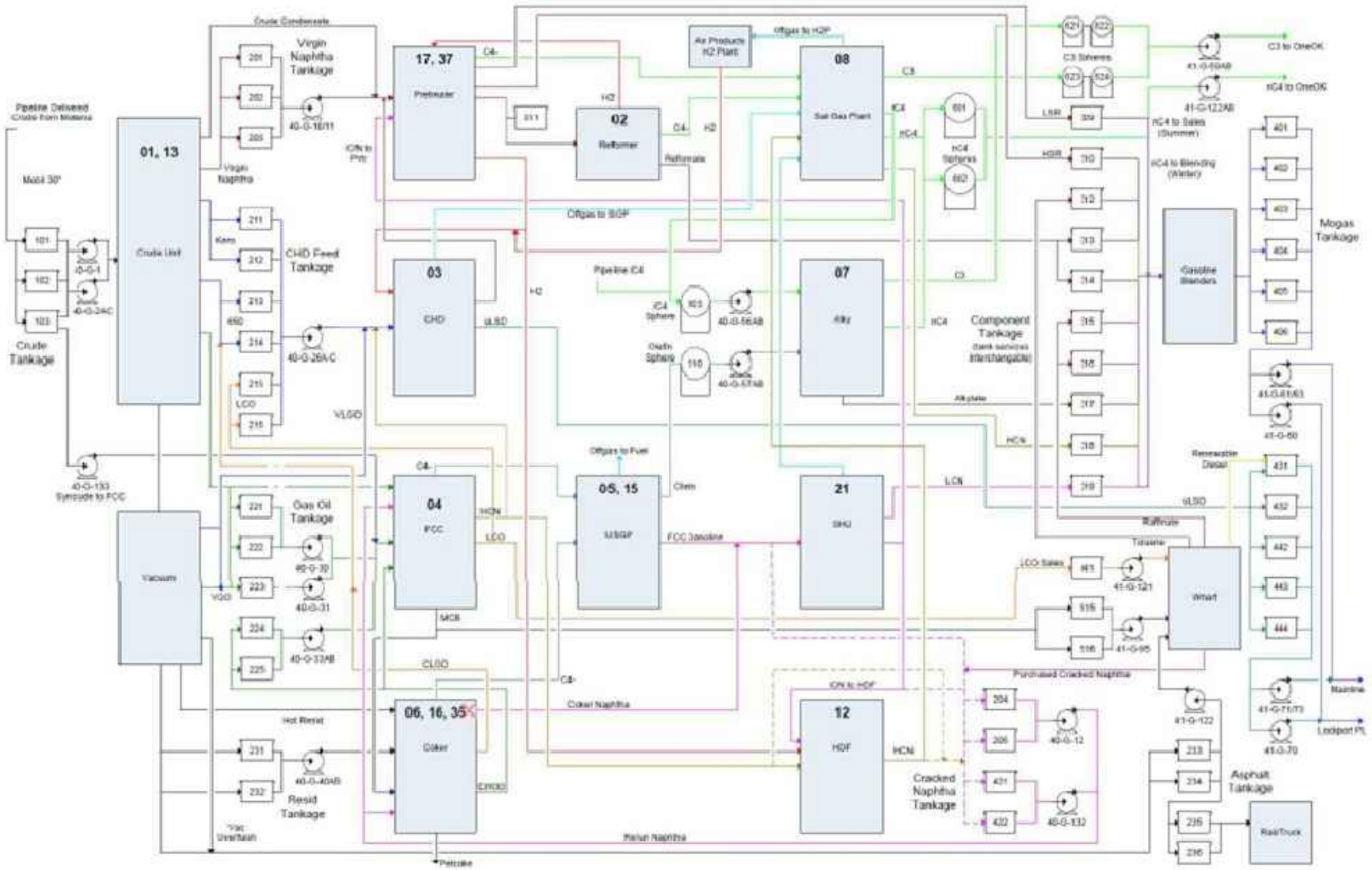


Figure 3
Overview of Joliet Refinery
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois

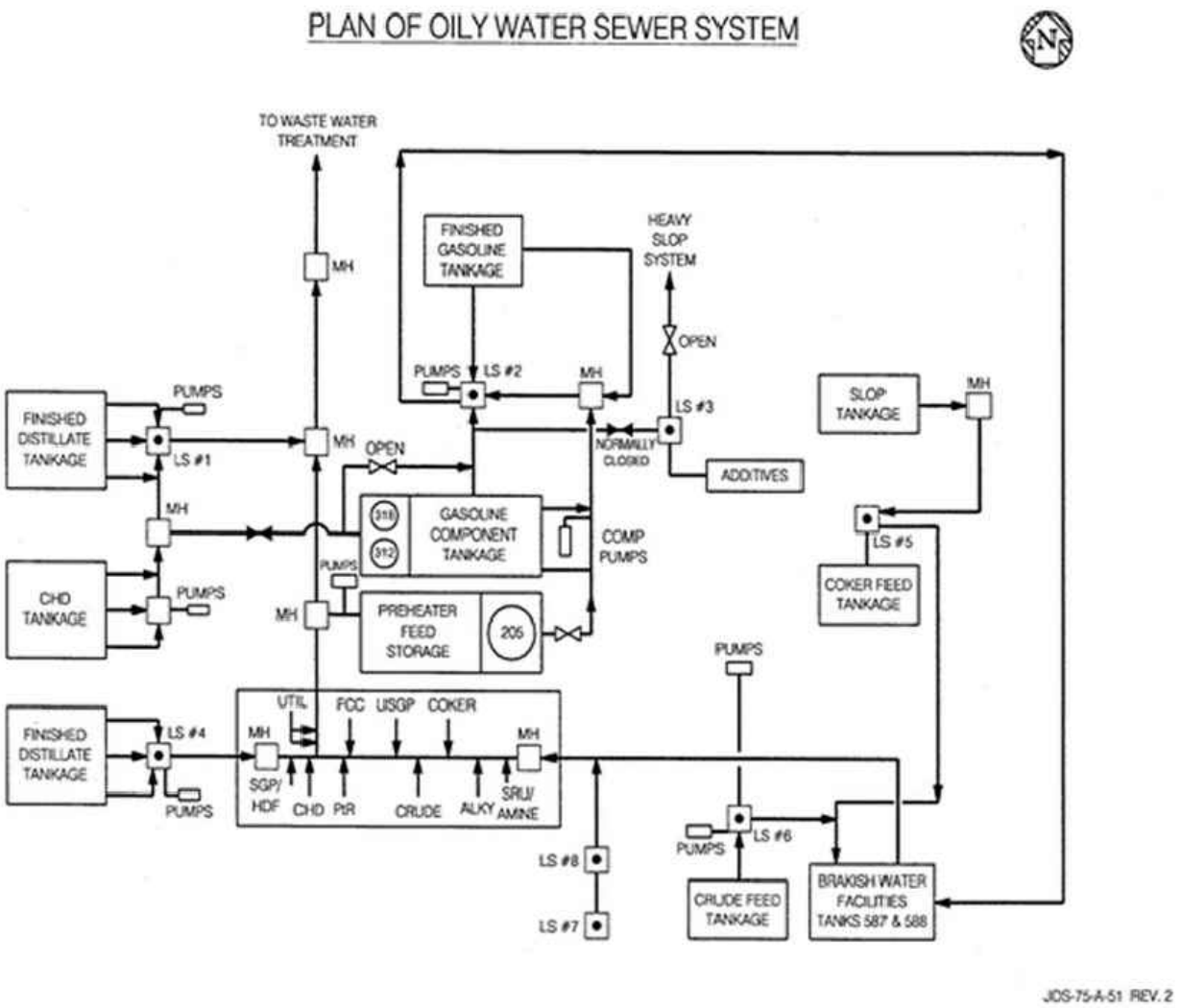
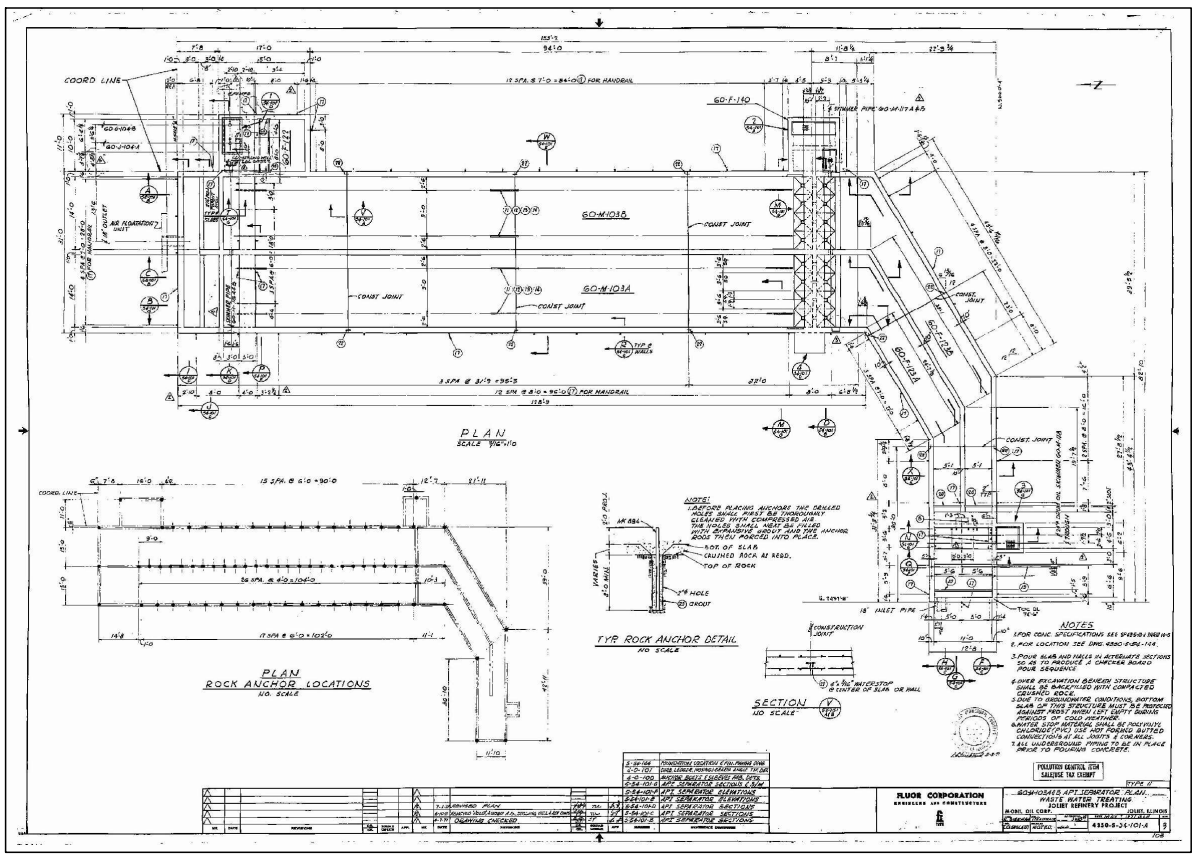
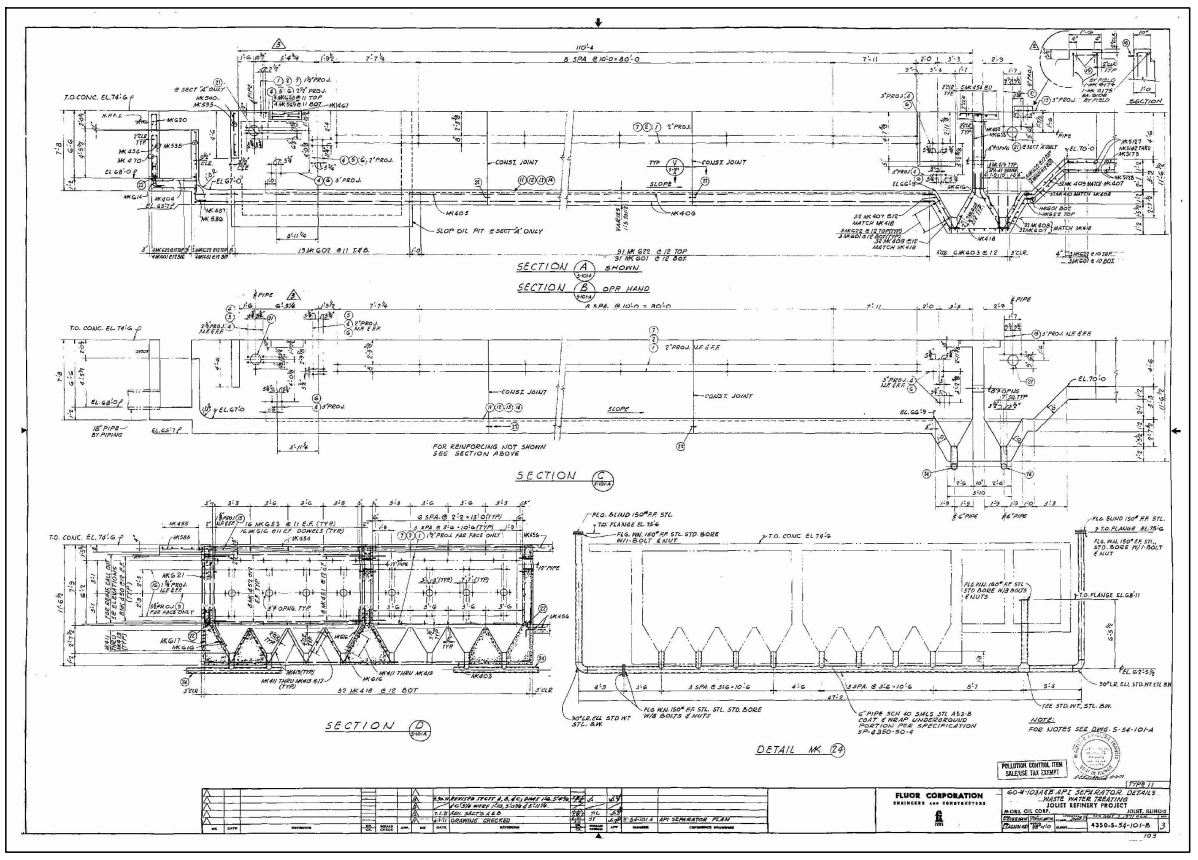


Figure 4
Plan of Refinery Delisting Petition
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois





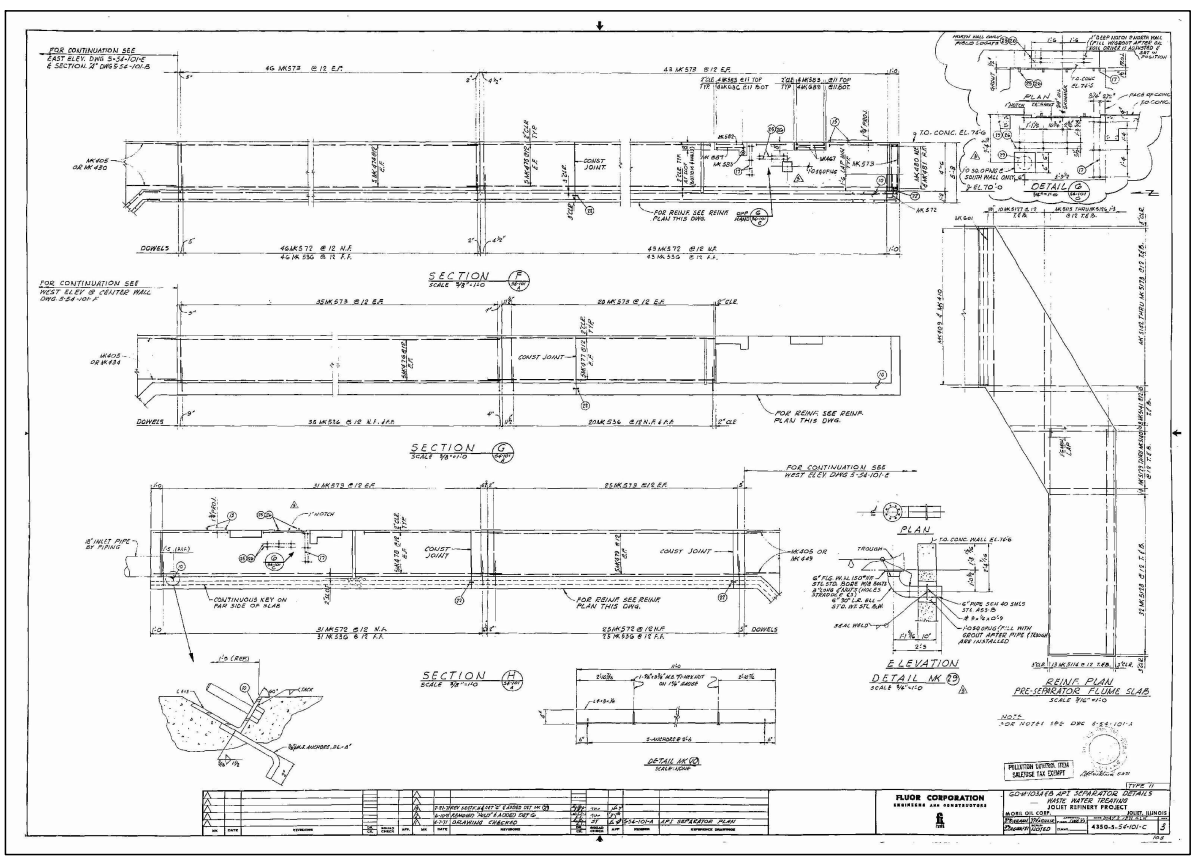
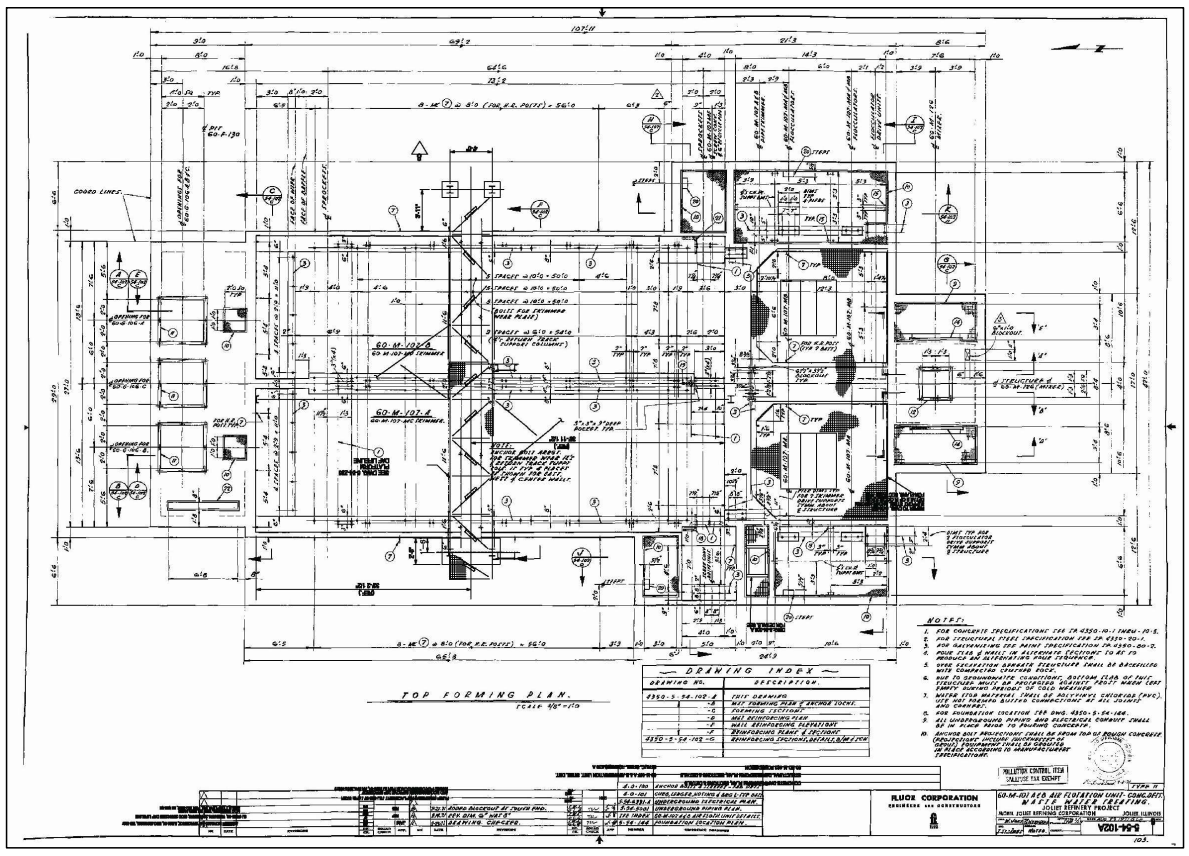
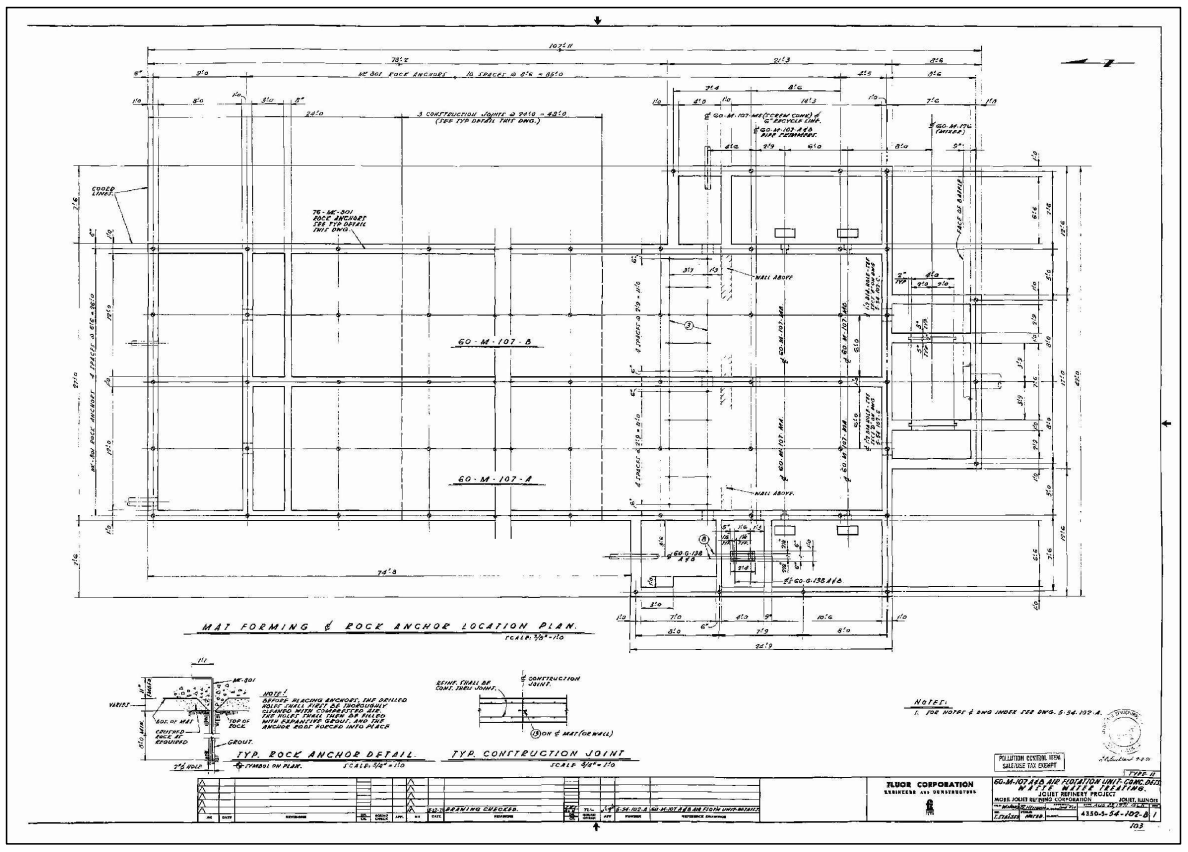


Figure 5
Engineering Schematic of Preseparator Flume & API Separator
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois

FILE PATH: T:\DWG\AutoCAD\dwg\0647752\0647752_details.dwg FIG 6, PRINTED ON 3/18/2024 BY Cindy Kennedy





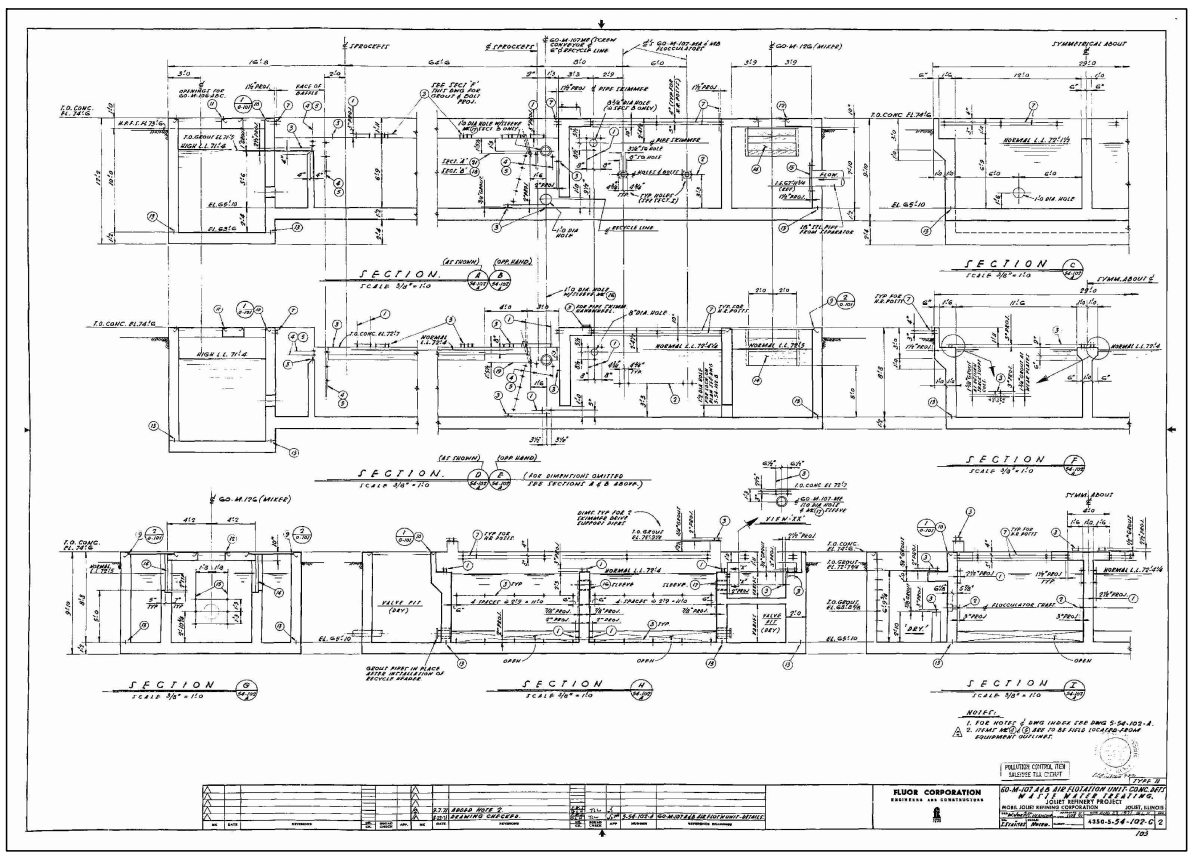
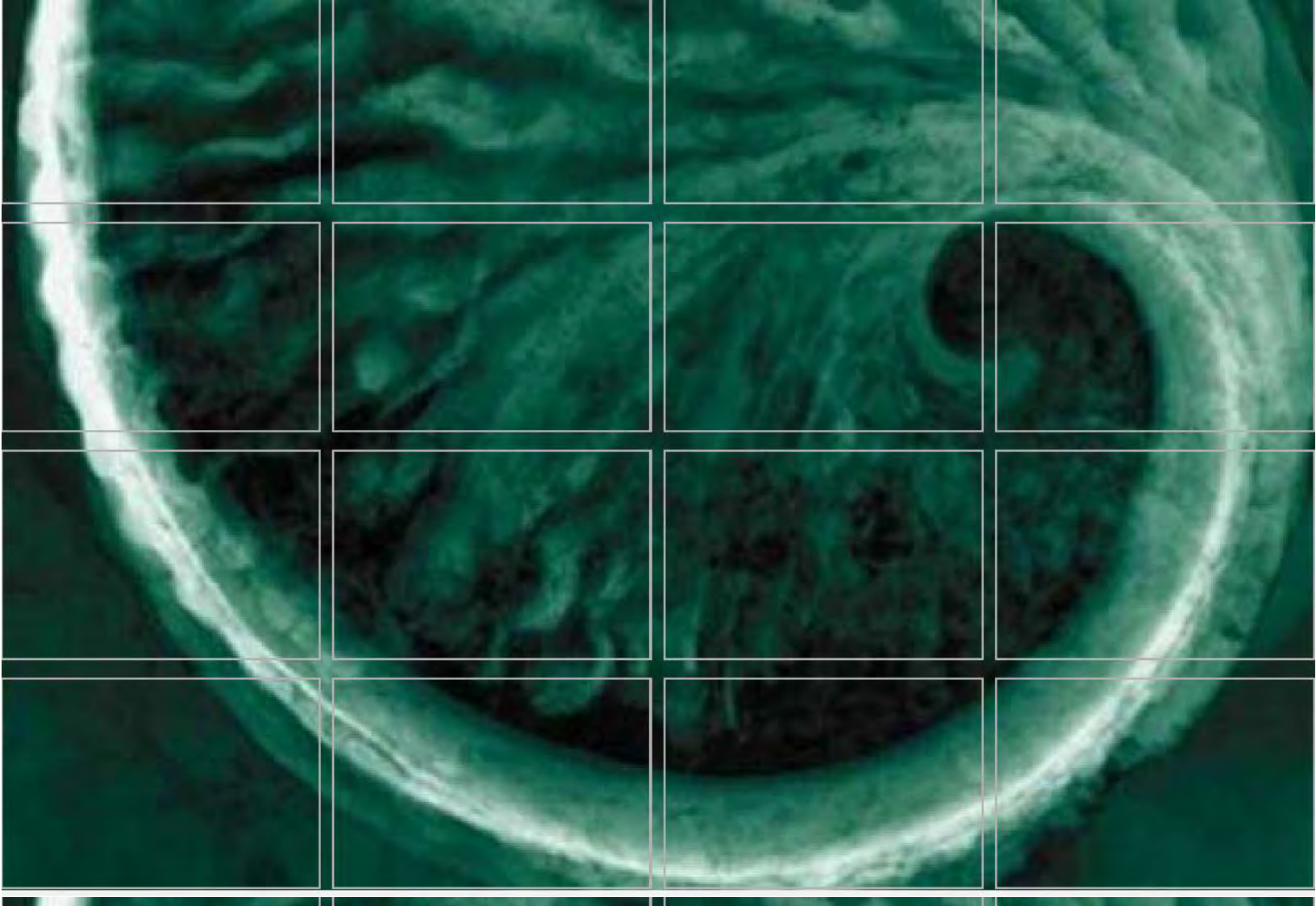


Figure 6
Engineering Schematic of DAF
Joliet Refinery Delisting Petition
ExxonMobil Joliet Refinery
Channahon, Illinois

APPENDIX A SAMPLING AND ANALYSIS PLAN



Sampling and Analysis Plan: Primary Treatment Solids Waste Delisting

ExxonMobil Joliet Refinery, Illinois

20 October 2022

Project No.: 0647752

The business of sustainability

ERM

Signature Page

20 October 2022

Sampling and Analysis Plan: Primary Treatment Solids Waste Delisting

ExxonMobil Joliet Refinery, Illinois

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Acronyms and Abbreviations

ALS	ALS Laboratory
DAF	Dissolved Air Floatation
EPA	Environmental Protection Agency
ERM	Environmental Resources Management
ExxonMobil	Exxon Mobil Corporation
IEPA	Illinois Environmental Protection Agency
JRF	Joliet Refinery
PPE	Personal protective equipment
PTS	Primary Treatment Solids
QAPP	Quality Assurance Project Plant
SAP	Sampling and Analysis Plan
TCLP	Toxicity Characteristic Leaching Procedures
WWTP	Wastewater Treatment Plant

1. INTRODUCTION

Environmental Resources Management-Southwest, Inc. prepared this *Sampling and Analysis Plan* (SAP) at the request of Exxon Mobil Corporation (ExxonMobil). This SAP describes the field and laboratory procedures that will be implemented during sampling of Primary Treatment Solids (PTS) (currently managed with EPA Hazardous Waste Codes F037, F038, K048, and K051) generated at the Wastewater Treatment Plant (WWTP) within the ExxonMobil Joliet Refinery (JRF). This SAP will be submitted to the Illinois Environmental Protection Agency (IEPA) in conjunction with the Quality Assurance Project Plant (QAPP) prepared for this waste stream. Following receipt of IEPA approval of this SAP and the associated QAPP, ExxonMobil and ERM will implement the sampling program to obtain data needed to support development of a PTS waste delisting petition. ExxonMobil intends to submit a petition requesting the delisting of the PTS so that it may be disposed of at an off-site, non-hazardous landfill in Illinois. As provided for in 35 Illinois Administrative Code (IAC) 720.122, this delisting petition is to be filed with the Illinois Pollution Control Board (IPCB) as an "adjusted standard" in accordance with the 35 IAC Part 104, Subpart D. The SAP will be used as the framework around which the sampling, testing and analysis activities will be conducted. This plan was prepared in accordance with general EPA guidance including:

- EPA, SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; and
- EPA RCRA Delisting Program Guidance Manual for the Petitioner (March 23, 2000).

1.1 Site and Process Description

The JRF is located in Channahon, Illinois approximately 50 miles southwest of Chicago, Illinois. The JRF occupies approximately 330 acres, situated south of the Des Plaines River just east of Interstate Highway 55 (Figure 1). The refinery is a mid-sized petroleum refinery and produces diesel, gasoline, coke, sulfur, propylene and asphalt.

The ExxonMobil JRF utilizes a WWTP to treat industrial wastewater generated at the refinery. The WWTP is situated approximately 400 feet north of Arsenal Rd. The WWTP encompass approximately 4,500 square feet and is generally rectangular in planview (Figure 2).

The PTS consist of Oil Water Sewer Solids, Dissolved Air Floatation (DAF) float and sludge, and API Separator Sludge, and is currently managed as a listed hazardous waste with EPA Waste Codes F037 and F038, K048, and K051. The PTS is stored in Tanks 585 and 586. Current management of the PTS includes either recycling as Oil Bearing Secondary Material or processing through a centrifuge and off-site disposal as hazardous waste.

1.2 Scope and Objectives

This SAP describes the methods and procedures that will be utilized during field sampling activities and laboratory analyses. The primary objective of the SAP is to document the techniques that will be used to sample the PTS waste stream at the ExxonMobil JRF and facilitate compliance with the data quality assurance objectives outlined in SW-846.

Where not explicitly described herein, field sampling will be completed in accordance with applicable EPA guidance and conventional sampling and analytical approaches.

Additional detail and refinement of Quality Assurance / Quality Control (QA/QC) procedures are provided in a QAPP that serves as a companion document to this SAP, but which has been submitted as a separate document.

2. FIELD PROCEDURES AND METHODS

2.1 PTS Sampling Procedures and Frequency

The PTS is stored in Tanks 585 & 586. Prior to sampling, the PTS solids will be transferred via in plant piping or vacuum truck to a dewatering equipment (portable centrifuge or belt press). After separation of free liquids, a sample of the remaining solids will be collected. ExxonMobil personnel will collect enough sample material for adequate testing in ALS Laboratory provided sample containers. Excess sample material will be returned to the point of origin. After collection, the sample containers will be placed on ice, picked up by an ALS courier, and shipped to the ALS Laboratory Group in Houston, Texas for analysis.

A total of four delisting samples will be collected for laboratory analysis. Samples of the solids, post the dewatering equipment at the point of generation, will be collected four times, once per month for four consecutive months. Currently, ExxonMobil plans to collect the samples monthly starting in February 2023. Samples from this timeframe will allow sample collection during the refinery's production of winter blend (February and March) and summer blend (April and May). For the first and third sampling events, samples will be collected and analyzed for the full suite of Appendix IX constituents, hazardous characteristics (40 CFR 261.24), and hazardous characteristics (40 CFR 268.40) as listed in Tables 1 and 2. The Toxicity Characteristic Leaching Procedures (TCLP) extractions for metals will be performed using three different pH solutions. Specifically, in addition to the acidic pH used for a standard TCLP test, a neutral pH (7.0 +/- 0.5), and a basic (10.01 +/- 0.05) test will also be performed. The analytical suite for the second and fourth sampling events will include detected 40 CFR 261.24 and 70 CFR 264 Appendix IX from the first and third events (cumulatively) and all constituents in 40 CFR 268.40 for F037, F038, K048, and K051.

2.2 Sample Management Procedures

The sample management procedures are an important aspect for collecting and tracking analytical samples for characterization of the PTS. Each new, laboratory-supplied container will be labeled with a unique sample identification, the time and date sampled, the parameters to be analyzed, the preservatives (if any), and the sampler's initials. The samples will be placed in a cooler and packed on ice to maintain a temperature of approximately 4° C (See Section 3.0).

The sample identification number for the sampling effort will appear on sample labels, sample-tracking matrix forms, chain-of-custody forms and the other applicable documentation used during the sampling activity.

Each sample will be assigned a multi-part sample type code. The first part of the code identifies the sample name, PTS.

- PTS for Primary Treatment Solids;
- Dup for blind field duplicate samples;
- TB for trip blank; and
- MS/MSD for matrix spike and matrix spike duplicate.

Then the number of the sample is added (i.e., 01). Next a unique identifier for the sample matrix is used, in this case it will be SL. Lastly the date in year, month, day format (i.e., YYYYMMDD) should be added.

The following is the list of expected sample IDs with the unique sample date for each event changing.

Project Sample	PTS-01-SL-YYYYMMDD
Duplicate Sample	DUP-01- SL -YYYYMMDD
Matrix Spike Sample	MS-01- SL -YYYYMMDD
Matrix Spike Duplicate Sample	MSD-01- SL -YYYYMMDD
Trip Blank	TB-01- SL -YYYYMMDD

A chain-of-custody form will be completed for each sampling event. The time and date the cooler is relinquished to the local analytical laboratory will be indicated on the chain-of-custody form.

2.3 Analytical Requirements

The PTS samples will be analyzed per standard SW-846 Methods or EPA methods as indicated in Table 1.

3. SAMPLE PRESERVATION AND SHIPMENT

Samples are to be labeled, sent to the lab, and preserved using the following procedures:

- The appropriate quantity of chemical preservatives, if any, is added to the sample bottles by the laboratory before the bottles are delivered to the site.
- A sample label is affixed to each sample container.
- The field sampler records the analytical parameters and required sampling information for that sample on the laboratory issued chain-of-custody form.
- Upon collection, the bottles are placed in ice chests containing packs of frozen gel or ice to lower and maintain a sample temperature of approximately 4°C. Samples are packed with cushioning material sufficient to prevent breakage of glass sample containers during transport. After sampling is completed, the samples are transported to the laboratory and stored, if necessary, under refrigeration at approximately 4°C.
- The ice chests containing samples to be analyzed are delivered or picked up by the laboratory and signed over to laboratory personnel in accordance with chain-of-custody procedures for storage or preparation for analysis.

4. CHAIN-OF-CUSTODY AND RECORDKEEPING

These procedures, which conform to those listed in SW-846 or equivalent U.S. EPA methods, are intended to document sample possession from the time of collection to analysis. For the purpose of these procedures, a sample is considered in custody if it is:

- In one's actual possession;
- In view, after being in physical possession;
- Locked so that no one can tamper with it, after having been in physical custody; and
- In a secured area, restricted to authorized personnel.

Chain-of-custody procedures include the following:

- A chain-of-custody similar to that shown in Appendix A is initiated in the field. This record is completed with pertinent information, including analytical parameters for each different group of sample bottles. The original accompanies the samples during transit to the laboratory.
- Upon sample receipt, the laboratory sample custodian responsible for logging in samples completes the chain-of-custody, files a copy, and sends the original to the laboratory project manager for the sampling program. A copy of the chain-of-custody is included with the analytical results.
- The following recordkeeping items will supplement the chain-of-custody records:
- Sampling records; and
- Sample receipt checklist or acknowledgment form from the laboratory.

Field investigation documentation shall include thorough, accurate record keeping. Information pertinent to field measurements or a sampling event will be recorded on a form (similar to the one attached in Appendix B). The sample documentation forms will be filled out in ballpoint or waterproof ink and corrections will consist of lined-out deletions that are initialed and dated. Details will include the following, as applicable:

- Name and title of author, date and time of entry and physical/environmental conditions during field activity;
- Names and contact information of field contacts;
- Details of the sampling locations (photographs can be attached if allowed);
- Information concerning sampling changes, such as scheduling modification;
- Tank PTS previously stored in;
- Information regarding centrifuge – such as date/time it was run, duration, and also details on make and model;
- Date and time of sample collection;
- Field observations;
- Sample identification number(s);
- Sample distribution and transportation (e.g., name of lab courier, time relinquished, etc);
- Decontamination procedures;

- Summary of daily tasks and documentation on any scope of work changes required by field conditions; and
- Signature of the personnel responsible for sampling and date.

Sufficient information should be recorded so that a reviewer can reconstruct the sampling activity without relying on the collector's memory. Copies of the forms will be sent to ERM at the end of each event for use during preparation of the petitions.

5. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

5.1 Equipment

New or dedicated sampling equipment will be used to reduce the potential for cross-contamination. One bucket will be dedicated to sample collection. The bucket will be labeled, decontaminated using a low-phosphate detergent and distilled water rinse after each sampling event, and stored in secure location.

5.2 Sample Collection

The following procedures will be used to identify and reduce possible sources of error in sampling and analysis:

- Trip or field blanks will be used to assess for potential cross-contamination at a rate of one per sampling event.
- Blind field duplicate samples or split samples will be used to assess for laboratory accuracy and precision at rates equivalent to standard industry practice at a rate of one per sampling event.
- Sufficient volume will be provided to allow matrix spike and matrix spike duplicate analyses during each sampling event.

5.3 Blind Field Duplicates

Two blind field duplicate PTS samples will be submitted for laboratory analysis of the parameters specified for the primary samples during the course of the delisting petition sampling events. The blind field duplicate samples will be assigned separate sample identification numbers from the actual field samples such that the laboratory will not be able to identify that it is the same one as the other samples.

Blind field duplicate samples are to be collected in addition to, and at the same time, as an investigative sample. Field replication provides information on the precision and homogeneity of sampling, handling, shipping, storage, preparation, and analysis techniques because duplicate samples ideally are equally representative of the sample matrix at that point in time and are similarly influenced by conditions at the time of sampling, handling, shipping, storage, preparation, and analysis. Blind field duplicate samples will be submitted to the laboratory 'blind' with fictional identities.

5.4 Matrix Spikes and Matrix Spike Duplicates

As part of the laboratory's internal QA/QC procedures, one MS/MSD sample will be analyzed to provide a measurement of matrix effects on analytical procedures. A set of MS/MSD samples will be collected during one sampling event in addition to, and at the same time as, one of the investigative samples.

6. MANAGEMENT OF INVESTIGATION-DERIVED WASTE

The primary types of investigation-derived waste that will be produced during the field sampling activities include:

- Disposable personal protective equipment (PPE) and disposable sampling equipment.

Used PPE and disposable sampling equipment will be properly managed by ExxonMobil JRF as oily waste per applicable state and federal regulatory requirements. Excess sample volume leftover in buckets after sampling is completed will be returned to its source.

REFERENCES

EPA, SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

EPA 2000. EPA RCRA Delisting Program Guidance Manual for the Petitioner, United States Environmental Protection Agency, March 2000.

TABLES

TABLE 1

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Metals	**Appendix IX**	**40 CFR 261.24**	**Waste Code COC**	**SW 846 Method (Totals)**	**SW 846 Method (TCLP)**
Antimony	X			6000 / 7000	1311 / 6000 / 7000
Arsenic	X	X		6000 / 7000	1311 / 6000 / 7000
Barium	X	X		6000 / 7000	1311 / 6000 / 7000
Beryllium	X			6000 / 7000	1311 / 6000 / 7000
Cadmium	X	X		6000 / 7000	1311 / 6000 / 7000
Chromium	X	X	X	6000 / 7000	1311 / 6000 / 7000
Cobalt	X			6000 / 7000	1311 / 6000 / 7000
Copper	X			6000 / 7000	1311 / 6000 / 7000
Lead	X	X	X	6000 / 7000	1311 / 6000 / 7000
Mercury	X	X		6000 / 7000	1311 / 6000 / 7000
Nickel	X		X	6000 / 7000	1311 / 6000 / 7000
Selenium	X	X		6000 / 7000	1311 / 6000 / 7000
Silver	X	X		6000 / 7000	1311 / 6000 / 7000
Thallium	X			6000 / 7000	1311 / 6000 / 7000
Tin	X			6000 / 7000	1311 / 6000 / 7000
Vanadium	X			6000 / 7000	1311 / 6000 / 7000
Zinc	X			6000 / 7000	1311 / 6000 / 7000
Volatile Organic Compounds					
1,1,1,2-Tetrachloroethane	X			8260	8260 / 1311
1,1,1-Trichloroethane	X			8260	8260 / 1311
1,1,2,2-Tetrachloroethane	X			8260	8260 / 1311
1,1,2-Trichloroethane	X			8260	8260 / 1311
1,1-Dichloroethane	X			8260	8260 / 1311
1,1-Dichloroethylene	X	X		8260	8260 / 1311
1,2-Dibromoethane	X			8260	8260 / 1311
1,2-Dichloroethane		X		8260	8260 / 1311
1,2-Dichloropropane	X			8260	8260 / 1311
1,4-Dioxane	X			8260	8260 / 1311
Acetone	X			8260	8260 / 1311
Acetonitrile	X			8260	8260 / 1311
Acrolein	X			8260	8260 / 1311
Acrylonitrile	X			8260	8260 / 1311
Benzene	X	X	X	8260	8260 / 1311
Bromodichloromethane	X			8260	8260 / 1311
Bromoform	X			8260	8260 / 1311
Carbon disulfide	X			8260	8260 / 1311
Carbon tetrachloride	X	X		8260	8260 / 1311
Chlorobenzene	X	X		8260	8260 / 1311
Chlorodibrmomethane (Dibromochloromethan	X			8260	8260 / 1311
Chloroethane	X			8260	8260 / 1311
Chloroform	X	X		8260	8260 / 1311
cis-1,3-Dichloropropene	X			8260	8260 / 1311
Dibromomethane (Methylene bromide)	X			8260	8260 / 1311
Dichlorodifluoromethane	X			8260	8260 / 1311
Ethyl methacrylate	X			8260	8260 / 1311
Ethylbenzene	X		X	8260	8260 / 1311
Iodomethane (Methyl iodide)	X			8260	8260 / 1311
Isobutyl alcohol	X			8260	8260 / 1311
Methyl methacrylate	X			8260	8260 / 1311
Methylene chloride	X			8260	8260 / 1311
Pentachlorobenzene	X			8260	8260 / 1311
Tetrachloroethylene	X	X		8260	8260 / 1311
trans-1,2-Dichloroethylene	X			8260	8260 / 1311
trans-1,3-Dichloropropene	X			8260	8260 / 1311
Trichloroethylene	X	X		8260	8260 / 1311
Trichlorofluoromethane	X			8260	8260 / 1311
Vinyl chloride	X	X		8260	8260 / 1311
Xylene	X		X	8260	8260 / 1311

TABLE 1 (Contd.)

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Volatile Organic Compounds (cont'd)	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Methacrylonitrile	X			8260	8260 / 1311
Methyl bromide	X			8260	8260 / 1311
Methyl ethyl ketone	X	X		8260	8260 / 1311
Methyl isobutyl ketone (4-Methyl-2-pentanone	X			8260	8260 / 1311
Toluene	X		X	8260	8260 / 1311
2-Chloro-1.3-butadiene (Chloroprene)	X			8260	8260 / 1311
3-Chloropropylene (Allyl chloride)	X			8260	8260 / 1311
Ethyl cyanide (Propanenitrile)	X			8260	8260 / 1311
m-Dichlorobenzene	X			8260	8260 / 1311
o-Dichlorobenzene	X			8260	8260 / 1311
p-Dichlorobenzene	X	X		8260	8260 / 1311
Methyl chloride	X			8260	8260 / 1311
2-Hexanone	X			8260	8260 / 1311
2-Picoline	X			8260	8260 / 1311
o-Toluidine	X			8260	8260 / 1311
p-(Dimethylamino)azobenzene	X			8260	8260 / 1311
Pentachloroethane	X			8260	8260 / 1311
p-Phenylenediamine	X			8260	8260 / 1311
Vinyl acetate	X			8260	8260 / 1311
Styrene	X			8260	8260 / 1311
trans-1,4-Dichloro-2-butene	X			8260	8260 / 1311
Semivolatile Organic Compounds					
1,2,4,5-Tetrachlorobenzene	X			8270	8270 / 1311
1,2,4-Trichlorobenzene	X			8270	8270 / 1311
2,3,4,6-Tetrachlorophenol	X			8270	8270 / 1311
2,4,5-Trichlorophenol		X		8270	8270 / 1311
2,4,6-Trichlorophenol		X		8270	8270 / 1311
2,4-Dichlorophenol	X			8270	8270 / 1311
2,4-Dimethylphenol	X			8270	8270 / 1311
2,4-Dinitrophenol	X			8270	8270 / 1311
2,4-Dinitrotoluene	X	X		8270	8270 / 1311
2,6-Dichlorophenol	X			8270	8270 / 1311
2,6-Dinitrotoluene	X			8270	8270 / 1311
2-Acetylaminofluorene	X			8270	8270 / 1311
2-Chloronaphthalene	X			8270	8270 / 1311
2-Chlorophenol	X			8270	8270 / 1311
2-Naphthylamine	X			8270	8270 / 1311
3-Methylcholanthrene	X			8270	8270 / 1311
4-Aminobiphenyl	X			8270	8270 / 1311
5-Nitro-o-toluidine	X			8270	8270 / 1311
Acenaphthene	X		X	8270	8270 / 1311
Acenaphthylene	X			8270	8270 / 1311
Acetophenone	X			8270	8270 / 1311
Aniline	X			8270	8270 / 1311
Anthracene	X		X	8270	8270 / 1311
Benzo(a)anthracene	X		X	8270	8270 / 1311
Benzo(a)pyrene	X		X	8270	8270 / 1311
Benzo(b)fluoranthene	X			8270	8270 / 1311
Benzo(ghi)perylene	X			8270	8270 / 1311
Benzo(k)fluoranthene	X			8270	8270 / 1311
Bis(2-chloroethoxy)methane	X			8270	8270 / 1311
Bis(2-chloroethyl)ether	X			8270	8270 / 1311
Bis(2-ethylhexyl) phthalate	X		X	8270	8270 / 1311
Butyl benzyl phthalate	X			8270	8270 / 1311
Chlorobenzilate	X			8270	8270 / 1311
Chrysene	X		X	8270	8270 / 1311
Di-n-butyl phthalate	X		X	8270	8270 / 1311
Di-n-octyl phthalate	X			8270	8270 / 1311
Dibenz(a,h)anthracene	X			8270	8270 / 1311

TABLE 1 (Contd.)

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Semivolatile Organic Compounds (cont'd)	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Diethyl phthalate	X			8270	8270 / 1311
Dimethyl phthalate	X			8270	8270 / 1311
Diphenylamine	X			8270	8270 / 1311
Fluoranthene	X			8270	8270 / 1311
Fluorene	X		X	8270	8270 / 1311
Hexachlorobenzene	X	X		8270	8270 / 1311
Hexachlorobutadiene	X	X		8270	8270 / 1311
Hexachlorocyclopentadiene	X			8270	8270 / 1311
Hexachloroethane	X	X		8270	8270 / 1311
Hexachloropropene	X			8270	8270 / 1311
Indeno(1,2,3-cd)pyrene	X			8270	8270 / 1311
Isodrin	X			8270	8270 / 1311
Isosafrole	X			8270	8270 / 1311
Kepone	X			8270	8270 / 1311
Methapyrilene	X			8270	8270 / 1311
Methyl methanesulfonate	X			8270	8270 / 1311
Naphthalene	X		X	8270	8270 / 1311
Nitrobenzene	X	X		8270	8270 / 1311
N-Nitrosodi-n-butylamine	X			8270	8270 / 1311
N-Nitrosomethylethalamine	X			8270	8270 / 1311
N-Nitrosomorpholine	X			8270	8270 / 1311
N-Nitrosopiperidine	X			8270	8270 / 1311
N-Nitrosopyrrolidine	X			8270	8270 / 1311
Pentachloronitrobenzene	X			8270	8270 / 1311
Pentachlorophenol	X	X		8270	8270 / 1311
Phenacetin	X			8270	8270 / 1311
Phenanthrene	X		X	8270	8270 / 1311
Phenol	X		X	8270	8270 / 1311
Pronamide	X			8270	8270 / 1311
Pyrene	X		X	8270	8270 / 1311
Pyridine	X	X		8270	8270 / 1311
Safrole	X			8270	8270 / 1311
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	X			8270	8270 / 1311
Aramite	X			8270	8270 / 1311
Chlorobenzilate	X			8270	8270 / 1311
Dieldrin	X			8270	8270 / 1311
Disulfoton	X			8270	8270 / 1311
Famphur	X			8270	8270 / 1311
m-Cresol	X	X		8270	8270 / 1311
methyl parathion	X			8270	8270 / 1311
o-Cresol	X	X		8270	8270 / 1311
Parathion	X			8270	8270 / 1311
p-Cresol	X	X		8270	8270 / 1311
4,6-Dinitro-o-cresol	X			8270	8270 / 1311
p-Nitroaniline	X			8270	8270 / 1311
p-Nitrophenol	X			8270	8270 / 1311
p-Chloroaniline	X			8270	8270 / 1311
Cresol	X	X		8270	8270 / 1311
Phorate	X			8270	8270 / 1311
2,4-Dichlorophenoxyacetic acid (2,4-D)	X	X		8270	8270 / 1311
2-Methylnaphthalene	X			8270	8270 / 1311
4-Chlorophenyl phenyl ether	X			8270	8270 / 1311
Benzyl alcohol	X			8270	8270 / 1311
Dibenzofuran	X			8270	8270 / 1311
Isophorone	X			8270	8270 / 1311
1,4-Naphthoquinone	X			8270	8270 / 1311
1-Naphthylamine	X			8270	8270 / 1311
3,3'-Dichlorobenzidine	X			8270	8270 / 1311
3,3'-Dimethylbenzidine	X			8270	8270 / 1311
4-Nitroquinoline 1-oxide	X			8270	8270 / 1311
7,12-Dimethylbenz(a)anthracene	X			8270	8270 / 1311
alpha, alpha-Dimethylphenethylamine	X			8270	8270 / 1311

TABLE 1 (Contd.)

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Semivolatile Organic Compounds (cont'd)	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Bis(2-chloro-1-methylethyl) ether	X			8270	8270 / 1311
Dimethoate	X			8270	8270 / 1311
Ethyl methanesulfonate	X			8270	8270 / 1311
Hexachlorophene	X			8270	8270 / 1311
m-Dinitrobenzene	X			8270	8270 / 1311
m-Nitroaniline	X			8270	8270 / 1311
N-Nitrosodiethylamine	X			8270	8270 / 1311
N-Nitrosodimethylamine	X			8270	8270 / 1311
N-Nitrosodiphenylamine	X			8270	8270 / 1311
O,O-Diethyl O-2-pyrazinyl phosphorothioate	X			8270	8270 / 1311
o-Nitroaniline	X			8270	8270 / 1311
o-Nitrophenol	X			8270	8270 / 1311
Tetraethyl dithiopyrophosphate	X			8270	8270 / 1311
Organochlorine Pesticides					
4,4'-DDD	X			8290	8290/1311
4,4'-DDE	X			8290	8290/1311
4,4'-DDT	X			8290	8290/1311
Aldrin	X			8290	8290/1311
alpha-BHC	X			8290	8290/1311
beta-BHC	X			8290	8290/1311
Chlordane	X	X		8290	8290/1311
delta-BHC	X			8290	8290/1311
Dieldrin	X			8290	8290/1311
Endosulfan I	X			8290	8290/1311
Endosulfan II	X			8290	8290/1311
Endosulfan sulfate	X			8290	8290/1311
Endrin	X	X		8290	8290/1311
gamma-BHC	X	X		8290	8290/1311
Heptachlor	X	X		8290	8290/1311
Heptachlor epoxide	X	X		8290	8290/1311
Methoxychlor	X	X		8290	8290/1311
Toxaphene	X	X		8290	8290/1311
Diallate	X			8290	8290/1311
Endrin aldehyde	X			8290	8290/1311
Chlorinated Herbicides					
2,4,5-T (Trichlorophenoxyacetic acid)	X			8151	8151/1311
Silvex	X	X		8151	8151/1311
Dioxins/Furans					
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	X			8290	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	X			8290	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	X			8290	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	X			8290	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	X			8290	--
Hexachlorodibenzofurans	X			8290	--
Hexachlorodibenzo-p-dioxins	X			8290	--
Pentachlorodibenzofurans	X			8290	--
Pentachlorodibenzo-p-dioxins	X			8290	--
Tetrachlorodibenzofurans	X			8290	--
Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	X			8290	--
Polychlorinated dibenzofurans	X			8290	--
Polychlorinated dibenzo-p-dioxins	X			8290	--

TABLE 1 (Contd.)

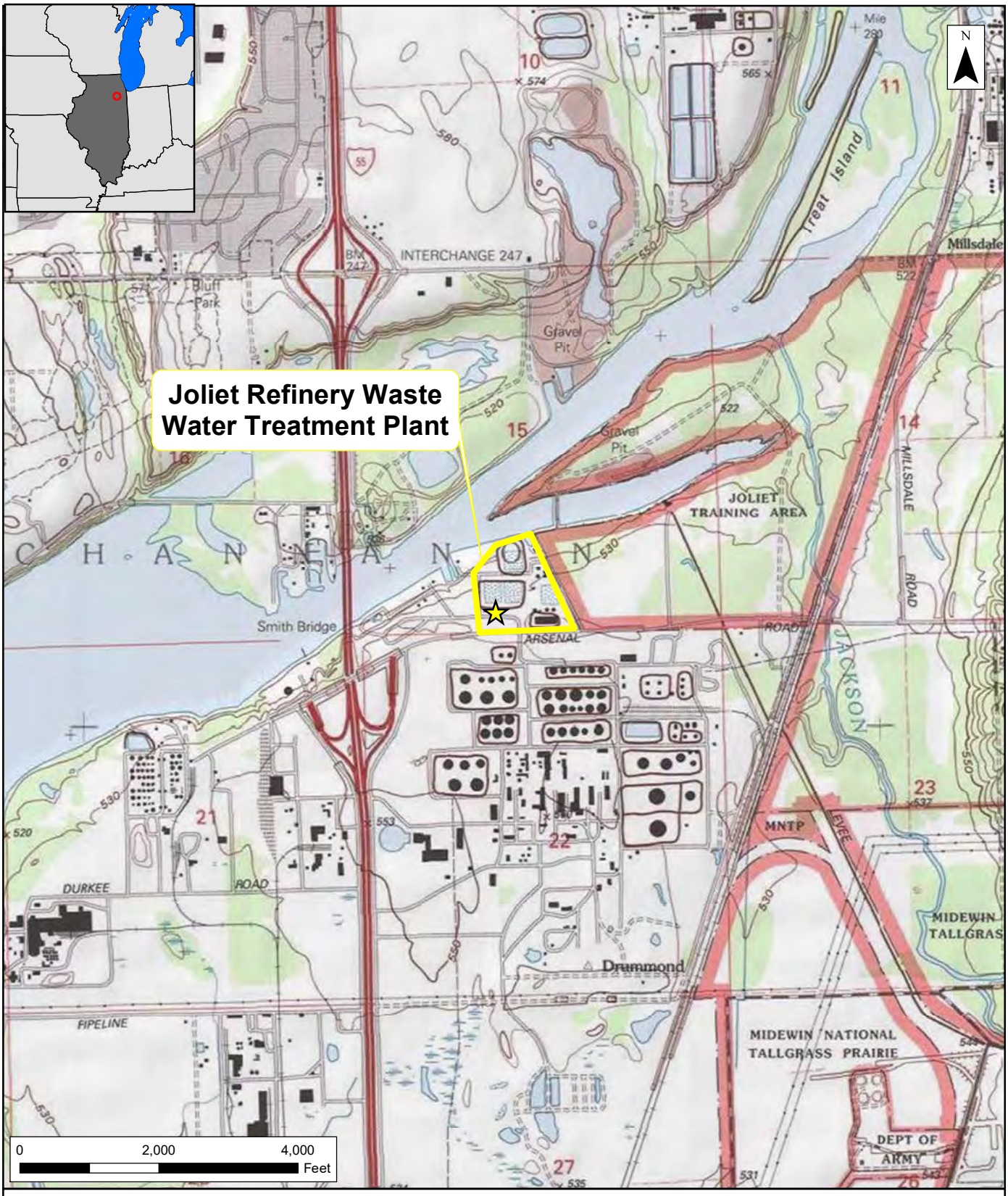
Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Cyanide	**Appendix IX**	**40 CFR 261.24**	**Waste Code COC**	**SW 846 Method (Totals)**	**SW 846 Method (TCLP)**
Cyanide (Total) (Amenable)	X		X	9014	--
Flouride				**SW 846 Method**	
Flouride	X			4500 FC	--
Sulfide				**SW 846 Method**	
Sulfide	X			4500 SE	--
Polychlorinated biphenyl (PCB)				**SW 846 Method**	
Aroclor 1016	X			8082	--
Aroclor 1221	X			8082	--
Aroclor 1232	X			8082	--
Aroclor 1242	X			8082	--
Aroclor 1248	X			8082	--
Aroclor 1254	X			8082	--
Aroclor 1260	X			8082	--

NOTES:
TCLP - Toxicity Characteristic Leaching Procedure

FIGURES



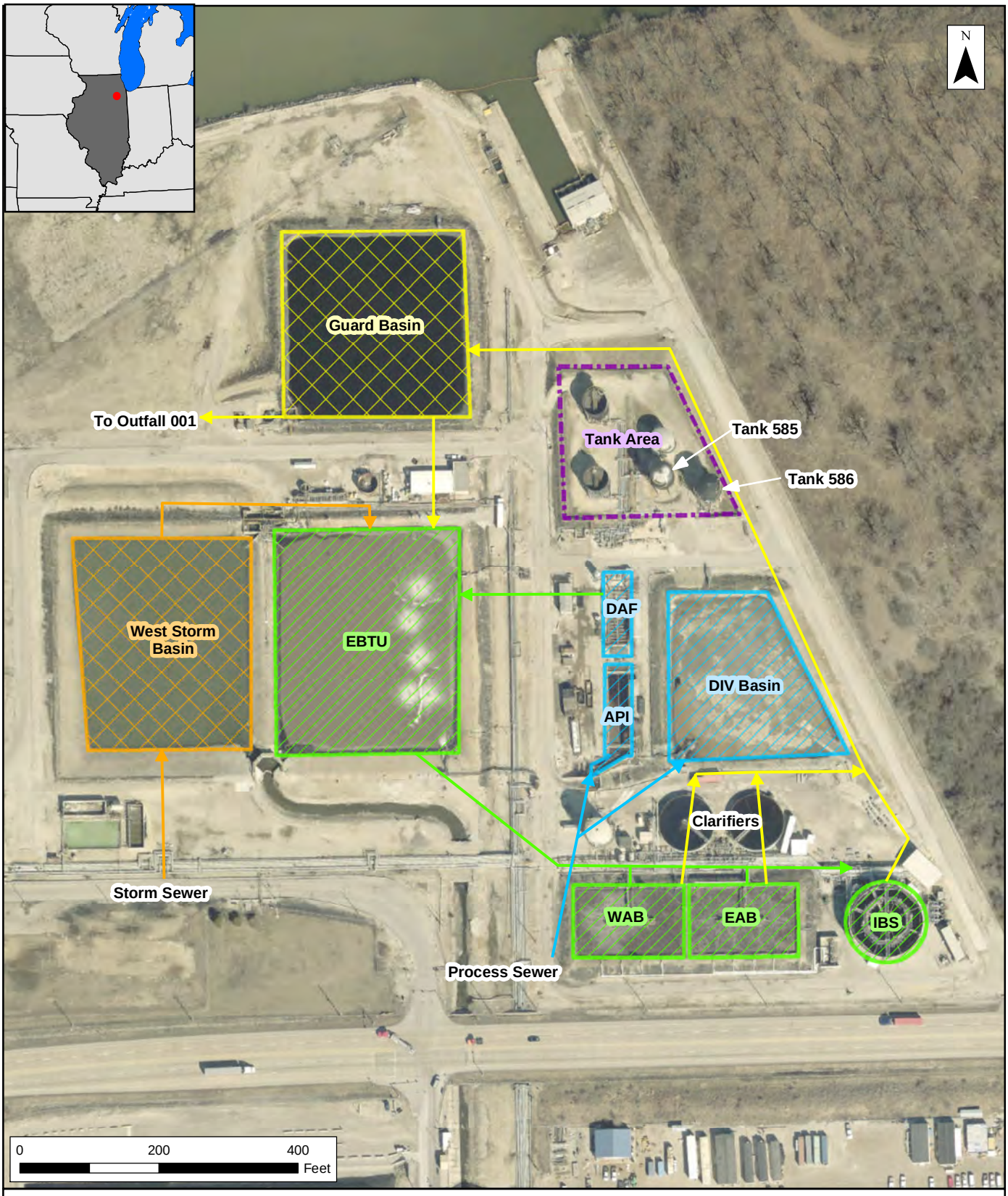
Legend

★ PTS (Preliminary Treatment Solids) Sampling Point

Figure 1
Site Location Map
ExxonMobil Refining and Supply Company
Joliet Refinery
Will County, IL

ERM, Inc.
ERM www.erm.com

HOU\Proj\0647752\DM\30569H(figs).pdf
HOU\Proj\0647752\DM\32091H(AppA).pdf



Legend

- Primary Treatment: Preflume, API, DIV (Diversion) Basin, and Dissolved Air Floatation (DAF)
- Secondary Treatment: East/West Aeration Basins (EAB/WAB), East Biological Treatment Unit (EBTU) and Integrated Biological System (IBS)
- Storm Water
- Waste Water Treatment Plant (WWTP)
- Tanks for Oil (to Ref Slop) and Solids (to

ERM, Inc.
ERM www.erm.com

Figure 2
Joliet Refinery Waste Water Treatment Plant
ExxonMobil Refining and Supply Company
Will County, IL

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

APPENDIX A EXAMPLE CHAIN-OF-CUSTODY FORM

Chain of Custody Form

Page _____ of _____

ALS Environmental
North America Corporate Office
10450 Stancliff Road, Suite 210
Houston, TX 77099
+1 800 695 7222

ALS Project Manager:		Work Order #:	

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name		A	
Work Order		Project Number		B	
Company Name		Bill To Company		C	
Send Report To		Invoice Attn.		D	
Address		Address		E	
				F	
City/State/Zip		City/State/Zip		G	
Phone		Phone		H	
Fax		Fax		I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s): Please Print & Sign	Shipment Method:	Required Turnaround Time:	Results Due Date:
		☐ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour ☐ Other _____	

Relinquished by:	Date:	Time:	Received by:	Notes:
Relinquished by:	Date:	Time:	Received by (Laboratory):	Cooler Temp.
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	

QC Package: (Check Box Below)

	Level II: Standard QC		TRRP-Checklist
	Level III: Std QC + Raw Data		TRRP Level IV
	Level IV: SW846 CLP-Like		
	Other: _____		

Preservative Key: 1-HCL 2-HNO3 3-H2SO4 4-NaOH 5-Na2S2O3 6-NaHSO4 7-Other 8-4 degrees C 9-5035

Note: Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.

APPENDIX B SAMPLING RECORD

PTS Sampling Checklist

Sampler: Time: Date:
Position Held:
Contact Information (phone/email):
Outdoor Sampling Conditions (*i.e.,* Temperature, Precipitation):

PTS Sample

Sample ID: Time collected: Date:

Sampling Notes:

CENTRIFUGE

Model: Make:	Date/time Ran: Duration of Run:	Origin Tank of Solids Run:

Decon Procedures:

Summary of Daily Tasks:

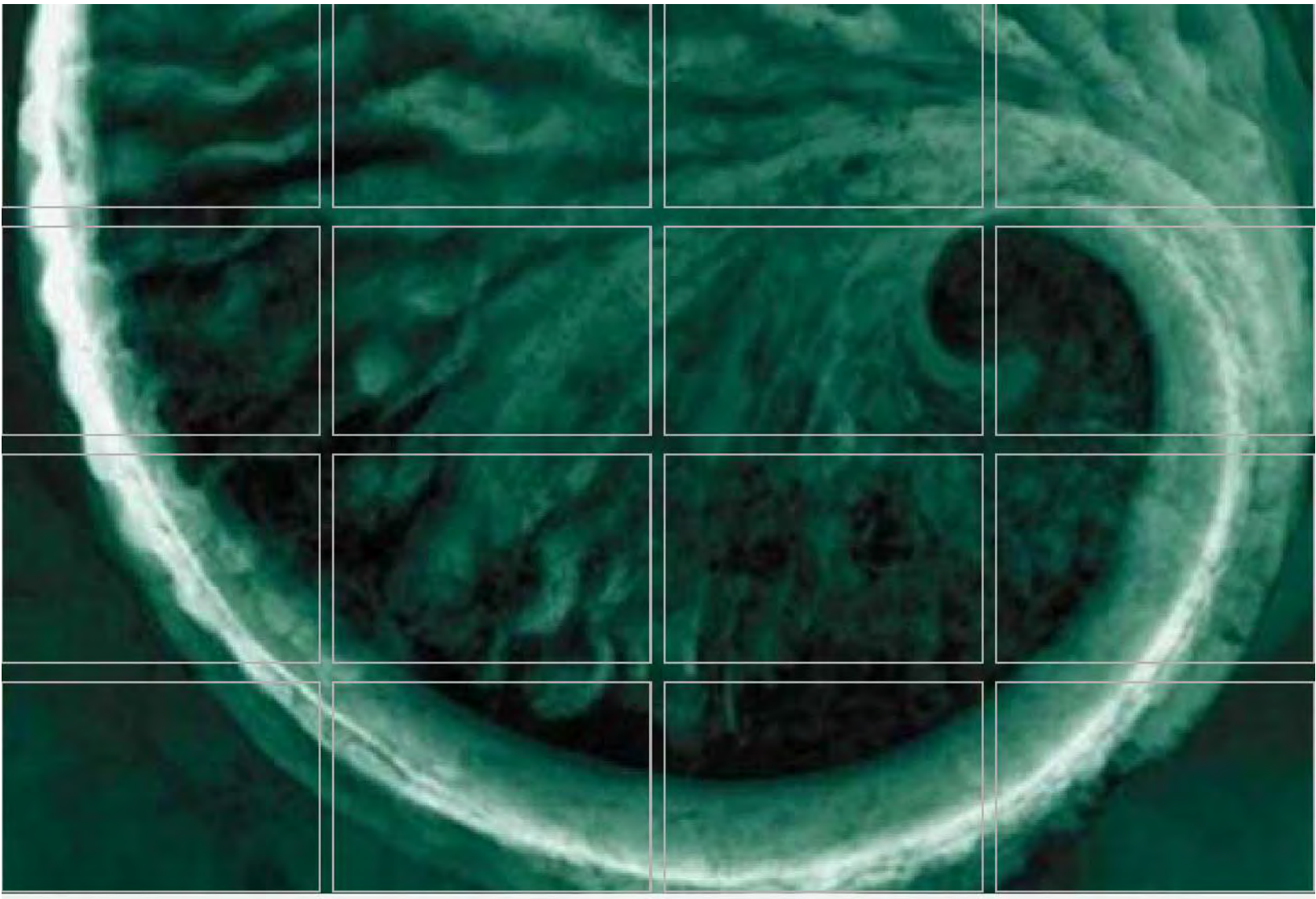
If any, what scope of work changes occurred during this sampling?

ALS Laboratory information

Name of Lab Courier:	Time/Date of Sample Relinquist:

Sampler Signature:	Date:

APPENDIX B QUALITY ASSURANCE PROJECT PLAN



Quality Assurance Project Plan: Primary Treatment Solids Waste Delisting

ExxonMobil Joliet Refinery, Illinois

20 October 2022

Project No.: 0647752

The business of sustainability

ERM

Signature Page

20 October 2022

Quality Assurance Project Plan: Primary Treatment Solids Waste Delisting

ExxonMobil Joliet Refinery, Illinois

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Acronyms and Abbreviations

AE	Account Executives
ALS	ALS Laboratory
CLP	Contract Laboratory Program
CoC	Chain of custody
CSM	Client Service Managers
DAF	Dissolved Air Floatation
DQO	Data Quality Objective
EDD	Electronic data deliverable
EDL	Estimated Detection Limit
EPA	Environmental Protection Agency
ERM	Environmental Resources Management
ERP	Enterprise Resource Planning
ExxonMobil	Exxon Mobil Corporation
IEPA	Illinois Environmental Protection Agency
JRF	Joliet Refinery
MDL	Method Detection Limit
NELAC	National Environmental Laboratory Accreditation Conference
PM	Project Managers
PTS	Primary treatment solids
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RAS	Routine Analytical Services
RL	Reporting Limit
RPD	Relative percent difference
SAP	Sampling and Analysis Plans
TNI	The NELAC Institution
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

1. INTRODUCTION

Environmental Resources Management-Southwest, Inc. prepared this *Quality Assurance Project Plan* (QAPP) on behalf of Exxon Mobil Corporation (ExxonMobil) . This QAPP describes the field and laboratory procedures that will be implemented during sampling of Primary Treatment Solids (PTS) (currently managed with EPA Hazardous Waste Codes F037, F038, K048, and K051) generated at the Wastewater Treatment Plant (WWTP) within the ExxonMobil Joliet Refinery (JRF). This QAPP will be submitted to the Illinois Environmental Protection Agency (IEPA) in conjunction with the Sampling and Analysis Plans (SAP) prepared for this waste stream. Following receipt of IEPA approval of this QAPP and the associated SAP, ExxonMobil and ERM will implement the sampling program to obtain data needed to support development of a PTS waste delisting petition. ExxonMobil intends to submit a petition requesting the delisting of the PTS so that it may be disposed of at an off-site non-hazardous landfill in Illinois. As provided for in 35 Illinois Administrative Code (IAC) 720.122, this delisting petition is to be filed with the Illinois Pollution Control Board (IPCB) as an “adjusted standard” in accordance with the 35 IAC Part 104, Subpart D.

The sampling methods, analytical testing, frequency, and methods to be utilized during the delisting process are described in the SAP for PTS; submitted in conjunction with this QAPP. This QAPP was prepared in accordance with EPA guidance including:

- *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5);
- *EPA Guidance on Systematic Planning using the Data Quality Objectives Process* (QA/G-4);
- *EPA Guidance for Quality Assurance Project Plans* (QA/G-5); and
- Conventionally accepted Quality Assurance and Quality Control (QA/QC) objectives.

1.1 Site and Process Description

The JRF is located in Channahon, Illinois approximately 50 miles southwest of Chicago, Illinois. The JRF occupies approximately 330 acres, situated south the Des Plaines River just east of Interstate Highway 55 (Figure 1). The refinery is a mid-sized petroleum refinery and produces diesel, gasoline, coke, sulfur, propylene and asphalt.

The ExxonMobil JRF utilizes a WWTP to treat industrial wastewater generated at the refinery. The WWTP is situated approximately 400 feet north of Arsenal Rd. The WWTP encompass approximately 4,500 square feet and is generally rectangular in planview (Figure 2).

The PTS consist of Oil Water Sewer Solids, Dissolved Air Floatation (DAF) float and sludge, and API Separator Sludge, and is currently managed as a listed hazardous waste with EPA Waste Codes F037 and F038, K048, and K051. The PTS is stored in Tanks 585 and 586. Current management of the PTS includes either recycling as Oil Bearing Secondary Material or processing through a centrifuge and off-site disposal as hazardous waste.

1.2 Scope and Objectives

The scope of this QAPP represents the foundation of QA/QC that will be utilized to assess and verify that the sampling, testing, and analysis activities are executed in a manner that is consistent with applicable EPA guidance document *ERP Requirements for Quality Assurance Project Plans* (EPA QA/R-5) and other conventional QA / QC objectives described in Section 1 of this report.

The objectives of this QAPP include:

- Assessing the data generated in terms of representatives, precision, accuracy, completeness and comparability; and
- Documenting the assessment results consistent with the fundamental guidelines of the delisting process as presented below.

Project Organization and Responsibility	Section 2
Data Quality Objectives	Section 3
Sampling Procedures	Section 4
Sample Handling, Documentation, and Custody	Section 5
Quality Assurance Procedures for Laboratory Activities	Section 6
Quality Assurance Procedures for Field Activities	Section 7
Data Reduction, Assessment and Validation	Section 8
Audits	Section 9
Preventive Maintenance	Section 10
Corrective Action	Section 11
Pollution Control	Section 12
Waste Management	Section 13

1.3 Distribution List

Copies of the documents produced during this project will be submitted to the following individuals

1. Soad Soliman
   Illinois Environmental Protection Agency
   1021 North Grand Ave. East
   P.O. Box 19276
   Springfield, IL 62794-9276
2. Heidi Mulhall
   ExxonMobil Joliet Refinery
   25915 S. Frontage Road
   Channahon, IL 60410
3. Peter Gagnon
   Environmental Resources Management
   CityCenter Four
   840 West Sam Houston Parkway North
   Suite 600
   Houston, Texas 77024-3920

2. PROJECT ORGANIZATION AND RESPONSIBILITY

This section describes the project organization and specifies personnel responsibilities. The project organization presented in this section has been developed to guide and assess the quality of sampling and testing procedures for obtaining reliable data, and to facilitate effective communication and decision-making during the project.

2.1 Project Organization

The principal entities that are involved in the waste delisting process for the facility, and their respective roles, include the following:

- Illinois Pollution Control Board – Review and approval of waste delisting deliverables;
- Illinois EPA - Review and recommendation of waste delisting deliverables;
- ExxonMobil – Entity performing waste sampling, and petitioner for waste delisting;
- Environmental Resources Management (ERM) – Environmental consultant, managing the quality of the analytical data and assisting with the preparation of the waste delisting petition; and
- ALS Laboratory Group, Inc. (ALS) – Analytical laboratory performing analysis of Primary Treatment Solid samples collected at the JRF WWTP.

Figure 3 shows the organization of the project team for the waste delisting activities.

2.2 Responsibility For Quality Assurance and Quality Control

The responsibilities of key members of the project team are summarized in the following subsections.

2.2.1 ExxonMobil Corporation

As applicant for the waste delisting petition, ExxonMobil is the primary point of contact during this project including responding to comments, if any, regarding all application materials. ExxonMobil has overall responsibility for all phases of project implementation, including approval of the strategies and activities required to complete the project. ExxonMobil responsibilities include:

- Provide direction to staff and subcontractors;
- Ensure staff has appropriate and required health and safety training;
- Provide necessary equipment, facilities, and staffing are available to implement the project;
- Coordinate field activities; and
- Collect the sample in the field.

2.2.2 Environmental Resources Management

ERM will report to ExxonMobil and is responsible for the execution of the work and for issuing all project deliverables. ERM is responsible for managing the scope and schedule of the delisting process. Figure 3 shows the organization for the delisting process. As part of this responsibility ERM will:

- Maintain the budget and schedule of work;
- Develop and execute QA / QC activities;
- Coordinate with ExxonMobil on scheduling of sampling;
- Coordinate with the laboratory in scheduling analyses;

- Assess compliance with the QAPP;
- Evaluate corrective measures if problems occur; and
- Assist in the preparation of the waste delisting petition.

2.2.3 Laboratory Subcontractors

For the purpose of this quality manual, ALS Laboratory Group (ALS) of Houston, Texas has been selected as the laboratory subcontractor and will be subcontracted by ERM to perform the analytical testing for the waste delisting process.

If the need arises to outsource testing for because of project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, ALS must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments.

When outsourcing analytical services, ALS will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this QAPP. All QC guidelines specific to the analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-The National Environmental Laboratory Accreditation Conference (NELAC) Institution (TNI) accredited work where required. Project Managers (PMs), Client Service Managers (CSM), or Account Executives (AE) for the Export Lab are responsible for obtaining ERM approval prior to subcontracting any samples. The laboratory will advise ERM of a subcontract arrangement in writing and when possible approval from the client shall be retained.

3. DATA QUALITY OBJECTIVES

This section presents the intended data usage and QA objectives for the sampling and analysis that will be performed during the waste delisting process. The overarching Data Quality Objective (DQO) is to generate data that is adequately complete, documented, and suitable for making decisions regarding the classification of the PTS. The following process was used to establish the data objectives:

1. *State the problem that the data collection is designed to address* – The data collected will be used to determine representative concentrations of the various organic and inorganic compounds in the PTS generated at the ExxonMobil JRF.
2. *Identify the decisions to be made with the data obtained* – The data will be used to decide if the PTS generated at the ExxonMobil JRF can be delisted and determined to be non-hazardous wastes.
3. *Identify the types of data inputs needed to make a decision* – Collect PTS samples that are representative of the current waste chemical concentrations and hazardous waste characteristics for laboratory analysis.
4. *Define the bounds of the data to be collected* – PTS samples will be used to assess chemical characteristics of the wastes.
5. *Identify the possible decision errors* – associated sampling and measurement decision errors are as follows:
    a. Sample Error (Field Variability)
        - Inherent variability
        - Sampling design, including sampling frame selection, sampling unit definition, selection probabilities, and/ or number of samples
    b. Measurement Error (Measurement Variability)
        - Physical sample collection including, support volume/mass, sample delineation, and/ or sample extraction
        - Sample handling including, preservation, packing, labeling, transport, and / or storage
        - Analysis including, preparation, subsampling, extraction, analytical determination, and/or data reduction

3.2 Intended Data Usage

The data collected during field activities will be used to characterize the PTS at the JRF WWTP. The data collected during the field activities will be compared with EPA defined standards to assess if the PTS: Additionally, the data will be analyzed using the EPA Delisting Risk Assessment Software (DRAS). The DRAS will be used as a screening step to model and evaluate risk from disposal of waste proposed for delisting.

- Contains the constituents of concern for the listed wastes F037, F038, K048 and K051;
- Exhibits the hazardous waste characteristics listed in 40 CFR 261, Subpart C (*i.e.*, characteristics of ignitability, corrosivity, reactivity, or toxicity); and/ or
- Exhibits any other factors that could cause it to be considered hazardous.

The analytical results will be presented in the PTS waste delisting petition to be submitted to the IEPA.

3.3 Field Investigation and Testing Objectives

The primary objectives of the field investigation and testing objectives include:

- Collecting representative samples of the PTS; and
- Assessing the PTS analytical data for use in the delisting petition which will include:
  - Comparison of the data collected to EPA defined standards; and
  - Data analysis using the DRAS to model and evaluate risk from disposal.

3.4 Data Quality and Measurement Objectives

The purpose of the DQOs is to establish target levels for data that is collected (through the sampling and analytical program) that can be compared to assess if they are of appropriate quality to produce documented, consistent, and technically defensible results. These results ultimately will define the characteristics and constituent concentrations present in the PTS. Accordingly, in order to verify that chemical analyses and laboratory QA / QC is consistent, a laboratory that follows the NELAC standards and follows the United States Environmental Protection Agency (EPA) SW-846 test methods will be utilized.

The quality of measurements made and the data generated will be evaluated in terms of the following characteristics;

- Method Detection Limit (MDL) or Estimated Detection Limit (EDL);
- Reporting Limit (RL);
- Representativeness;
- Precision and Accuracy;
- Completeness; and
- Comparability.

Specific objectives for each characteristic are established to develop sampling protocols and identify applicable documentation, sample handling procedures, and measurement system procedures. These objectives are established based on-site conditions, objectives of the project, and knowledge of available measurement systems.

In addition, the following criteria for chemical sample handling and analysis will help attain the DQOs:

- Standard EPA chain-of-custody procedures (which are described in later sections of this report); and
- Analytical testing will be performed according to SW-846 methods.

3.4.1 Method Detection Limit and Reporting Limit

The MDL is the lowest concentration for which there is at least a 95 percent chance that an analyte will be positively detected. For dioxins/furans analyses an EDL may be used in lieu of an MDL. An EDL is the quantitative value based upon sample extract per analyte per injection measured 2.5:1 signal to noise. The RL is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Actual MDLs, EDLs, and RLs reported by the laboratory may vary due to the nature of individual samples.

3.4.2 Representativeness

Measurements will be made so that analytical results are as representative as practical of the actual field conditions. Samplings protocols will be utilized to help assure that samples collected are representative of the media present in the field.

Sample handling protocols, including such tasks as storage, transportation, and preservation, will be structured to protect the representativeness of the samples gathered during the project. Proper documentation in the field and the laboratory will verify whether protocols are followed, and whether sample identification and integrity are preserved. Data representativeness will be achieved by performing field sampling and laboratory testing and analysis in a standardized manner that adheres to the procedures specified in the SAP for the PTS.

Representativeness will be assessed also by comparing the results of field duplicates to assess the variability in the analytical results. The results of QC blanks will be examined for evidence of contamination unrelated to the site on sampling activities. Such contamination may be cause for invalidation or qualification of affected samples. Sample analytical data classified as “questionable” or “qualitative” by any of the above criteria may be invalidated.

3.4.3 Precision and Accuracy

Precision is a characteristic that reflects the ability to replicate a previously obtained value using identical testing procedures, while accuracy reflects the ability to obtain a value that equals, or approaches with certain predetermined limits, the true value of a certain phenomenon. DQOs for precision and accuracy are established under the Contract Laboratory Program (CLP) guidelines for each major parameter to be measured during the project.

Accuracy measurements will be performed by the contract laboratory on fortified samples as specified in Appendix A. Duplicate samples will be collected as defined in the SAPs. Precision of sample collection can be measured by comparing analytical results of samples and duplicate samples. The variation in results is a measure of precision. Precision can be expressed as the relative percent difference (RPD), which is determined using the formula shown in Appendix A (and in SW-846).

The precision and accuracy control limits (in terms of spike recoveries, replicate results, *etc*.) that must be met for the Routine Analytical Services (RAS) analytical data to be considered acceptable are established under CLP guidelines. Appendix A provides acceptable precision and accuracy limits for waste delisting sampling activities. These control limits for accuracy and precision will be utilized to identify outliers (data results outside the specified control limits). If outliers occur or if contamination is detected in the blanks, the corresponding analytical results will be flagged as follows:

- The problem will be discussed in the data validation report (including a list of the potentially affected samples);
- The problem and its implications will be discussed in the appropriate report; and
- The compounds will be noted and explanatory text included in the summary table.

3.4.4 Completeness and Comparability

The characteristic of completeness is a measure of the amount of valid data (or samples) obtained compared to the amount that was specified to be obtained under normal conditions. The objective for completeness is to provide enough valid data to ensure the goals of the field investigation are met. Completeness of the analysis will be documented by the laboratory with data such as blanks, duplicates, and matrix spikes to allow the data user to assess the quality of the results.

Comparability expresses the confidence that one set of analytical data may be compared with another. Data sets that can be used for comparison include results of studies conducted previously in the area. Comparability is maintained by the use of standard analytical methods. Also, the personnel involved in data acquisition and reduction must operate measurement systems within the calibrated range of the particular instrument as well as utilize analytical methodologies that produce comparable results.

The comparability of field investigation tasks (*e.g.*, PTS sampling technique) will be maintained using established EPA Technical Guidance documents, and / or the SAPs.

3.5 Analytical Methods and DQOS

Analytical testing will be performed according to SW-846 Methods. Table 1 and Table 2 of this QAPP provides a summary of various analytical methods that are specified for use during the waste delisting activities. The QA manuals included in Appendix A of this QAPP enlist the numerical DQOs for the specified methods listed in Table 1 and Table 2. Details on sample container volume, sample preservations, and holding time are also presented in Appendix A (ALS Houston Quality Assurance Manual, Appendix F).

4. SAMPLING PROCEDURES

The objective of PTS sampling procedures is to obtain samples and measurements that are representative of the medium being investigated. Through the use of proper sampling tools, sampling techniques, and equipment decontamination procedures, the potential for cross contamination due to trace levels of chemicals will be reduced. These procedures are described further in the SAP for the waste.

5. SAMPLE HANDLING, DOCUMENTATION, AND CUSTODY

The purpose of specific procedures for sample handling, documentation and custody is to maintain the integrity of samples during collection, transportation, analysis and reporting. These procedures are necessary to validate the history of sample data, from collection through reporting, by providing adequate documentation. Designated chain of custody (CoC) forms will be completed after sampling to record the sequence of custody, transport, and analysis. An example CoC form from ALS Laboratory is presented in Appendix B.

Additionally sample handling, documentation and custody procedures are provided in the SAP. QA / QC checks will be performed during the field activities to assess whether the procedures elaborated in the SAP are followed. ExxonMobil will perform the QA / QC check prior to packaging the samples and transportation to the designated laboratory.

6. QUALITY ASSURANCE PROCEDURES FOR ANALYTICAL LABORATORY ACTIVITIES

ALS will perform the PTS analysis during the delisting activities. A copy of ALS's laboratory *Quality Assurance Manual* is provided in Appendix A. This plan includes the laboratory's internal QA / QC procedures that cover the aspects of QA / QC during implementation of laboratory procedures and technical quality systems.

7. QUALITY ASSURANCE PROCEDURES FOR FIELD ACTIVITIES

This section describes the QA / QC procedures related to the field activities during the collection, handling, labeling, packaging, preservation, and custody of samples for chemical analysis. These procedures also are described in the SAP.

Field QA / QC samples will be used to verify that sample collection and handling do not affect the quality of samples that will be subjected to chemical analyses. This section discusses the preparation and collection frequency of field QA / QC samples consisting of field blanks, trip blanks, duplicates, and matrix spike / matrix spike duplicates for PTS. This section also provides a general guidance on maintaining QA / QC on the subsequent activities to ensure the goals of the field activities are met.

7.1 Internal Quality Control

Field QA/QC samples will follow the procedures set in accordance with the SAP for PTS. The required analyses and the amount of sample needed to complete the analyses will be evaluated prior to sampling. The minimum required quantity of sample matrix to perform the analyses will be collected.

Trip Blanks – Trip blanks are typically used to assess the potential for Volatile Organic Compound (VOC) contamination during sample shipment and storage. Trip blanks will be provided by the laboratory for analysis of select VOC constituents. The trip blanks will not be opened in the field. One trip blank per sampling event will be selected for analysis as a single sampling cooler is anticipated. If more than one cooler is needed for a sampling event, all sample bottles for VOC analysis will be placed in the same cooler as the trip blank.

Duplicates – During at least two delisting petition sampling events, two PTS samples (one primary sample and one duplicate sample) will be collected. Unless otherwise indicated by analytical results or other factors, only two duplicate samples will be collected for the entire delisting petition sampling program. These duplicates will be assigned separate sample identification numbers from the actual field sample such that the laboratory will not be able to identify that this is the same as one of the other samples. The PTS duplicates will be submitted for the same analysis as primary samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - As part of the laboratory's internal QA/QC procedures, one MS/MSD sample will be analyzed to provide a measurement of matrix effects on analytical procedures. A set of MS/MSD sample will be collected during one sampling event in addition to, and at the same time as, one of the investigative samples.

7.2 Equipment

New or dedicated equipment will be utilized for collecting samples. Using the correct equipment for sampling is important in meeting the objectives of QA / QC. New, laboratory supplied equipment such as sample containers are generally uncontaminated. However, a simple visual QA / QC check of any containers in cases that were opened may identify potential issues. Preprinted labels with relevant information will be ordered from the laboratory to maintain consistency in identification of the samples and to prevent any errors in marking the bottles.

7.2.1 Sampling Equipment Decontamination

A dedicated bucket will be used to reduce cross contamination. The bucket will be stored securely in a covered location between each sampling event. Following each sampling event each bucket will undergo decontamination as described in the SAPs.

7.2.2 Supplies and Consumables

Sampling tools required for the collection of the samples (*e.g.,* scoop, spoon, or trowel) will be inspected prior to the sampling event. Standard material such as sample containers, and distilled water will be inspected for tamper proof seals. If the seals appear to be broken, the material will not be used in the collection of the samples. Reusable equipment will be decontaminated prior to, and between the uses as specified in the SAPs.

7.3 Field Documentation

Field documentation forms and calculation work sheets (if any) utilized during the field investigations will be maintained accurately and in accordance with the requirements of the SAP. Specific details on field documentation entries can be found in the SAP. Copies of field forms will be included in the project reports as appropriate.

7.4 Procedures to Assess Precision, Accuracy, Completeness, and Comparability

Quantitative levels for precision and accuracy have not been specified for field measurements because field instruments will not be used in the PTS sampling process.

7.5 Corrective Action

If QA audits of data result in detection of unacceptable data, ERM will be responsible for developing and initiating corrective action. Corrective action for sampling procedures may include evaluating and amending sampling procedures, or re-sampling (see Section 11 for additional details regarding potential corrective action).

8. DATA REDUCTION, ASSESSMENT AND VALIDATION

8.1 Laboratory Data

Reduction of laboratory measurements and laboratory reporting of analytical parameters will be in accordance with the procedures specified for each analytical method (*i.e.*, perform laboratory calculations in accordance with the method-specified procedure). Upon receipt of the laboratory data, the designated project team member will execute the following reduction, assessment and reporting scheme:

- Laboratory data will be screened for inclusion and frequency of the necessary QC supporting information (*i.e.*, detection limit verification, initial calibration, continuing calibration, duplicates, spikes, reagent blanks). QC information not included, or of insufficient frequency, will be caused to designate the affected measurement data as qualified or rejected. Requests for reanalysis or for additional QC supporting information can be made at this point.
- QC supporting information will then be screened for QC data outside established control limits and, if out-of-control data are discovered, for appropriate corrective action. Certain out-of-control data without appropriate corrective action will be caused to designate the affected measurement data as qualified or rejected. Requests for re-analysis can be made at this point.

For the other out-of-control QC samples and criteria, either samples are assigned laboratory flags qualified per the CLP Statements of Work or no corrective action is specified. This includes serial dilution, matrix spikes and duplicates, and EPA-approved standards. Thus, it is recognized that, if a laboratory is operating per protocol and no error or anomaly has occurred during sample preparation and analysis, the data were generated by a system that was in control. The existence of qualified results does not automatically invalidate data. This latter point is repeatedly emphasized in the EPA Functional Guidelines for Evaluating Inorganics Analysis (EPA 1988) and is inherently acknowledged by the very existence of the data validation/flagging guidelines. The goal to produce the best possible data does not necessarily mean producing data without QC qualifiers. Some qualifiers can provide useful information.

8.2 Data Management

Well-established procedures for data management are important for tracking field and laboratory data, maintaining quality control, and for production of deliverables. Upon successful completion of the data assessment process, the data generated for the investigation will be stored in an electronic database. In addition, an integrated GIS system may be used to further manage spatial data was well as AutoCad to create figures.

Analytical data will be delivered in electronic report format (pdf) and as an electronic data deliverable (EDD). The EDDs will be in database format to facilitate entry into an EQuIS database. At the time of EDD receipt, electronic data will be verified against pdf data reports. Data review and evaluation will be performed by the laboratory and ERM for the purpose of assessing data quality and usability.

All documents including laboratory reports, field logs, QA reports, *etc.* will be retained for a minimum of 5 years. Data summaries and results will be submitted to the EPA in the delisting petitions. Data management details are also provided in the SAPs.

8.3 Data Validation

Data validation is an evaluation of laboratory data quality based on a review of the data deliverables through calibration and other method-specific performance criterion. The data packages will receive a data package completion check from the corresponding laboratory generating the data package to help assess whether the deliverable requirements specified for this project have been satisfied.

Data reviews will be conducted as the data are received to assess whether the QC criteria established for the associated analytical methods and the DQOs established for this project have been met. ERM will perform a full data validation on 100 percent of the data packages generated.

9. AUDITS

Data audits involve a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements. Quality assurance audits will be performed to assess whether the QA / QC measures are being utilized to provide data of acceptable quality. The audits will be completed to verify that subsequent calculation, interpretation, and other project outputs are checked and validated.

9.1 Field Systems Audit

Field systems audits will address whether field tools are selected and used in such a manner as to meet the requirements specified by the project objectives stated in this plan.

Field documentation and sample custody records will be reviewed. During the audit, data handling procedures will be reviewed with the appropriate personnel. Accuracy, consistency, documentation, and appropriate selection of methodologies will be discussed.

9.2 Laboratory Audit

Due to the limited duration of the sampling program, no laboratory audits are proposed.

10. PREVENTATIVE MAINTENANCE

Preventative maintenance for laboratory equipment is described in Appendix A.

11. CORRECTIVE ACTION

Corrective or preventive action is required when potential or existing conditions are identified that may have an adverse impact on data quality. Corrective action can be immediate or long term. In general, any member of the project staff who identifies a condition adversely affecting quality can initiate corrective action by notifying in writing their supervisor. The written communication will identify the condition and explain how it may affect data quality. Corrective action in the field is the responsibility of the on-site staff. This includes reviewing the procedures to be followed prior to sampling events and checking the procedures taking place after the sampling event is completed. Corrective action with regard to laboratory analysis is the responsibility of the designated laboratory, and is described in Appendix A.

11.1 Immediate Corrective Action

This type of corrective action is usually applied to spontaneous, nonrecurring problems, such as instrument malfunction. The individual who detects or suspects nonconformance to previously established criteria or protocol in equipment, instruments, data, methods, etc., will immediately notify his/her supervisor. The supervisor and the appropriate task leader will then investigate the extent of the problem and take necessary corrective steps. If a large quantity of data is affected, ERM will prepare a memorandum to ExxonMobil. ERM and ExxonMobil will collectively decide on a course of action to correct the deficiencies while the project continues to proceed. If the problem is limited in scope, the task leaders will decide on a corrective action measure, document the solution, and notify the project team.

11.2 Long-Term Corrective Action

Long-term corrective action procedures are devised and implemented to reduce the potential for the recurrence of a potentially serious problem. The project team will be notified of the problem and will conduct an investigation to determine the severity and extent of the problem. Corrective actions may be initiated as a result of other activities such as audits. ExxonMobil will be responsible for documenting the notification, recommendations, final decisions, and notifying project staff and implementing the agreed upon course of action. ERM will be responsible for developing and implementing routine program controls to reduce the need for corrective action. The development and implementation of preventive and corrective actions will be timed, to the extent possible, to assess any adverse impact on project schedules and subsequent data generation/processing activities. However, scheduling delays will not override the decision to correct the data collection deficiencies before proceeding with additional data collection.

12. POLLUTION CONTROL

It is ALS's policy to evaluate each method and look for opportunities to minimize waste generated during laboratory analysis (*i.e.*, examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

13. WASTE MANAGEMENT

Waste management practices will be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed.

13.1 Waste Streams

The following waste streams are produced when this method is carried out.

- Solvent waste generated by the sample extracts. Samples are collected in a satellite container until they are taken to the vail drum.
- Expired standards. Old standards are collected and placed into the solvent waste drum. Neat standards will be disposed of by lab pack.
- All waste that is disposed of in the hazardous waste room is logged into a book that tells when and how much waste was added to the drum.

REFERENCES

EPA, SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

EPA, Functional Guidelines for Evaluating Inorganics Analysis, July 1, 1988

ALS Houston, Quality Assurance Manual, ALSHS-QAM, REV 12.0, April 12, 2022

TABLES

TABLE 1

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Metals	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Antimony	X			6000 / 7000	1311 / 6000 / 7000
Arsenic	X	X		6000 / 7000	1311 / 6000 / 7000
Barium	X	X		6000 / 7000	1311 / 6000 / 7000
Beryllium	X			6000 / 7000	1311 / 6000 / 7000
Cadmium	X	X		6000 / 7000	1311 / 6000 / 7000
Chromium	X	X	X	6000 / 7000	1311 / 6000 / 7000
Cobalt	X			6000 / 7000	1311 / 6000 / 7000
Copper	X			6000 / 7000	1311 / 6000 / 7000
Lead	X	X	X	6000 / 7000	1311 / 6000 / 7000
Mercury	X	X		6000 / 7000	1311 / 6000 / 7000
Nickel	X		X	6000 / 7000	1311 / 6000 / 7000
Selenium	X	X		6000 / 7000	1311 / 6000 / 7000
Silver	X	X		6000 / 7000	1311 / 6000 / 7000
Thallium	X			6000 / 7000	1311 / 6000 / 7000
Tin	X			6000 / 7000	1311 / 6000 / 7000
Vanadium	X			6000 / 7000	1311 / 6000 / 7000
Zinc	X			6000 / 7000	1311 / 6000 / 7000
Volatile Organic Compounds					
1,1,1,2-Tetrachloroethane	X			8260	8260 / 1311
1,1,1-Trichloroethane	X			8260	8260 / 1311
1,1,2,2-Tetrachloroethane	X			8260	8260 / 1311
1,1,2-Trichloroethane	X			8260	8260 / 1311
1,1-Dichloroethane	X			8260	8260 / 1311
1,1-Dichloroethylene	X	X		8260	8260 / 1311
1,2-Dibromoethane	X			8260	8260 / 1311
1,2-Dichloroethane		X		8260	8260 / 1311
1,2-Dichloropropane	X			8260	8260 / 1311
1,4-Dioxane	X			8260	8260 / 1311
Acetone	X			8260	8260 / 1311
Acetonitrile	X			8260	8260 / 1311
Acrolein	X			8260	8260 / 1311
Acrylonitrile	X			8260	8260 / 1311
Benzene	X	X	X	8260	8260 / 1311
Bromodichloromethane	X			8260	8260 / 1311
Bromoform	X			8260	8260 / 1311
Carbon disulfide	X			8260	8260 / 1311
Carbon tetrachloride	X	X		8260	8260 / 1311
Chlorobenzene	X	X		8260	8260 / 1311
Chlorodibrmomethane (Dibromochloromethan	X			8260	8260 / 1311
Chloroethane	X			8260	8260 / 1311
Chloroform	X	X		8260	8260 / 1311
cis-1,3-Dichloropropene	X			8260	8260 / 1311
Dibromomethane (Methylene bromide)	X			8260	8260 / 1311
Dichlorodifluoromethane	X			8260	8260 / 1311
Ethyl methacrylate	X			8260	8260 / 1311
Ethylbenzene	X		X	8260	8260 / 1311
Iodomethane (Methyl iodide)	X			8260	8260 / 1311
Isobutyl alcohol	X			8260	8260 / 1311
Methyl methacrylate	X			8260	8260 / 1311
Methylene chloride	X			8260	8260 / 1311
Pentachlorobenzene	X			8260	8260 / 1311
Tetrachloroethylene	X	X		8260	8260 / 1311
trans-1,2-Dichloroethylene	X			8260	8260 / 1311
trans-1,3-Dichloropropene	X			8260	8260 / 1311
Trichloroethylene	X	X		8260	8260 / 1311
Trichlorofluoromethane	X			8260	8260 / 1311
Vinyl chloride	X	X		8260	8260 / 1311
Xylene	X		X	8260	8260 / 1311

TABLE 1 (Contd.)

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Volatile Organic Compounds (cont'd)	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Methacrylonitrile	X			8260	8260 / 1311
Methyl bromide	X			8260	8260 / 1311
Methyl ethyl ketone	X	X		8260	8260 / 1311
Methyl isobutyl ketone (4-Methyl-2-pentanone	X			8260	8260 / 1311
Toluene	X		X	8260	8260 / 1311
2-Chloro-1.3-butadiene (Chloroprene)	X			8260	8260 / 1311
3-Chloropropylene (Allyl chloride)	X			8260	8260 / 1311
Ethyl cyanide (Propanenitrile)	X			8260	8260 / 1311
m-Dichlorobenzene	X			8260	8260 / 1311
o-Dichlorobenzene	X			8260	8260 / 1311
p-Dichlorobenzene	X	X		8260	8260 / 1311
Methyl chloride	X			8260	8260 / 1311
2-Hexanone	X			8260	8260 / 1311
2-Picoline	X			8260	8260 / 1311
o-Toluidine	X			8260	8260 / 1311
p-(Dimethylamino)azobenzene	X			8260	8260 / 1311
Pentachloroethane	X			8260	8260 / 1311
p-Phenylenediamine	X			8260	8260 / 1311
Vinyl acetate	X			8260	8260 / 1311
Styrene	X			8260	8260 / 1311
trans-1,4-Dichloro-2-butene	X			8260	8260 / 1311
Semivolatile Organic Compounds					
1,2,4,5-Tetrachlorobenzene	X			8270	8270 / 1311
1,2,4-Trichlorobenzene	X			8270	8270 / 1311
2,3,4,6-Tetrachlorophenol	X			8270	8270 / 1311
2,4,5-Trichlorophenol		X		8270	8270 / 1311
2,4,6-Trichlorophenol		X		8270	8270 / 1311
2,4-Dichlorophenol	X			8270	8270 / 1311
2,4-Dimethylphenol	X			8270	8270 / 1311
2,4-Dinitrophenol	X			8270	8270 / 1311
2,4-Dinitrotoluene	X	X		8270	8270 / 1311
2,6-Dichlorophenol	X			8270	8270 / 1311
2,6-Dinitrotoluene	X			8270	8270 / 1311
2-Acetylaminofluorene	X			8270	8270 / 1311
2-Chloronaphthalene	X			8270	8270 / 1311
2-Chlorophenol	X			8270	8270 / 1311
2-Naphthylamine	X			8270	8270 / 1311
3-Methylcholanthrene	X			8270	8270 / 1311
4-Aminobiphenyl	X			8270	8270 / 1311
5-Nitro-o-toluidine	X			8270	8270 / 1311
Acenaphthene	X		X	8270	8270 / 1311
Acenaphthylene	X			8270	8270 / 1311
Acetophenone	X			8270	8270 / 1311
Aniline	X			8270	8270 / 1311
Anthracene	X		X	8270	8270 / 1311
Benzo(a)anthracene	X		X	8270	8270 / 1311
Benzo(a)pyrene	X		X	8270	8270 / 1311
Benzo(b)fluoranthene	X			8270	8270 / 1311
Benzo(ghi)perylene	X			8270	8270 / 1311
Benzo(k)fluoranthene	X			8270	8270 / 1311
Bis(2-chloroethoxy)methane	X			8270	8270 / 1311
Bis(2-chloroethyl)ether	X			8270	8270 / 1311
Bis(2-ethylhexyl) phthalate	X		X	8270	8270 / 1311
Butyl benzyl phthalate	X			8270	8270 / 1311
Chlorobenzilate	X			8270	8270 / 1311
Chrysene	X		X	8270	8270 / 1311
Di-n-butyl phthalate	X		X	8270	8270 / 1311
Di-n-octyl phthalate	X			8270	8270 / 1311
Dibenz(a,h)anthracene	X			8270	8270 / 1311

TABLE 1 (Contd.)

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Semivolatile Organic Compounds (cont'd)	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Diethyl phthalate	X			8270	8270 / 1311
Dimethyl phthalate	X			8270	8270 / 1311
Diphenylamine	X			8270	8270 / 1311
Fluoranthene	X			8270	8270 / 1311
Fluorene	X		X	8270	8270 / 1311
Hexachlorobenzene	X	X		8270	8270 / 1311
Hexachlorobutadiene	X	X		8270	8270 / 1311
Hexachlorocyclopentadiene	X			8270	8270 / 1311
Hexachloroethane	X	X		8270	8270 / 1311
Hexachloropropene	X			8270	8270 / 1311
Indeno(1,2,3-cd)pyrene	X			8270	8270 / 1311
Isodrin	X			8270	8270 / 1311
Isosafrole	X			8270	8270 / 1311
Kepone	X			8270	8270 / 1311
Methapyrilene	X			8270	8270 / 1311
Methyl methanesulfonate	X			8270	8270 / 1311
Naphthalene	X		X	8270	8270 / 1311
Nitrobenzene	X	X		8270	8270 / 1311
N-Nitrosodi-n-butylamine	X			8270	8270 / 1311
N-Nitrosomethylethalamine	X			8270	8270 / 1311
N-Nitrosomorpholine	X			8270	8270 / 1311
N-Nitrosopiperidine	X			8270	8270 / 1311
N-Nitrosopyrrolidine	X			8270	8270 / 1311
Pentachloronitrobenzene	X			8270	8270 / 1311
Pentachlorophenol	X	X		8270	8270 / 1311
Phenacetin	X			8270	8270 / 1311
Phenanthrene	X		X	8270	8270 / 1311
Phenol	X		X	8270	8270 / 1311
Pronamide	X			8270	8270 / 1311
Pyrene	X		X	8270	8270 / 1311
Pyridine	X	X		8270	8270 / 1311
Safrole	X			8270	8270 / 1311
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	X			8270	8270 / 1311
Aramite	X			8270	8270 / 1311
Chlorobenzilate	X			8270	8270 / 1311
Dieldrin	X			8270	8270 / 1311
Disulfoton	X			8270	8270 / 1311
Famphur	X			8270	8270 / 1311
m-Cresol	X	X		8270	8270 / 1311
methyl parathion	X			8270	8270 / 1311
o-Cresol	X	X		8270	8270 / 1311
Parathion	X			8270	8270 / 1311
p-Cresol	X	X		8270	8270 / 1311
4,6-Dinitro-o-cresol	X			8270	8270 / 1311
p-Nitroaniline	X			8270	8270 / 1311
p-Nitrophenol	X			8270	8270 / 1311
p-Chloroaniline	X			8270	8270 / 1311
Cresol	X	X		8270	8270 / 1311
Phorate	X			8270	8270 / 1311
2,4-Dichlorophenoxyacetic acid (2,4-D)	X	X		8270	8270 / 1311
2-Methylnaphthalene	X			8270	8270 / 1311
4-Chlorophenyl phenyl ether	X			8270	8270 / 1311
Benzyl alcohol	X			8270	8270 / 1311
Dibenzofuran	X			8270	8270 / 1311
Isophorone	X			8270	8270 / 1311
1,4-Naphthoquinone	X			8270	8270 / 1311
1-Naphthylamine	X			8270	8270 / 1311
3,3'-Dichlorobenzidine	X			8270	8270 / 1311
3,3'-Dimethylbenzidine	X			8270	8270 / 1311
4-Nitroquinoline 1-oxide	X			8270	8270 / 1311
7,12-Dimethylbenz(a)anthracene	X			8270	8270 / 1311
alpha, alpha-Dimethylphenethylamine	X			8270	8270 / 1311

TABLE 1 (Contd.)

Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Semivolatile Organic Compounds (cont'd)	Appendix IX	40 CFR 261.24	Waste Code COC	SW 846 Method (Totals)	SW 846 Method (TCLP)
Bis(2-chloro-1-methylethyl) ether	X			8270	8270 / 1311
Dimethoate	X			8270	8270 / 1311
Ethyl methanesulfonate	X			8270	8270 / 1311
Hexachlorophene	X			8270	8270 / 1311
m-Dinitrobenzene	X			8270	8270 / 1311
m-Nitroaniline	X			8270	8270 / 1311
N-Nitrosodiethylamine	X			8270	8270 / 1311
N-Nitrosodimethylamine	X			8270	8270 / 1311
N-Nitrosodiphenylamine	X			8270	8270 / 1311
O,O-Diethyl O-2-pyrazinyl phosphorothioate	X			8270	8270 / 1311
o-Nitroaniline	X			8270	8270 / 1311
o-Nitrophenol	X			8270	8270 / 1311
Tetraethyl dithiopyrophosphate	X			8270	8270 / 1311
Organochlorine Pesticides					
4,4'-DDD	X			8290	8290/1311
4,4'-DDE	X			8290	8290/1311
4,4'-DDT	X			8290	8290/1311
Aldrin	X			8290	8290/1311
alpha-BHC	X			8290	8290/1311
beta-BHC	X			8290	8290/1311
Chlordane	X	X		8290	8290/1311
delta-BHC	X			8290	8290/1311
Dieldrin	X			8290	8290/1311
Endosulfan I	X			8290	8290/1311
Endosulfan II	X			8290	8290/1311
Endosulfan sulfate	X			8290	8290/1311
Endrin	X	X		8290	8290/1311
gamma-BHC	X	X		8290	8290/1311
Heptachlor	X	X		8290	8290/1311
Heptachlor epoxide	X	X		8290	8290/1311
Methoxychlor	X	X		8290	8290/1311
Toxaphene	X	X		8290	8290/1311
Diallate	X			8290	8290/1311
Endrin aldehyde	X			8290	8290/1311
Chlorinated Herbicides					
2,4,5-T (Trichlorophenoxyacetic acid)	X			8151	8151/1311
Silvex	X	X		8151	8151/1311
Dioxins/Furans					
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	X			8290	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	X			8290	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	X			8290	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	X			8290	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	X			8290	--
Hexachlorodibenzofurans	X			8290	--
Hexachlorodibenzo-p-dioxins	X			8290	--
Pentachlorodibenzofurans	X			8290	--
Pentachlorodibenzo-p-dioxins	X			8290	--
Tetrachlorodibenzofurans	X			8290	--
Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	X			8290	--
Polychlorinated dibenzofurans	X			8290	--
Polychlorinated dibenzo-p-dioxins	X			8290	--

TABLE 1 (Contd.)

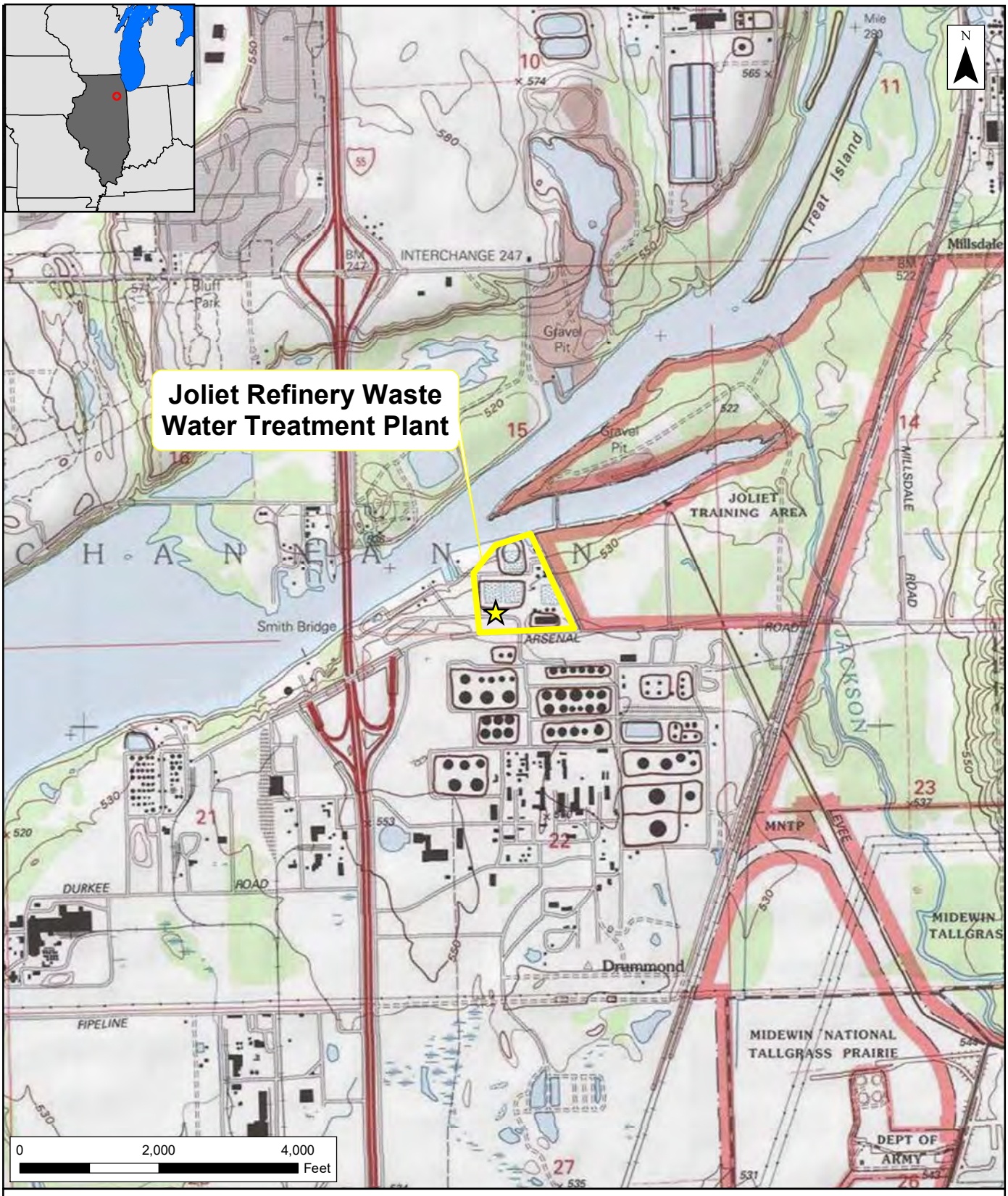
Delisting Constituent List and Analytical Methods

PTS Waste Delisting
ExxonMobil Joliet Refinery
Joliet, Illinois

Cyanide	**Appendix IX**	**40 CFR 261.24**	**Waste Code COC**	**SW 846 Method (Totals)**	**SW 846 Method (TCLP)**
Cyanide (Total) (Amenable)	X		X	9014	--
Flouride				**SW 846 Method**	
Flouride	X			4500 FC	--
Sulfide				**SW 846 Method**	
Sulfide	X			4500 SE	--
Polychlorinated biphenyl (PCB)				**SW 846 Method**	
Aroclor 1016	X			8082	--
Aroclor 1221	X			8082	--
Aroclor 1232	X			8082	--
Aroclor 1242	X			8082	--
Aroclor 1248	X			8082	--
Aroclor 1254	X			8082	--
Aroclor 1260	X			8082	--

NOTES:
TCLP - Toxicity Characteristic Leaching Procedure

FIGURES



Legend

☆ PTS (Preliminary Treatment Solids) Sampling Point

Figure 1

Site Location Map

ExxonMobil Refining and Supply Company
Joliet Refinery
Will County, IL

ERM, Inc.
ERM www.erm.com

HOU\Proj\0647752\DM\30568H(figs).pdf
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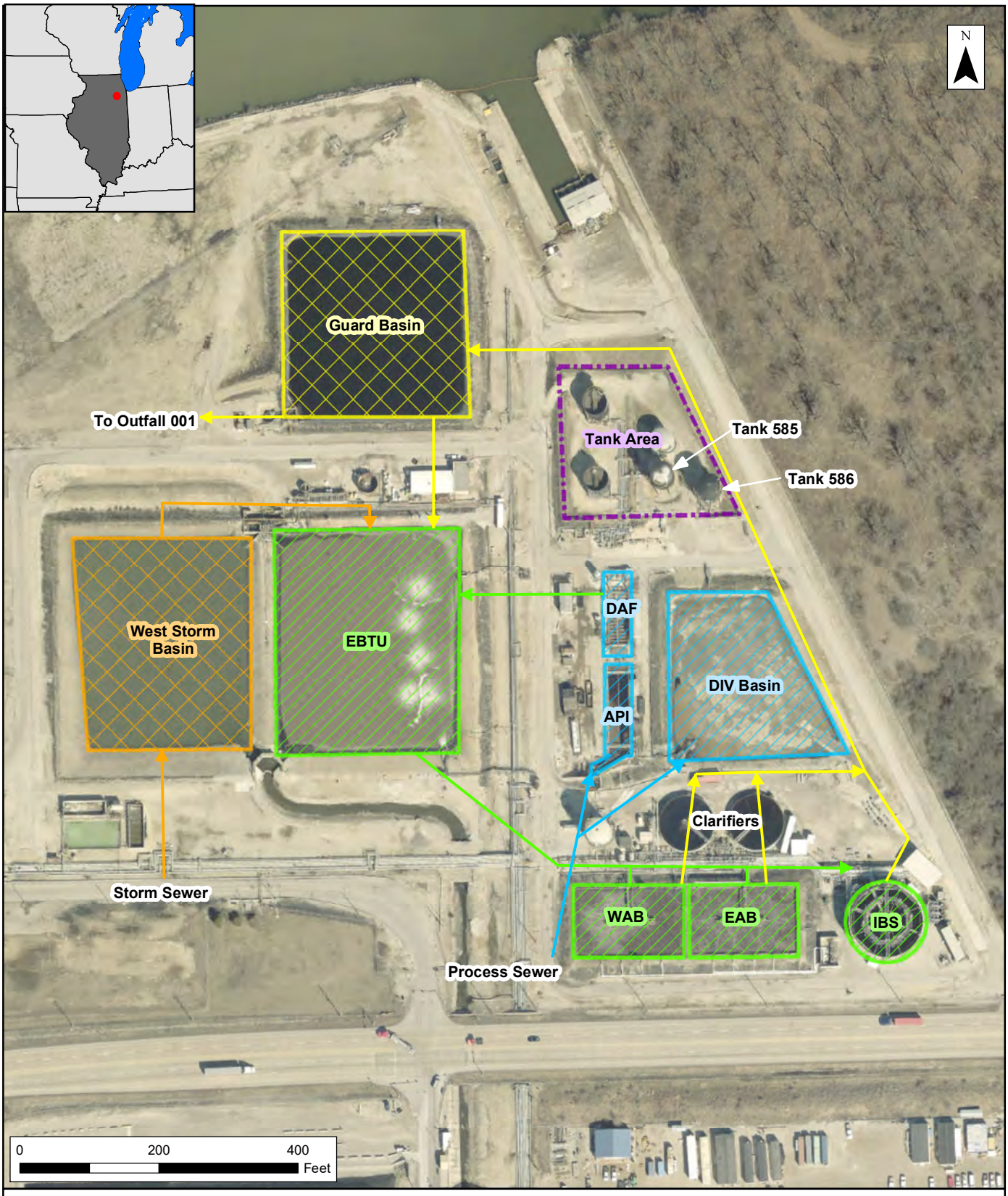

Legend

- Primary Treatment: Preflume, API, DIV (Diversion) Basin, and Dissolved Air Floatation (DAF)
- Secondary Treatment: East/West Aeration Basins (EAB/WAB), East Biological Treatment Unit (EBTU) and Integrated Biological System (IBS)
- Storm Water
- Waste Water Treatment Plant (WWTP)
- Tanks for Oil (to Ref Slop) and Solids (to

ERM, Inc.
ERM www.erm.com

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 2
Joliet Refinery Waste Water Treatment Plant
ExxonMobil Refining and Supply Company
Will County, IL

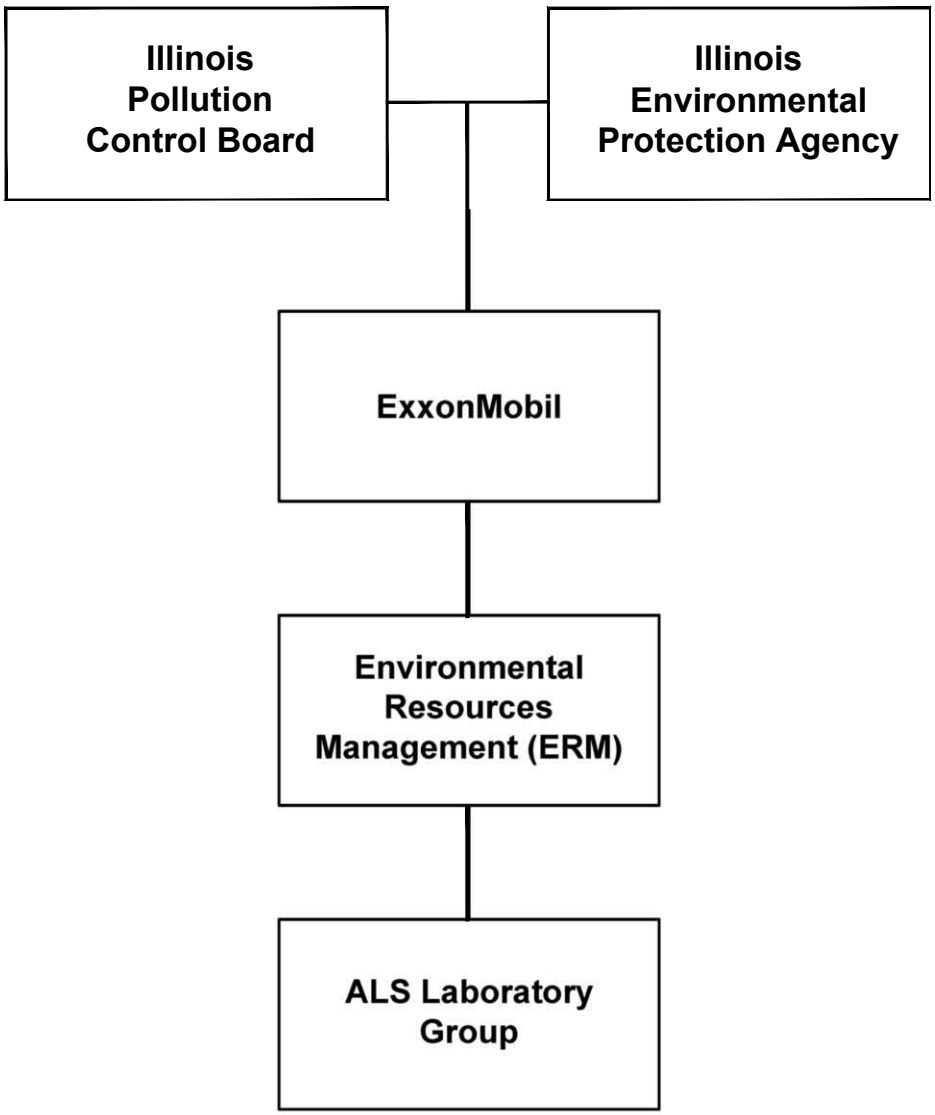

Figure 3
PROJECT ORGANIZATION CHART
FOR DELISTING ACTIVITIES
ExxonMobil Joliet Refinery
Illinois

APPENDIX A ALS HOUSTON QUALITY ASSURANCE MANUAL

QUALITY ASSURANCE MANUAL

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ALS HOUSTON QUALITY ASSURANCE MANUAL

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1) Introduction and Scope

The purpose of this Quality Assurance Manual is to outline the quality system for the Houston division of ALS Group USA, Corp (ALS USA, Corp). The Quality Assurance Manual defines the policies, procedures, and documentations that assure analytical services continually meet a defined standard of quality that is designed to provide clients with data of known and documented quality and, where applicable, demonstrate regulatory compliance. ALS SOPs are referenced in this document to direct the reader to more complete information.

We recognize that quality assurance requires a commitment to quality by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory. Laboratory management is committed to ensuring the effectiveness of its quality systems and to ensure that all tests are carried out in accordance with customer requirements. Key elements of this commitment are set forth in SOP CE-GEN001, *Laboratory Ethics and Data Integrity* and in this Quality Assurance Manual (QAM). ALS – Houston is committed to operate in accordance with these requirements and those of regulatory agencies, accrediting authorities, and certifying organizations. The laboratory also strives for improvement through varying continuous improvement initiatives and projects.

Quality Control (QC) procedures are used to continually assess performance of the laboratory and quality systems. The laboratory maintains control of analytical results by adhering to written standard operating procedures (SOPs), using analytical control parameters with all analyses, and by observing sample custody requirements. All analytical results are calculated and reported in units consistent with project specifications to allow comparability of data.

The Quality Manual sets the standard under which all laboratory operations are performed, including the laboratory's organization, objectives, and operating philosophy. This Standard is consistent with ISO/IEC 17025:2017 and all requirements that are relevant to the scope of environmental testing services and various accreditation and certification programs listed in Appendix F.

1.1 Scope of Testing

ALS Group USA, Corp provides analytical services for many matrices, including aqueous, soil, sediment, solid waste, biological tissue, and air using analytical protocols defined by EPA Approved Methods. ALS Group USA, Corp strives to provide analytical test results that are of the type and quality needed and expected by our customers.

ALS maintains certifications pertaining to various commercial and government entities. Each certification requires that the laboratory continue to perform at levels specified by the programs issuing certification. Program requirements can be rigorous; they include performance evaluations as well as annual audits of the laboratory to verify compliance.

1.2 Glossary and Acronyms Used

1.2.1 Glossary

The Terms and Definitions Section of the TNI Standard are adopted by ALS. Specifically, Modules 1-7 in the 2016 TNI Environmental Laboratory Sector Standard – Volume 1 – Management and Technical Requirements for Laboratories Performing Environmental Analysis (EL-V1, M1 through M7, ISO/IEC 17025:2017) are adopted.

1.2.2 Acronyms – See Appendix A

1.3 Management of the Quality Assurance Manual

1.3.1 The Quality Assurance Manager is responsible for maintaining the currency of the Quality Assurance Manual.

1.3.2 The Quality Manual is reviewed annually by the Quality Assurance Manager and laboratory personnel to ensure it still reflects current practices and meets the requirements of any applicable regulations or client specification.

1.3.3 The Quality Assurance Manual is considered confidential within the Houston division of ALS Group USA, Corp and may not be altered in any way except by approval of the Laboratory Director, Technical Director and Quality Assurance Manager. If it is distributed to external users, it is for the purpose of reviewing the management system and may not be used for any other purpose without written permission.

2) Organization

2.1 The laboratory is responsible for carrying out testing activities that meet the requirements of the TNI Standard, the DOD/DOE Quality Systems Manual (QSM) for Environmental Laboratories, and that meet the needs of the client, the regulatory authorities or organizations providing recognition. Through application of the policies and procedures outlined in this Section and throughout the Quality Assurance Manual:

2.1.1 Management and technical personnel have the authority and resources to carry out their duties and have procedures to identify and correct departures from the laboratory's management system.

2.1.2 Personnel understand the relevance and importance of their duties as related to the maintenance of the laboratory's management system.

2.1.3 Ethics and data integrity procedures (see SOP CE-GEN001 Ethics) ensure personnel do not engage in activities that diminish confidence in the laboratory's capabilities.

2.1.4 The purpose of the QA program at ALS Environmental, Houston is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality.

2.2 Laboratory Organizational Structure

ALS Group USA, Corp is a wholly owned subsidiary of ALS Limited. The laboratory is a commercial operation located at 10450 Stancliff Road, Suite 210, Houston, Texas, 77099. The Laboratory director, Sarah Packett can always be reached at (281) 530-5656.

An organization chart is provided in Appendix B that shows the operational structure and reporting relationships in the laboratory.

Additional information regarding responsibilities, authority and interrelationship of personnel who manage, perform or verify testing is included in Section 3 – "Management" and Section 20 – "Personnel". These Sections also include information on supervision, training, technical management, job descriptions, quality personnel, and appointment of deputies for key managerial personnel.

2.3 Impartiality, Conflict of Interest and Undue Pressure

The organizational structure indicated above minimizes the potential for conflicting or undue interests that might influence the technical judgment of analytical personnel. In addition, procedures are in place to prevent outside pressures or involvement in activities that may affect competence, impartiality, judgment, operational integrity, or the quality of the work performed at the laboratory.

2.4 The laboratory management team is responsible for and committed to safeguarding impartiality of laboratory activities, and therefore shall not allow commercial, financial or other pressures to compromise impartiality.

All employees are required to enter into the following agreements:

- **Code of Conduct Agreement**
  Provides a framework for decisions and actions in relation to conduct in employment. The agreement covers a wide range of topics including personal and professional behavior, conflicts of interest, gifts, confidentiality, legal compliance, security of information, among others. The code of conduct agreement is administered by the USA Human Resources department. This agreement is provided to the employee during the hiring and induction process and the agreement is reviewed and signed.

- **Confidentiality Agreement**
  Describes policies for identifying and protecting information owned by ALS and its customers, and for keeping this information in confidence. The confidentiality agreement is administered by the USA Human Resources department. This agreement is provided to the employee during the hiring and induction process and the agreement is reviewed and signed.

- **Ethics and Data Integrity Agreement**
  Provided to the employee as part of the hiring and induction process and reviewed during periodic ethics refresher training. This is coordinated between the Human Resources and Quality Assurance (QA) departments. This training is provided to the employee during the hiring and induction process and the Certificate of Completion is printed and signd. All employees are required to take annual ethics and data integrity refresher training

3) Management

3.1 Management Responsibility

3.1.1 The Laboratory Management includes the titles of Laboratory Director, Technical Director, Quality Assurance Manager, Information Technology Manager, Project Managers, Safety Officer and Department Supervisors/Managers. Roles and duties are defined in Section 3.2 below.

3.1.2 Management has overall responsibility for the technical operations and the authority needed to generate the required quality of laboratory operations.

3.1.3 Management ensures communication within the organization to maintain an

effective management system and to communicate the importance of meeting customer, statutory, and regulatory requirements.

3.1.4 Management assures that the system documentation is known and available so that appropriate personnel can implement their part.

3.1.5 When changes to the management system occur or are planned, managers ensure that the integrity of the system is maintained.

3.1.6 Managers implement, maintain, and improve the management system, and identify noncompliance with the management system or procedures.

3.1.7 Managers initiate actions to prevent or minimize noncompliance.

3.1.8 Management must ensure technical competence of personnel operating equipment, performing tests, evaluating results, or signing reports, and limits authority to perform laboratory functions to those appropriately trained and/or supervised, HS-QS013 Employee Training.

3.1.9 Management is responsible for defining the minimal level of education, qualifications, experience, and skills necessary for all positions in the laboratory and assuring that technical staff have demonstrated capabilities in their tasks.

3.1.10 Management must ensure training is kept up to date by periodic review of training records and through employee performance review.

3.1.11 Management bears specific responsibility for maintenance of the management system. This includes:

3.1.11.1 Defining roles and responsibilities of personnel

3.1.11.2 Approving documents

3.1.11.3 Providing required training

3.1.11.4 Providing a procedure for confidential reporting of data integrity issues, and periodically reviewing data, laboratory procedures, and documentation.

3.1.11.5 The assignment of responsibilities, authorities, and interrelationships of the personnel who manage, supervise, perform, or verify work affecting the quality of environmental tests is documented in Section 20.

3.1.11.6 Management ensures that audit findings and corrective actions are completed within required time frames.

3.1.11.7 ALS management also views risk management as a key component of its governance responsibilities and an essential process in achieving and mandating a viable organization. ALS is committed to enterprise wide risk management to ensure its corporate governance responsibilities are met and its strategic goals are realized. See SOP HS-QS023 Risks and Opportunities.

3.2 Roles and Duties

3.2.1 Laboratory Director: Responsible for all laboratory activities as the highest level manager. The Laboratory Director provides administrative, financial, operational, and technical leadership through planning, allocation and

management of personnel and resources. Provides resources for implementation of the QA program and reviews and approves the Quality Assurance Manual. Requires a BS or BA degree in Science, Engineering or Management, and five years of supervisory experience in environmental laboratory operations. This individual is an approved signatory for all facility policies and procedures.

3.2.2 Technical Director: Assures reliable data through the following activities: method development, monitoring quality control performance, monitoring the validity of generated data and corroborating the analysis performed. The Technical Director certifies that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited; reviews new methods for their applicability to a project, implements new methodology at the facility, and directs, trains and supervises individuals participating in this effort. in the case of the Technical Director's absence, Departmental Lab Managers shall maintain these duties. Requires a BS or BA degree in Science, Engineering or Management (with at least 24 college semester credits in chemistry), and five years technical supervisory experience in environmental laboratory operations. This individual is an approved signatory for all facility policies and procedures, as well as training documentation. Changes to this position must be communicated to accreditation bodies within 30 days of the change. In the event of the Technical Director being absent for more than 45 days such as on leave, accreditation bodies must be notified of the Technical Director absence.

3.2.3 Operations Manager: Manages all laboratory departments, scheduling, productivity, reporting and evaluation of analytical methodologies, project planning, budgeting, and Quality Assurance/Quality Control protocol oversight. Supports the development and execution of strategic and business plans for the business. Responsible for ensuring that the client service provided is consistent, of high quality, and meets ALS Group guidelines. Other responsibilities include conducting facility compliance reviews; providing departmental support for equipment purchases; ensures laboratory equipment is of the standard required to meet or exceed Data Quality Objectives (DQOs), resolving personnel issues; determining resource allocation; and providing supervision, training, and leadership to key laboratory staff. Assesses the results of QA/QC audits and implement improvements as required. Ensures the required turnaround time (compliance and average days) for samples is achieved and maintained whilst ensuring the highest quality of results for clients. Works closely with the Corporate Human Resource and Corporate Compliance Department to achieve the management of human resources within the laboratory including Employee Training Programs (technical, supervisory, and safety), Employee Mentoring Programs, Employee career development, Recruitment, Induction, and Performance Management.

3.2.4 Quality Assurance Manager: Has the authority and responsibility for implementing, maintaining and improving the quality system; ensures that all personnel understand the quality system. This includes coordination of QA activities within the laboratory, ensuring that personnel understand the quality system, ensuring communication takes place at all levels within the laboratory regarding the effectiveness of the quality system, evaluating the effectiveness of training; and monitor trends and continually improve the quality system. Audit

and surveillance results, control charts, proficiency testing results, data analysis, corrective and preventive actions, customer feedback, and management reviews can all be used to support quality system implementation. The QA Manager is responsible for ensuring compliance with TNI standards (and ISO, DoD QSM, etc. as applicable). The QA Manager works with laboratory staff to establish effective quality control and assessment plans and has the authority to stop work in response to quality problems. The QA Manager is responsible for maintaining the QA Manual and performing an annual review of it; reviewing and approving SOPs and ensuring the annual review of technical SOPs; maintaining QA records such as metrological records, archived logbooks, PT results, etc.; document control; conducting proficiency testing studies; approving nonconformity and corrective action reports; maintaining the laboratory's certifications and approvals; and performing internal QA audits. The QA Manager maintains a general knowledge of the analytical test methods performed in the facility. In the case of absence, the QA Generalist or the Technical Director shall maintain these duties. Requires a BS or BA degree in Science preferably in Chemistry or any other physical science and five years of experience in environmental laboratory and two years of experience in quality system management. This individual is an approved signatory for all policy and procedural documents within the facility. Changes to this position must be communicated to accreditation bodies within 30 days of the change.

The QA Manager reports directly to the Laboratory Director and reports indirectly to the ALS Quality Improvement Manager, USA. It is important to note that when evaluating data, the QA Manager does so in an objective manner and free of outside, or managerial, influence.

The ALS Quality Improvement Manager, USA is responsible for the overall QA program at all the ALS Environmental laboratories. The ALS Quality Improvement Manager, USA is responsible for oversight of QA Managers' regulatory compliance efforts (TNI, ISO, DoD, etc). In addition, may perform internal audits to evaluate compliance. This person also approves company-wide SOPs and provides assistance to the laboratory QA staff and laboratory managers as necessary.

3.2.4 Information Technology Manager: Reports directly to the Laboratory Director; responsible for maintaining the Laboratory Information Management System (LIMS) and other specific computer software and hardware pertinent to laboratory activity. Functions include maintaining the computer network, IT systems development and implementation, education of analytical staff in the use of scientific software, software implementation and control, Electronic Data Deliverables (EDDs), data back-up, data archiving, and maintaining electronic data integrity and maintaining procedures and methodologies for:maintaining historical file of software, software version and change control, defining acceptance criteria, testing, records, and approval for changes in LIMS hardware and communication equipment. The IT Manager requires an Associate of Science degree in Information Systems or Computer Science, and five years of experience in computers and network information system hardware and software. This individual is an approved signatory for policy and procedures related to Information Technology.

3.2.5 Project Managers (PM): Senior level scientists that interface with both laboratory

supervision and the client. Project Managers report to the Laboratory Director. Project Managers are responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. The PM relays the project details, requested by the customer, to the laboratory staff. The PM reviews all sample log-in information; helps direct turnaround time commitments and reviews all final reports. BS or BA degree in Science, Engineering or Management is preferred but not required and five years of experience in environmental laboratory operations. This individual is an approved signatory for client reports.

3.2.6 Client Services Manager (CSM) – The CSM is responsible for all aspects of client services within the laboratory. This includes management and oversight of Project Managers, electronic deliverables, and support functions. The laboratory provides a complete interface with clients from initial project specification to final deliverables. The Client Services Manager has the responsibility and authority to stop work in response to accreditation/certification or quality problems, or in response to similar subcontractor quality problems.

3.2.7 Health and Safety Environmental (HSE) Officer : Responsible for the administration of the laboratory's safety program: Designated as the Chemical Hygiene Officer and reports directly to the Laboratory Director. The HSE Officer is coordinator for the Safety Committee, implements safety policies, supervises new employee safety training, reviews any accidents or incidents, prepares prevention plan; monitors hazardous waste disposal, and conducts routine safety inspections. Requires a high school diploma, completion of a 40-hr OSHA Safety training course (or designate personnel) and two years of experience in the environmental laboratory. This individual is an approved signatory for all policies and procedures related to Safety. The HSE Officer has a dotted-line reporting responsibility to ALS North America HSE Manager.

3.2.8 Sample Management Supervisor: The Sample Management Office plays a key role in the laboratory QA program by handling all activities associated with receiving, storage, and disposal of samples, bottle preparation, and maintaining documentation for all samples received. SMO staff is also responsible for the proper disposal of samples after analysis. The SMO Supervisor reports to the Client Services Manager; Requires a high school diploma, and two years of experience in the environmental laboratory. This individual is an approved signatory for all policies and procedures related to Sample Management.

3.2.9 Department Supervisors/Managers: Responsible for a technical supervision of technical operation in their area of laboratory responsibility (e.g. Organics Manager). They report to the Technical Director; are full-time members of the staff and assure reliable data through the following activities: monitoring quality control, corroborating the analysis performed, and provide supervision to staff in training, assuring demonstrations of capability are performed by the departmental staff upon completion of training and then annually; they assist the Technical Director in certifying that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited. A department manager has the authority to stop work in response to quality problems in their area. Requires a BS or BA degree in Science, Engineering or Management, and five years technical supervisory experience in environmental laboratory operations. Department Managers are

approved signatories for policies and procedures for their respective areas. They are also approved signatories on raw data. Changes must be communicated to accreditation bodies within 30 days of change to this position.

3.3 Laboratory Key Personnel Deputies

The following table defines who assumes the responsibilities of key personnel in their absence if the absence is more than 15 days:

Key Personnel	Deputy
Laboratory Director	Operations Manager
QA Manager	QA Generalist
Technical Director	Organic Manager Inorganics Manager HRMS Manager
Operations Manager	HRMS Manager

3.4 Quality Policy

ALS is committed to producing legally defensible analytical data of known and documented quality acceptable for its intended use and in compliance with applicable regulatory programs. This QAM is designed to satisfy the applicable requirements of the various States, United States Environmental Protection Agency (USEPA), Current TNI Volume 1, current Department of Defense Quality Systems Manual, and current ISO 17025.

ALS corporate management has committed its full support to provide the personnel, facilities, equipment, and procedures required by this QAM and other client and project related requirements.

ALS management reviews its operations on an ongoing basis and seeks input from staff and clients to make improvements

Management's commitment to quality and to the management system is stated in the Quality Policy below, which is upheld through the application of related policies and procedures described in this Quality Assurance Manual and associated quality system documents

Quality Policy Statement

The objective of the quality system, and the commitment of management, is to consistently provide our customers with data of known and documented quality that meets their requirements. Our policy is to use good professional practices, to maintain quality, to uphold the highest quality of service, and to comply with TNI and the DOD ELAP Standard. However, the primary responsibility for quality rests with each individual within the laboratory organization. ALS managers are committed to continually improve the effectiveness of the management system. Every laboratory employee must ensure that the generation and reporting of quality analytical data is a

fundamental priority. All laboratory employees are required to familiarize themselves with the quality documentation and to implement the policies and procedures in their work.

3.5 Impartiality, Ethics, Professional Conduct and Data Integrity

One of the most important aspects of the success of ALS – Houston is the emphasis placed on the structure in place to manage and safeguard against impartiality, the integrity of the data provided, and the services rendered. This success is reliant on the professional conduct of all employees within ALS – Houston well as established laboratory practices. All personnel involved with environmental testing and calibration activities must familiarize themselves with the quality documentation and implement the policies and procedures in their work.

All management and employees are committed to acting impartially and are required to sign and adhere to the requirements set forth in the *ALS Code of Conduct Policy* and agree to the *Confidentiality Agreement*.

3.5.1 Professional Conduct

- To promote quality, ALS – Houston requires certain standards of conduct and ethical performance among employees. The following examples of documented ALS policy are representative of these standards, and are not intended to be limiting or all-inclusive:
- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action.
- Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.
- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible.

3.5.2 Confidentiality

It is the responsibility of all laboratory employees to safeguard sensitive company information, client data, records, and information; and matters of national security concern should they arise. The nature of our business and the well-being of our company and of our clients is dependent upon protecting and maintaining confidential and/or proprietary company and client information. All information, data, and reports (except that in the public domain) collected or assembled on behalf of a client is treated as confidential.

Information may not be given to third parties without the consent of the client. Unauthorized release of confidential information about the company or its clients is taken seriously and is subject to formal disciplinary action. All employees sign a confidentiality agreement upon hire to protect the company and client's confidentiality and proprietary rights. When the laboratory is required by law or authorized by contractual agreement to release confidential information, the customer or individual concerned shall, unless prohibited by law, be notified of the information provided. Information about the customer

obtained from sources other than the customer (e.g. complainant, regulators) shall be confidential between the customer and the laboratory. The provider of this information shall be confidential to the laboratory and shall not be shared with the customer, unless agreed by the source. Personnel, including any committee members, contractors, personnel of external bodies, or individuals acting on the laboratory's behalf, shall keep confidential all information obtained or created during the performance of laboratory activities, except as required by law.

3.5.3 Prevention and Detection of Improper, Unethical, or Illegal Actions

It is the intention of the laboratory to proactively prevent and/or detect any improper, unethical, or illegal action conducted within the laboratory. This is performed by the implementation of a program designed for not only the detection but also prevention. Prevention consists of educating all laboratory personnel in their roles and duties as employees, company policies, inappropriate practices, and their corresponding implications as described here.

In addition to education, appropriate and inappropriate practices are included in SOPs such as manual integration, data review, and specific method procedures. Electronic and hardcopy data audits are performed regularly, including periodic audits of chromatographic electronic data. Requirements for internal QA audits are described in SOP HS-QS012, Internal Audits. All aspects of this program are documented and retained on file according to the company policy on record retention.

The ALS Employee Handbook also contains information on the ALS ethics and data integrity program, including mechanisms for reporting and seeking advice on ethical decisions.

3.5.4 Laboratory Data Integrity and Ethics Training

Each employee receives in-depth “core” Data Integrity/Ethics Training. New employees are given a QA and Ethics orientation within the first month of hire, followed by the core training within 1 year of hire. On an ongoing basis, all employees receive annual ethics refresher training. Topics covered are documented in writing and all training is documented. It is the responsibility of the QA Manager to ensure that the training is conducted as described.

Key topics covered are the organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting, how and when to report data integrity issues and record keeping. Training includes discussion regarding all data integrity procedures, data integrity training documentation, in-depth data monitoring and data integrity procedure documentation.

Trainees are required to understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences including immediate termination, or civil/criminal prosecution.

The training session includes many concepts and topics, numerous examples of improper actions (defined by DoD as deviations from contract-specified or method-specified analytical practices and may be intentional or unintentional), legal and liability implications (company and personal), causes, prevention, awareness, and reporting mechanisms.

ALS is committed to ensuring the integrity of its data and providing valid data of known and documented quality to its clients. The elements of the Ethics and Data Integrity program include:

- Documented data integrity procedures signed and dated by top management.
- An Ethics and Data Integrity Policy signed by all management annually (SOP CE-GEN001 Ethics). This policy is signed, dated and distributed by the Quality Assurance Manager.
- Manual Integrations (SOP HS-QS016)
- Nonconformance and Corrective Action Procedures (SOP HS-QS003)
- Data recall procedures (SOP CE-GEN006)
- Annual data integrity training.
- Procedures for confidential reporting of alleged data integrity issues.
- An audit program that monitors data integrity and procedures for handling data integrity investigations and client notifications.

In addition to the agreements, project managers act as a firewall to insulate the analysts from clients so that the lab personnel have no contact with clients. Lab IDs are assigned to samples and used throughout preparation and analysis to make the samples ambiguous to lab personnel. Together these agreements and procedures ensure freedom from undue internal and external commercial, financial, and other pressures or influences that could adversely affect the quality of work. They protect customers' confidential information and ALS' proprietary rights. They ensure avoidance of activities that could diminish confidence in the competence, impartiality, judgment or integrity of any ALS laboratory and staff.

3.5.5 Investigations

All investigations resulting from data integrity issues are conducted confidentially. They are documented and notifications are made to clients who received any negatively affected data that did not meet the client's data quality requirements. Procedures for investigation are included in CE-GEN001.

3.5.5.1 All reports of suspected improper action or errors in reporting must be investigated to determine the validity of the reported data. All results that require correction must be revised and changes must be communicated to the client in writing.

3.5.5.2 The Laboratory Director, with assistance of the Quality Assurance Manager, must develop a plan to confidentially investigate the issue, resolve the problem, and contact any affected clients. The investigation may include personnel interviews, data audits, training evaluations, data package review, internal method audits and surveillance to determine inappropriate practices.

3.5.5.3 The QA Manager must investigate if the inappropriate practice has an impact on data integrity and reported values. The QA Manager must complete a comprehensive report to management with investigations findings and recommendations for training, corrective actions, and communication of incident to ALS staff. The QA Manager will facilitate client contact procedures and notify all acreditation body of any instance of inappropriate and prohibited practice (and data recall if required) from the findings witin 15 days of discovery. Corrective action or proposed corrective actions must be submitted to accrediting bodies within 30 days of discovery.

3.5.5.4 ALS management will take necessary steps to prevent the problem from recurring, including the retraining of staff on ethics and other related procedures. If an investigation indicates improper, unethical or illegal practices by any ALS employee, disciplinary action will be taken. Disciplinary action may include termination and legal action.

3.5.6 Public Disclosure

In the event that and internal investigation reveals that improper, unethical or illegal practices have occurred, all affected clients and accrediting body must be notified as soon as possible, and full disclosure shall be made to all affected regulatory agencies. This disclosure must occur within 10 working days (or shorter period if required by law) after ALS has discovered that a violation has occurred or may have occurred and must be in writing to any relevant state regulatory agency or accrediting body. Corrective action(s) implemented must be submitted to all affect clients and accrediting bodies.

Note DOD requires notification of all affected customers and accrediting body of potential data quality issues resulting from nonconforming work within 15 business days. Notification shall be performed according to a written procedure. Records of corrections taken or proposed corrective actions to resolve the nonconformance shall be submitted to the customer(s) and accrediting body within 30 business days of discovery.

3.6 Management and Employee Commitment

The laboratory makes every attempt to ensure that employees are free from any commercial, financial, or other undue pressures that might affect their quality of work. Related policies are described in the laboratory Employee Handbook. This includes:

- ALS Open Door Policy (ALS Employee Handbook) – Employees are encouraged to bring any work related problems or concerns to the attention of local management or their Human Resources representative. However, depending on the extent or sensitivity of the concern, employees are encouraged to directly contact any member of upper management.
- FairCall – An anonymous and confidential reporting system available to all employees that is used to communicate misconduct and other concerns. The program shall help minimize negative morale, promote a positive work place, and encourage reporting suspected misconduct without retribution. Associated upper management is notified and the investigations are documented.

- Use of flexible work hours. Within reason and as approved by supervisors, employees are allowed flexible work hours in order to help ease schedule pressures which could impact decision-making and work quality.
- Operational and project scheduling assessments are continually made to ensure that project planning is performed and that adequate resources are available during anticipated periods of increased workloads. Procedures for subcontracting work are established, and within the laboratory network additional capacity is typically available for subcontracting, if necessary.
- Gifts and Favors (ALS Employee Handbook) – To avoid possible conflict of interest implications, employees do not receive unusual gifts or favors to, nor accept such gifts or favors from, persons outside the Company who are, or may be, in any way concerned with the projects on which the Company is professionally engaged.

3.7 Order of Precedence - In the event of a conflict or discrepancy between policies, the order of precedence is as follows unless otherwise noted:

3.7.1 Quality Assurance Manual

3.7.2 SOPs and Policies - Laboratory SOPs will have precedence over Corporate SOPs.

3.7.3 Other (Work Instructions, memos, flowcharts, etc.)

4) Document Control

4.1 This Section describes how the laboratory establishes and maintains a process for document management. Procedures for document management include controlling, distributing, reviewing, and accepting modifications. The purpose of document management is to preclude the use of invalid and/or obsolete documents.

4.2 Documents can be SOPs, policy statements, specifications, calibration tables, charts, textbooks, posters, notices, memoranda, software, drawings, plans, etc. These may be on various media, whether hard copy or electronic, and they may be digital, analog, photographic or written.

Note: There is a difference between records and documents. Documents include statements, identify requirements, or provide an explanation related to operations in the laboratory. Records are data (observational, qualitative or quantitative) that are generated manually or electronically during laboratory activities. Logbooks present an interesting case. The logbook form is a document that is tracked with a unique document control number as in §4.4.1. However, once printed and bound for entering data into, they also receive a unique Records Tracking number as specified in §17.

4.3 Types of Documents: The laboratory manages two types of documents: 1) controlled, 2) obsolete.

4.3.1 Controlled Documents - A Controlled Document is one that is uniquely identified, issued, tracked, and kept current as part of the management system. Controlled documents may be internal documents (i.e. SOPs) or external documents (i.e. published methodologies, instrument manuals, etc).

4.3.2 Obsolete documents are those that have been superseded by more recent versions or are no longer needed. Original obsolete internal documents (i.e.

SOPs) are maintained in archive storage within the QA drive.

4.4 Document Approval: All documents that affect the quality of laboratory data are managed appropriate to the scope and depth required. Controlled internal/ Laboratory documents will be reviewed and approved for use by the QA Manager and/or the Technical Director and the department supervisor, where applicable. Internal documents are reviewed annually to ensure their contents are suitable and in compliance with the current quality systems requirements, and accurately describe current operations. Approved copies of documents (internal and external) are available at all locations where operations are essential to the effective functions of the laboratory.

4.4.1 Controlled internal documents are uniquely identified with 1) a unique name or number identification 2) Effective date, 3) revision identification, 4) page number, 5) the total number of pages (or a mark to indicate the end of the document), and 6) the identification or signatures of the issuing authority (i.e. management).

4.5 Document Master List: A master list of controlled internal documents is maintained that includes distribution, location, and revision dates. A master list of controlled external documents is also maintained that includes title, author, version, and department. The controlled document list is maintained by the QA Department. The controlled document list is updated each time a new document is added to the quality system.

4.6 Standard Operating Procedures: SOPs are approved controlled documents and are used to ensure consistency of application of common procedures.) Where equipment manuals or published methods accurately reflect laboratory procedures in detail, a separate SOP may not be required.

4.6.1 SOP Location: The laboratory SOPs for all test methods can be accessed on the secure local laboratory network.

4.6.2 Any deviation from a test method SOP must be documented and approved by QA, including both a description of the change made and a technical justification. The deviation from a test method in a SOP must be reported to the client or be agreed upon as part of client project specification or requirement.

4.6.3 All SOPs are written, maintained and archived according to the guidelines of the SOP HS-GEN001 Preparation and Management of SOPs.

4.7 Electronic Signature Policy

4.7.1 It is a policy of ALS Environmental to allow the use of electronic signatures. For data reporting an electronic signature may be applied to the report by an approved report signatory and is binding to the same extent as a handwritten wet signature.

4.7.2 To authenticate the electronic signature, the identity of the signatory is verified before their electronic signature can be created. Each electronic signature shall be unique to a single individual and shall not be used by any other individual. Following login, these credentials are used to identify and document the user.

5) Review of Requests, Tenders and Contracts

5.1 The review of all new work assures that oversight is provided so that requirements are clearly defined, the laboratory has adequate resources and capability, and the test method is applicable to the customer's needs. This process assures that all work will be given adequate attention without shortcuts that may compromise data quality. Contracts for new work may be formal bids, signed documents, or other communication, either verbal or electronic.

5.2 The Laboratory Project Management Group and the Laboratory Director determine if the laboratory has the necessary accreditation, resources, including schedule, equipment, deliverables, and personnel to meet a work request. Every client is assigned to a designated Project Manager, who informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to the complete the work satisfactorily.

5.3 Projects submitted under the Department of Defense Quality System Manual for Environmental Laboratories (DoD-QSM), current version, must follow project-specific requirements for data quality objectives. These requirements are typically outlined in a project-specific quality assurance project plan (QAPP). See also SOP HS-GEN009. Where project-specific requirements are not provided, the quality control requirements and acceptance limits outlined in Appendix B of the Current DoD-QSM must be met.

5.4 The client must be informed of any deviation from a contract including the test method or sample handling processes. All differences between the request and a final contract are resolved and recorded before any work begins. It is necessary that the contract be acceptable to both the laboratory and the client. This review process is repeated when there are amendments to the original contract by the client. The participating laboratory personnel are given copies of the amendments.

5.5 Records are maintained for every contract or work request, when appropriate by the Project Manager. This includes pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract.

6) Subcontracting of Tests

6.1 A subcontract contract laboratory is defined as a laboratory external to ALS Environmental –Houston facility, or at a different location than the address indicated on the front cover of this manual, that performs analyses on behalf of ALS Environmental Houston. When subcontracting analytical services, the project management group must assure work requiring accreditation is placed with an appropriately accredited laboratory or one that meets applicable statutory and regulatory requirements for performing the tests. To assure this, a list of accredited subcontractors is maintained on the laboratory network for those fields of testing clients routinely requested. Where these requirements are not met, the final report must clearly identify the subcontracted data as non-accredited. ALS Environmental-Houston assumes responsibility for the subcontractor's work, except in the case where a client or a regulating authority has specified which subcontractor is to be used.

6.2 SOP HS-GEN007: "Subcontract Sample Submittal" requires that :

6.2.1 clients are notified in advance when test subcontracting is required

6.2.2 all samples are shipped under COC to maintain the integrity of the samples

6.2.3 the subcontract labs must have the required TNI accreditation to process the

submitted samples when TNI accredited testing is requested or other certification if required by QA Plan

6.2.4 results from subcontracted analyses are identified in the final test report

7) Purchasing Services and Supplies

7.1 The laboratory ensures that purchased supplies and services that affect the quality of environmental tests are of the required or specified quality by using approved suppliers and products. The laboratory has procedures for purchasing, receiving, and storage of supplies that affect the quality of environmental tests are found in SOP HS-QS001 Reagent/Standard Receiving and Preparation Tracking. The laboratory test method SOPs, in general, specify the chemicals and grade required by each.

7.2 The Technical Director, QA Manager or a Departmental Manager is responsible for review and approval of service providers supplies and also approves technical content of purchasing documents prior to ordering.

7.3 ALS Environmental - Houston uses vendors which supply the level of quality required to perform testing activities. An Approved Vendor List is maintained in the secured network drive that indicates the basis or bases for approval along with certification status. Relevant certifications are maintained in this system. ALS Environmental - Houston Environmental - Houston maintains a relationship with multiple vendors and uses vendors with comparable certifications or accreditations.

8) Service to the Client

8.1 The laboratory collaborates with clients and/or their representatives in clarifying their requests and in monitoring of the laboratory performance related to their work. Each request is reviewed to determine the nature of the request and the laboratory's ability to comply with the request within the confines of prevailing statutes and/or regulations without risk to the confidentiality of other clients. The laboratory utilizes a number of processes to ensure that adequate resources exist to meet service demands. Senior staff meetings, tracking of outstanding proposals and a current synopsis of incoming work all assist the senior staff in properly allocating sufficient resources. Status/production meetings are conducted daily with the laboratory and Project Managers to inform the staff of the status of incoming work, future projects, and project requirements.

8.1.1 The laboratory actively seeks client feedback, both positive and negative, to identify areas of improvement within the quality system, testing activities and service to the client.

8.1.2 The laboratory will clarify requests if the customer has specified incorrect, obsolete, or improper methods.

8.1.3 The laboratory will notify customers when methods require modifications to ensure achievement of project-specific objectives contained in planning documents (e.g., difficult matrix, poor performing analyte).

8.1.4 The laboratory will communicate with customers when project planning documents (e.g., QAPP or Sampling and Analysis Plan (SAP)) are missing or

requirements (e.g., action levels, detection and quantification capabilities) in the documents require clarification.

8.1.5 The laboratory will notify customers when a problem has been encountered with sampling or analysis that may impact results (e.g., improper preservation of sample).

Laboratory management also monitors a number of other indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients. This includes on-time performance, customer complaints, training reports and non-conformity reports. A frequent assessment is made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload.

All Requests for Proposal (RFP) documents are reviewed by the Project Manager and appropriate managerial staff to identify any project specific requirements that differ from the standard practices of the laboratory. Any requirements that potentially cannot be met are noted and communicated to the client, as well as requesting the client to provide any applicable project specific Quality Assurance Project Plans (QAPPs).

When a client requests a modification to an SOP, policy or standard specification, the Project Manager will discuss the proposed deviation with the Laboratory Manager, and department supervisors to obtain approval for the deviation. The QA Manager may also be involved. All project-specific requirements must be on-file and with the service request upon logging in the samples. The modification or deviation must be documented. A project-specific communication form, or similar, may be used to document such deviations.

8.2 Client Confidentiality

8.2.1 The laboratory confidentiality policy is to not divulge or release any information to a third party without proper authorization from the client. Third party requests for data and information are referred to the client. Data and records identified as proprietary, privileged, or confidential are exempt from disclosure. All electronic data (storage or transmissions) are kept confidential, based on technology and laboratory limits, as required by client or regulation. The procedures for maintaining client confidentiality are found in SOP HS-GEN004 Client Confidentiality of Electronic Data Transfers.

8.2.2 Communication with the client, or their representative, is maintained to provide proper instruction and modification for testing. Technical staff is available to discuss any technical questions or concerns the client may have.

8.2.3 The client, or their representative, may be provided reasonable access to laboratory areas for witnessing testing.

8.2.4 Delays or major deviations to the testing are communicated to the client immediately by the assigned Project Manager.

8.2.5 The laboratory will provide the client with all requested information pertaining to the analysis of their samples. An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

8.2.6 Any information obtained from or about a customer or regulator will be kept strictly confidential unless sharing has been agreed to by the source.

8.2.7 All personnel including external bodies, contractors or any individual acting on

the laboratory's behalf are required to keep all information obtained or created during the performance of their activities confidential except as required by law.

8.3 Client Feedback

8.3.1 The laboratory seeks both negative and positive feedback following the completion of projects and periodically for ongoing projects. Feedback provides acknowledgement, corrective actions where necessary, and opportunities for continuous improvement. Feedback is obtained via web surveys, the results of which are maintained by marketing and provided to the Lab Director. A link is embedded in the email signature of all employees that regularly engage in communications with clients. An integral part of the client experience is to target recent clients on their recent laboratory experience via the client survey. For surveys with score of 6 or lower, the QA Department will create a correction action report in the NCAR system.

9) Complaints

9.1 The purpose of this section is to assure that customer complaints are addressed and corrected. This includes requests to verify results or analytical data.

9.2 For complaints received directly from a client, the personnel who receives the complaint performs any initial documentation and assessment of the issue to determine if it is related to laboratory activities. Depending upon the nature of the complaint, the Project Manager for that client will be notified of the issue. The project manager will inform the client that the laboratory acknowledges receipt of the complaint and provide regular updates as they arise on the progress of the resolution. Management personnel is responsible for investigating, validating, addressing, following through and correcting the issue. The client will be contacted with a resolution in a timely manner, usually in the form of a formal letter once the complaint has been properly addressed.

9.3 If it is determined that a complaint is without merit, it is documented, and the client is contacted.

9.4 All complaints are entered into the Customer Complaints and Queries (CCQs) database on Sharepoint where they are tracked. If the complaint represents a systemic issue, the CCQ will be linked to an NCAR in the Corrective Action database on Sharepoint.

10) Facilities and Equipment

10.1 The laboratory facilities are designed and organized to facilitate testing of environmental samples. Environmental conditions are monitored to ensure that conditions do not invalidate results or adversely affect the required quality of any measurement.

10.2 ALS Group USA, Corp, Houston facility, is conveniently located in southwest Houston at 10450 Stancliff Road. The current facility has 26,000 square feet, in which 17,000 square feet is associated with laboratory work space, sample receiving and storage areas. Another 8000 square feet contains the HRMS facility (Dioxins & Furans, Perchlorate, Corporate administration). The two floor plans are found in Appendix C.

10.3 Separate work areas, or departments, are designated by application within the facility.

The work space is complimented by special air handling and ventilation capabilities, sophisticated central gas supply, sensitive, modern and automated instrumentation, current data management software and computer hardware. The work area for volatile organic analysis has a separate, dedicated HVAC system. In addition, there are separate secure facilities for sample storage, solvent storage, laboratory inventory and hazardous waste management and storage. Large walking sample refrigerators/freezers are monitored 24 hours by ALS's security company. All large walk coolers/freezers are backed up by a standby natural gas generator, in the event there is a loss of power in the building.

10.4 The laboratory security features provide sample integrity and storage. Staff access to the facility is limited to the front and rear doors and the shipping and receiving door. Visitor access to laboratory is limited to the front entrance or client services door. All visitors must be escorted while on site. Access to ALS complex is controlled by electronic security gates during nonworking hours and holidays.

10.5 Access to the server room is restricted to only the necessary IT personnel, in order to maintain a safe temperature-controlled area. The doors of the server room are kept locked with a cyber lock to prevent unauthorized access.

10.6 Information Technology (IT) and LIMS.

- LIMS for ALS Environmental - Houston HRMS lab is maintained by the LIMS group, located at ALS - Kelso, Washington. The Kelso office is responsible for the upgrades, testing and maintenance such as backup of the server. LIMS for ALS Environmental - Houston Full Service lab is maintained by the LIMS group, located at ALS – Houston, Texas.
- ALS Kelso maintains the server for HRMS LIMS (StarLIMS) at a datacenter in Portland, Oregon. ALS Houston maintains the server for FS LIMS (alphaLIMS, GEL).
- Client must be notified prior to the implementation of a new LIMS or activates that may affect data integrity and security, such as the move of server to a different location, change in LIMS database structure, etc.
- QA Manager or designee must maintain records and notify Management immediately if any electronic data processing issue is identified. This check must be performed with the quarterly 10% data package review.

11) Sample Management

11.1 Chain of Custody

The laboratory does not use legal chain of custody services except when projects request the use of internal chain of custody procedures. Upon request a preprinted Chain-of-Custody is provided, custody seals are sent by the lab for sample cooler if the sampling containers are ordered from the laboratory. If required, custody seals for individual containers are available upon request. Shipping records are maintained with the chain of custody.

11.2 Processes to facilitate and document sample handling and management. The quality of analytical results is highly dependent upon the quality of the procedures used to

collect, preserve, and store samples. Sampling factors that must be taken into account to insure accurate, defensible analytical results include:

11.2.1 Amount of sample taken

11.2.2 Type of container used

11.2.3 Type of sample preservation

11.2.4 Sample storage time

11.2.5 Proper custodial documentation

11.3 ALS – Houston provides clients with appropriate sample collection materials to meets EPA sample collection guidelines. Materials and information provided are:

- Sample collection containers
- Sample bottle labels
- Preservative information
- Chain of custody forms
- Sample shipping containers
- Directions for collection, as needed
- A trip blank if volatile organics are to be collected
- A cooler temperature blank
- Custody seals for the shipping coolers plus individual sample containers, if requested
- Sample receipt policy
- Additional packing material, as needed
- Cooler packing and shipping instructions
- These items are provided as necessary based on client instructions through Project Management. SOP HS-SM002 Bottle Orders, describes procedures to supply clients with the above sample collection materials.

11.4 Sample Storage – The laboratory building is operated under a controlled access security system, where entrance requires use of a magnetic key for employees or and when entry access is granted internally, using an electronic door lock release switch system. The building security ensures that only laboratory employees have access to sample storage areas. For the samples received, specific cooler or freezer storage locations are assigned per SOP HS-SM001 sample receipt and Log –in.- Samples for volatile organic testing are segregated and stored in coolers that are separate from general storage (semi-volatiles, metals, etc.). Refrigerator / Freezer sample storage areas are monitored daily for the required storage temperatures (e.g. above 0 to 6˚C for water samples) according to SOP HS-EQ002 Thermometer Calibration and Temperature Monitoring.

11.4.1 Sample Transfer to subcontracted lab or return to client:

All samples are shipped under COC to maintain the integrity of the samples.

Shipping container must be shipped and packed in accordance with DOT regulations, such DOT approve shipping container, Haz Commination Labeling, etc.

11.5 Sample Disposal – Samples are held in storage for 30 days after invoice date, unless directed otherwise. Disposal of samples follow procedures identified in SOP HS-SAF-001

Hazardous and Non-Hazardous Waste Disposal Procedures. The SOP directs the following:

11.5.1 All Foreign and Regulated soil must be sterilized to comply with USDA Soil import permit requirements.

11.5.2 Neutral, non-hazardous aqueous waste may be disposed into the sanitary sewer system.

11.5.3 Hazardous waste are segregated according to type, stored as per RCRA hazardous storage rule (40 CFR 260-262).

11.5.4 The laboratory is Large Quantity Generator and must comply with TCEQ/EPA/RCRA waste reporting policies.

11.5.5 All Hazardous waste shipments are handled by a RCRA permitted waste transporter.

11.5.6 All Hazardous Waste is only shipped to a RCRA permitted waste disposal facility.

11.6 Sampling Containers

11.6.1 The laboratory offers clean sampling containers for use by clients. Empty containers returned to the lab will be destroyed and client may by charged the cost of the containers.

11.6.2 ALS does not provide sampling services. The laboratory's responsibility in the sample collection process lies in supplying the sampler with the necessary coolers, reagent water, sample containers, preservatives, sample labels, custody seals, COC forms, and packing materials required to properly preserve, pack, and ship samples to the laboratory.

11.6.3 All preserved sample containers must be labeled in accordance Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

11.7 Sampling Containers, Preservation Requirements, Holding Times

11.7.1 See Appendix D for Sampling Containers, Preservation Requirements and Holding Time. If preservation or holding time requirements are not met, the procedures in Section 15 – "Control of Nonconforming Environmental Testing Work" are followed.

11.8 Samples are logged into a Laboratory Information Management System (LIMS). Potential problems with a sample shipment are addressed by contacting the client and discussing the pertinent issues. When the Project Manager and client have reached a satisfactory resolution, the login process may continue and analysis may begin. During the login process, each sample container is given a unique laboratory code and a service request form is generated. The LIMS generates a Service Request that contains client information, sample descriptions, sample matrix information, required analyses, sample collection dates, analysis due dates and other pertinent information. The service request is reviewed by the appropriate Project Manager for accuracy, completeness, and consistency of requested analyses and for client project objectives.

12) Analytical Procedures

All methods must be validated before they are put into use. Sources of methods employed are based on published methods. The following elements of method validation are: Demonstration of Capability, On-going proficiency, Initial Test Method Evaluation, Estimation of Uncertainty and Laboratory-Developed or Non-Standard Method Validation and Control of Data.

12.1 Initial Demonstration of Capability (IDOC) is a procedure to establish the ability of the analyst to generate data of acceptable accuracy and precision in a specific matrix. This procedure requires the preparation and analysis of a known concentration of each analyte spiked in four separate aliquots of laboratory pure matrix. These samples are carried through the entire preparation and analytical procedure. The resulting recovery and the standard deviation are determined and compared to specified limits. This IDOC must be made at any time there is a significant change in instrument type, personnel or test methods. For analytes that do not lend themselves to spiking, the demonstration of capability may be performed using quality control samples. In cases of analytes for which spiking is not an option and for which quality control samples are not readily available, the procedure published in 40 CFR Part 136, Appendix A, test methods, is one way to perform this demonstration. The data for the DOC procedure is evaluated by either the section supervisor or the QA Department. Documentation for analyst IDOCs are maintained on the laboratory network by the QA Department as stored in analyst training records. After successful completion of the IDOC or on-going DOCs, certification statements are prepared and reviewed for approval by the Technical Director and the QA Manager.

12.2 On-going Proficiency-Annual ongoing DOCs are performed when either an analyst repeats the DOC annually or generates acceptable results when analyzing performance evaluation samples. All analysts, primary and backup must maintain yearly DOCs. The data for the DOC procedure is evaluated by either the section supervisor or the QA Department. Per TNI criteria, if DOCs lapse past one calendar year, analyst must perform IDOC prior to analyzing client samples or PT samples.

12.3 Initial Test Method Evaluation – This matrix-specific evaluation involves the determination of the Limit of Detection (LOD), confirmation of the Limit of Quantitation (LOQ), an evaluation of precision and bias, and an evaluation of the selectivity of the method.

12.3.1 The Limit of Detection (LOD) defines a range below the LOQ where detections must be reported with the data qualifier "J", indicating the value reported is an estimated value. The LOD is an estimate of the minimum amount of a substance that an analytical process can reliably detect. The LOD is analyte- and matrix-specific and may be laboratory-dependent. The LOD is used to verify an MDL study. Further discussion of LOD is found in SOP HS-QS006 Limit of Detection (LOD) - Limit of Quantitation (LOQ) . LODs are analyzed on a quarterly basis.

12.3.2 The Limit of Quantitation (LOQ) for an analytical method is established to be no lower than the lowest non-zero calibration standard for the determinative method. The LOQ defines the lower limit for an analyte working range where data may be reported without qualification. On a final analytical report, the LOQ may be labeled as the method quantitation limit (MQL) or practical quantitation limit (PQL). LOQs are are analyzed on a quarterly basis.

12.3.3 Evaluation of Precision and Bias: Precision and Bias are determined for

standard and non-standard methods, where:

12.3.3.1 Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, or range, in either absolute or relative terms.

12.3.3.2 Bias is the systematic error that contributes to the difference between the mean of a significant number of test results and the accepted reference value.

12.3.3.3 Precision and bias criteria are based upon evaluation of control chart limits or based upon approved program limits (e.g. TCEQ QAPP for Superfund control limits). When criteria are not documented, they are determined through the performance of a Demonstration of Capability.

12.3.3.4 Precision and bias using non-standard, modified standard or laboratory-developed methods are compared to the criteria established by the client (when requested), the method, or the laboratory.

12.3.4 Evaluation of the Selectivity of the Method – This evaluates selectivity of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. The laboratory evaluates selectivity through procedures defined in the test method SOPs such as use of dual columns, interference checks, and analysis of method required QC samples (e.g. blanks, LCS, etc).

12.4 Estimation of Uncertainty – An Estimation of uncertainty consists of the sum (combining the components) of the uncertainties of the numerous steps of the analytical process, including, but not limited to, sample plan variability, spatial and temporal sample variation, sample heterogeneity, calibration/calibration check variability, extraction variability, and weighing variability. To the degree where the laboratory has a control over these processes, the laboratory estimates uncertainty using the standard deviation calculated from routine quality control samples (e.g. the LCS) See SOP HS-QS024.

12.5 Control of Data: All calculations and all relevant data are subject to appropriate checks in a systematic manner that is addressed in the following laboratory SOPs:

12.5.1 SOP HS-IT001 LIMS Raw Data and Data Integrity, for the validation of software applications associated with data acquisition, calculation and reporting;

12.5.2 SOP HS-QS009 Data Reduction, Review and Validation, for procedure to insure that reported data are free from transcription and calculation errors and for procedures to address manual calculations, ”reasonableness” of results, verification of manual integration, etc.

12.5.3 SOP HS-QS016 Manual Integration Policy, for procedures for manual integrations;

12.5.4 SOP-HS-IT002 and HS-IT007 Computer Software Installation and Maintenance, and Software Testing assures that computers, user-developed computer software, automated equipment, or microprocessors used for the acquisition, processing, recording, reporting, storage, or retrieval of environmental test

data are properly installed and tested to document all computers and related software in use are validated as being adequate for use and:

12.5.4.1 Protected for integrity and confidentiality of data entry or collection, data storage, data transmission and data processing.

12.5.4.2 Maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of environmental test data.

12.5.4.3 Held secure including the prevention of unauthorized access to, and the unauthorized amendment of, computer records.

12.6 General Equipment Requirements include the following:

12.6.1 The laboratory has all the necessary equipment required for the correct performance of the scope of environmental testing presented in this Quality Manual.

12.6.2 All equipment and software used for testing and sampling is capable of achieving the accuracy required and complies with the specifications of the environmental test method as specified in the laboratory SOP.

12.6.3 Equipment is operated only by authorized and trained personnel.

12.6.4 Up-to-date instructions on the use and maintenance of equipment are readily available for use by laboratory personnel, including any relevant manuals provided by the manufacturer of the equipment.

12.6.5 SOP HS-QS-005 Validation of New Instrumentation and New Methods requires that all equipment is calibrated or checked, MDLs performed and Precision and Accuracy confirmed before being placed into use. This ensures that it meets laboratory specifications and the relevant standard specifications of the application.

12.6.6 SOPs HS-IT003 IT System Security, HS-IT007:Software Testing, HS-IT008: Software Development Methodology, and HS-IT009: Software Change Control are a part of the quality system to ensures that test equipment, including hardware and software, are safeguarded from adjustments which would invalidate the test results. This is accomplished by limiting access to the equipment and using password protection where possible. These SOPs also provide instructions for requesting, authorizing, testing, approving, implementing and establishing the priority of software change and software version control.

12.6.7 Equipment that has been subject to overloading, mishandling, given suspect results, or been shown to be defective or outside specifications are: taken out of service, isolated to prevent its use, and clearly labeled as out of service until it has been shown to function properly. If it is shown that previous tests are affected, then procedures for non-conforming work must be followed.

12.6.8 SOP HS-EQ004 Preventative Maintenance also requires each item of equipment and the software used to generate test results be uniquely identified and records of equipment maintenance and software installed be maintained. Maintenance Logbooks are assigned to each instrument for the purpose of documenting maintenance activities. This information includes the following:

- Identity of the equipment and its software.
- Manufacturer's name, type identification, serial number or other unique identifier.
- checks that equipment complies with specifications of applicable tests;
- Current location.
- manufacturer's instructions, if available, or a reference to their location
- dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and the due date of next calibration.
- Maintenance plan where appropriate, and maintenance carried out to date; documentation on all routine and non-routine maintenance activities and reference material verifications.
- Any damage, malfunction, modification or repair to the equipment;
- date received and date placed into service (if available); and
- Condition when received, if available (new, used, reconditioned).
- Instrument status – Date taken out of service and date return to service.

12.7 Support Equipment Calibration – Various types of support equipment have calibration verification requirements based upon application. Refer to Appendix G.

12.8 Instrument Calibration Procedures –,

12.8.1 Initial Calibrations – In general, all initial calibrations are according to method requirements described in the laboratory method SOP. The SOPs require the use of a second source calibration verification standard, acquired from a different vendor or different lot if the same vendor. The calibration type (internal, external) and the calibration model options are described in the SOPs. The following general rules must be followed for all multi-point initial calibrations:

12.8.1.1 Select points from the middle of the curve may not be dropped in order to achieve acceptance criteria.

12.8.1.2 If the low or high calibration point is dropped from the curve, the working curve is adjusted and sample results outside the curve are qualified or re-analyzed at dilution.

12.8.1.3 Sufficient raw data records are retained to allow reconstruction of each initial calibration.

12.8.2 Continuing Calibration Verification and frequency are performed according to method requirements. Refer to analytical SOPS for established acceptance criteria. The following general rules must be followed for continuing calibration verifications:

12.8.2.1 Continuing Calibration Verification (CCV) & Continuing Calibration Blank (CCB) is performed at the beginning, after every ten samples, and end of each analytical batch. Methods employing internal standards require continuing calibration verifications to be analyzed at the beginning of each analytical batch or as required by the determinative method, whichever is more restrictive. NOTE: Some programs require closing CCV even for internal standard calibration, please consult Supervisor or QA. Other programs may require Continuing Calibration Blank (CCB) to be paired with the CCV.

Continuing instrument calibration verification is performed whenever it is expected that the analytical system may be out of calibration or might not meet verification acceptance criteria.

12.8.2.2 Continuing instrument calibration verification is performed when the time period for calibration or the most recent calibration verification has expired.

12.8.2.3 Continuing instrument calibration verification is performed for all analytical systems that have a calibration verification requirement.

12.8.2.4 Calibration is verified for each compound, element, or other discrete chemical species.

12.8.2.5 The calculations and associated statistics for continuing instrument calibration are included or referenced in the test method SOP.

12.8.2.6 Sufficient raw data records are retained to allow reconstruction of the continuing instrument calibration verification. Continuing instrument calibration verification records connect the continuing verification date to the initial instrument calibration.

12.8.3 Unacceptable Continuing Instrument Calibration Verifications: If routine corrective action for continuing instrument calibration verification fails to produce subsequent consecutive (immediate) calibration verification within acceptance criteria, then a new calibration is performed or acceptable performance is demonstrated after corrective action with two consecutive calibration verifications.

12.8.3.1 For any samples analyzed on a system with an unacceptable calibration, some results may be useable if qualified and under the following conditions:

12.8.3.1.1 If the acceptance criteria are exceeded high (high bias) and the associated samples are below detection, then those sample results that are non-detects may be reported as non-detects.

12.8.3.1.2 If the acceptance criteria are exceeded low (low bias) and there are samples that exceed the maximum regulatory limit, then those exceeding the regulatory limit may be reported.

12.8.4 Corrective Actions for Calibration – see individual analytical SOPs.

12.9 Major Equipment List: For a list of test equipment in use, refer to the Master Equipment List maintained by the Quality Assurance Department on the ALS Environmental – Houston secure network.

13) Measurement Traceability and Calibration

13.1 Measurement Quality Assurance comes in part from traceability of standards to standard reference materials. To achieve traceability, the following are performed:

13.1.1 All equipment used for generation of test results, including equipment for subsidiary measurements, must be calibrated prior being put into service and

on a continuing basis.

13.1.2 Calibration standards must be traceable to certified reference materials of known quality, where available, for the preparation of the calibration standard(s);

13.1.3 For standards in use for calibration, second source standards are also acquired, to verify the calibration standards in use.

13.1.4 SOP HS-QS001 Chemical Purchase & Receipt; Chemical Preparation, Storage & Tracking describes the laboratory procedures for documenting chemical reference standards purchased for use in the laboratory and procedures for tracking chemical standards and solutions prepared in house. ..

The following records are kept for purchased standards:

Assignment of a unique tracking ID,
Standard name,
Manufacturer name or vendor name,
Certificate of analysis or purity (if available),
Lot ID,
Receipt date,
Expiration date,
Standard storage requirements are specified in the method SOPs.

13.1.5 The following records are kept for solutions prepared in house:

An assignment of a unique tracking ID,
The tracking IDs of stock standards or reagents used in the preparation,
Amounts and concentration of standards used,
The final volume and concentration,
Date prepared
An assigned expiration data (as per stability of the analyte based on the method / manufacturers expiration date, etc) and
Identification of the analyst associated with the preparation,
Standard storage requirements are specified in the method SOPs.

13.1.6 When traceability of measurements to SI units is not possible or not relevant, evidence for correlation of results through inter laboratory comparisons, proficiency testing, or independent analysis may be provided.

13.1.7 Equipment used for generation of test results are calibrated according to the minimum frequency identified in the laboratory SOP, as specified by the method, the manufacturer, by regulation, or as needed.

13.1.8 Additionally, clients may further verify a required level of uncertainty is achieved by: a review of internal quality control data, provided as requested by a client; and through a use of a third party data validation service, to review the data (as requested by a client).

13.1.9 Reference Material requirements for the Metrology equipment (analytical balances, thermometers, etc.) are identified is SOP HS-EQ001 Use and Maintenance of Balances - SOP HS-EQ002 Thermometer Calibration and Temperature Monitoring and SOP HS-EQ003 Lab Volumetric Ware Calibration.

13.1.9.1 SOP HS-EQ001 requires the annual analytical balance service and calibration verification using an outside service. Class 1 weights are

used for daily calibration verifications of analytical balance bracketing the range of use. Class 1 weights must be certified every year.

13.1.9.2 SOP HS-EQ002 requires that NIST-traceable Reference thermometers calibrations be verified every 5 years by a NVLAP calibration laboratory. Thermometers in use for various temperature monitoring activities (e.g. storage refrigerators, drying ovens, etc.) are verified for accuracy annually using the NIST-traceable reference thermometers at temperature bracketing the monitored range. Digital thermometers are verified for accuracy quarterly using the NIST-traceable reference thermometers at temperatures bracketing the monitored range.

13.1.9.3 SOP HS-EQ003 requires at least five measurements quarterly (for DoD projects, three measurements daily), and the precision, bias and individual % Recovery calculated and recorded. All volumetric labware shall be initially and thereafter annually inspected for possible defects.

13.2 Source and Preparation of Standards and Reference Materials

13.2.1 Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by a TNI-approved third party accreditor. The laboratory relies on a primary vendor for the majority of its analytical supplies. Consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Cambridge Isotope Laboratories (CIL), Wellington Laboratories, and Accustandard are examples of the vendors used. Reference material information is recorded in the “Materials Logbook” in LIMS and materials are stored under conditions that provide maximum protection against deterioration and contamination. Entries in the Materials Logbook include such information as an assigned LIMS identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. The date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

13.2.2 Stock solutions and calibration standard solutions are prepared fresh as often as necessary according to their stability. All standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the SOP HE-EXT006, *Preparation of Standard Solutions* or HS-QS001, *Reagent/Standards Receiving and Preparation* and are entered in to LIMS for tracking purposes. Prior to sample analysis, all calibration reference materials are verified with a second, independent source of the material.

13.3 High Resolution GC/MS Systems

13.3.1 All HRGC/HRMS instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise)

using procedures outlined in Standard Operating Procedures and/or appropriate USEPA method citations. All reference materials used for this function are vendor-certified standards. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method. For isotope dilution procedures, the internal standard response(s) and labeled compound recovery must meet method criteria. Method-specific instrument tuning is regularly checked using perfluorokerosene (PFK). Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed.

14) Assuring the Quality of Results

14.1 The quality of test results are defined by the use, collection, and monitoring of essential quality control elements of the test procedures. Procedures employed to accomplish this may include the following:

14.1.1 Defining acceptance criteria based upon method defined criteria, which may be static (e.g. ±20%) or statistically derived (e.g. ± 3 standard deviations from a mean). Acceptance criteria for the testing procedures are typically defined by the QC sample type (ICV, CCV, LCS, MS, etc.) and are in general based on either defined method criteria or a statistical method.

- Acceptance criteria and frequency for calibration and calibration verifications by method are found in the associated method SOP or in LIMS.
- Acceptance criteria and frequency for Laboratory Control Samples (LCS) by method are found in the associated method SOP or in LIMS.

14.1.2 Control Charting and Trending

14.1.2.1 In addition to evaluating individual batch QC results against control limits, QC results from successive batches are also evaluated for possible trends. While a trend is not necessarily an out-of-control situation, it can provide an early warning of a condition that can cause the system to go out of control. ALS SOP HS-QS024 “Trending, Control Limits, and Uncertainty” describes in detail the assessment of QC data in the laboratory. The following conditions are trends that may initiate action and/or monitoring.

- A series of successive points on the same side of the mean
- A series of successive points going in the same direction
- Two successive points between warning limits and control limits

14.1.2.2 ALS relies on analytical staff to identify trends in analytical systems. Quality Assurance can produce control charts as needed to assess trends but this activity by QA is not preventive and is only used to verify trends exist. The occurrence of a trend does not invalidate data that are otherwise in control. However, trends do require attention to determine whether a cause can be assigned to the trend so that appropriate preventive action can be undertaken.Participation

in semi-annual Proficiency Test studies (per matrix) provides data to assess the validity of the testing procedures employed.

14.1.3 Replicate tests using the same or different methods.

14.1.4 Retesting of retained samples to confirm analysis

14.1.5 Correlation of results for different characteristics of a sample.

14.1.6 The required use of second source calibration verification standards ensure the quality of reference materials used to prepare calibrations and other quality control samples employed in the testing processes.

14.1.7 All Test and Preparation SOPs define the quality control samples that are required in the test processes, based on the most restrictive requirements of an analytical methods, regulatory requirements, or internally generated QC criteria. When the most restrictive criteria are not apparent, the mandated method or regulatory criteria is employed. These QC samples include:

14.1.7.1 Initial Calibration Standards defined and acceptable calibration models and criteria

14.1.7.2 Initial Calibration Verification and Continuing Calibration criteria and frequency

14.1.7.3 Calibration or instrument blanks acceptance criteria and frequency

14.1.7.4 Method Blanks acceptance criteria and frequency Laboratory Control Samples acceptance criteria and frequency

14.1.7.5 Duplicate acceptance criteria (whether as sample, LCSD or MSD)

14.1.7.6 Interference checks as defined by a method

14.1.7.7 Internal / external calibration criteria as per method

14.1.7.8 Quality of reagents or solvents use to prepare standards and samples

14.1.7.9 Evaluation of method capability through limit of detection evaluation and analyst demonstration of capability

14.1.8 Employment of Positive and Negative control for Testing Procedures – The following are procedures employed as negative or positive:

14.1.8.1 Blanks (negative)

14.1.8.2 Laboratory control sample (positive)

14.1.9 Method Selectivity is assured through:

14.1.9.1 Absolute and relative retention times in chromatographic analyses;

14.1.9.2 Two-column confirmation when using non-specific detectors (e.g. dual ECD);

14.1.9.3 Use of acceptance criteria for mass-spectral tuning (found in test method SOPs);

14.1.9.4 Use of the correct method, according to its scope assessed during method validation.

14.2 Laboratory Quality Control Batch Sample types and typical corrective actions – (see

Batch Definition in Appendix A). These essential Quality Control components are processed in exactly the same manner as field samples.

14.2.1 Method Blanks (MB) –

14.2.1.1 MB is prepared from analyte free water (or other acceptable analyte free matrix)

14.2.1.2 Contaminated blanks are identified according to the acceptance limits in the test method SOPs, typical criteria <1/2 LOQ or < LOQ if a common lab contaminant (e.g. methylene chloride for VOC analysis).

14.2.1.3 When a blank is determined to be contaminated, the cause must be investigated and measures taken to minimize or eliminate the problem.

14.2.1.4 Batch Data that are unaffected by the blank contamination (non-detects or other analytes) are reported unqualified.

14.2.1.5 Batch Sample data that are suspect due to the presence of a contaminated blank are reanalyzed, qualified, or not reportable.

14.2.2 Laboratory Control Samples (LCS)

14.2.2.1 LCS are prepared from analyte free water (or other acceptable analyte free matrix), and spiked with verified and known amounts of analytes for the purpose of establishing precision or bias measurements.

14.2.2.2 LCS are analyzed at a frequency mandated by method, regulation, or client request, whichever is more stringent (1 per batch of 20 or less depending on the method is the practice in the laboratory SOPs as per method).

14.2.2.3 LCS data is calculated in percent recovery that allows comparison to established acceptance criteria.

14.2.2.4 When the LCS does not meet criteria, the cause must be investigated and measures to correct the problem must be taken.

14.2.2.5 For any batch samples analyzed with the unacceptable LCS, some results may be useable if qualified and under the following conditions:

- If the acceptance criteria are exceeded high (high bias) and the associated samples are below detection, then those sample results that are non-detects may be reported as non-detects.
- If the acceptance criteria are exceeded low (low bias) and there are samples that exceed the maximum regulatory limit, then those exceeding the regulatory limit may be reported.

14.2.2.6 For those batch samples having unusable data, reprocessing and reanalysis is required (after the cause of the LCS failure has been corrected),

14.2.2.7 Should re-analysis be an impossibility, any data reported must be qualified and discussed in the data report narrative to the client

14.2.3 Matrix Spikes and Matrix Spike Duplicates - prepared from a portion of client

sample, and spiked with verified and known amounts of analytes for the purpose of evaluating the effect of sample matrix on the test measurements.

14.2.3.1 The MS are analyzed at a frequency mandated by method, regulation, or client request, whichever is more stringent (1 per batch of 20 or less is the practice in the laboratory SOP as per most method).

14.2.3.2 MS are calculated in percent recovery that allows comparison to established acceptance criteria (the LCS criteria is utilized for most methods).

14.2.3.3 When the MS does not meet criteria, it is evaluated in comparison with the LCS to assess whether there is a matrix effect present. A reproducible duplicate MS (the MSD) would assist the confirmation that a matrix effect is likely present.

14.2.3.4 For any batch samples analyzed with the unacceptable MS, like the LCS some results may be useable under the following conditions:

- If the acceptance criteria are exceeded high (high bias) and the associated samples are below detection, then those sample results that are non-detects may be reported as non-detects.
- If the acceptance criteria are exceeded low (low bias) and there are samples that exceed the maximum regulatory limit, then those exceeding the regulatory limit may be reported.

14.2.3.5 All batch samples associated with a MS outside of criteria are identified for the client or program data usability decisions. The cause of an MS exceedance may be due to many reasons, most often due to an interference present that is not easily removed by a practice stated in the method. In these cases, the data is reported with the qualified MS results and noted on a laboratory data review checklist exception report.

14.2.4 Duplicates - prepared from a portion of client sample, for the purpose of evaluating method precision.

14.2.4.1 The duplicate is analyzed at a frequency mandated by method, regulation, or client request, whichever is more stringent (1 per batch of 20 or less is the practice in the laboratory SOP as per most methods). The duplicate may take the form as a duplicate, a matrix spike duplicates (MSD), or a laboratory control sample duplicate, depending on the availability of additional sample and the type of test method.

14.2.5 Surrogate Spikes - Surrogates are substances with chemical properties and behaviors similar to the analytes of interest used to assess method performance in individual samples.

14.2.5.1 Surrogates are added to all samples (in test methods where surrogate use is appropriate) prior to sample preparation or extraction.

14.2.5.2 Surrogate recovery results are compared to the acceptance criteria as established in the test method SOP or from program guidance (CLP or DOD) or from laboratory established limits.

14.2.5.3 For surrogate results outside established criteria, data is evaluated to determine the impact. Corrective actions include reprocessing and reanalysis to determine whether a matrix effect is present, qualifying the data and/or narrating the occurrence on the data review checklist exception report.

14.3 Proficiency Test Samples - The laboratory participates in proficiency test (PT) studies twice a year. These studies include all applicable fields of proficiency testing and are obtained from an approved proficiency test provider.

14.3.1.1 The laboratory does not share PT samples with other laboratories, does not communicate with other laboratories regarding current PT sample results, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

14.3.1.2 Proficiency Testing (PT) samples are treated as typical samples in the normal production process including the same preparation, calibration, quality control and acceptance criteria, sequence of analytical steps, number of replicates, and sample log-in. PT samples are not analyzed multiple times unless routine environmental samples are analyzed multiple times.

14.3.1.3 The laboratory initiates corrective action procedures for any unacceptable PT result. Additionally, the laboratory must successfully complete two of the most recent three proficiency tests for each field of proficiency testing. In the event that this requirement is not met, the laboratory institutes corrective action procedures, including participation in 2 supplemental PT studies to demonstrate corrective action. Supplemental PT studies are performed at least 15 days apart from each other.

- For a PT studies, a “Not Acceptable” result for any analyte on two of the most recent PT studies results in a “Fail” score for that analyte.

14.4 Data Review - The laboratory reviews all data generated in the laboratory, hardcopy and electronic, for compliance with method, and, whereapplicable, client requirements. Procedures for Data Reduction, Review and Validation are described in SOP HS-QS009.. In general, the procedure includes:

14.4.1.1 Initial analyst calibration, and applicable batch QC data (method blank, LCS, MS, Duplicate, etc,), including the raw data and calculated data entered into the lab LIMS. Batch QC limits by method are stored in LIMS to facilitate checks for meeting Batch QC acceptance limits by method. The LIMS also contains LOQ and LOD information along with upper calibration limits by method, to facilitate accurate evaluation of detections against the method applicability range for reporting, to ensure required dilutions were performed and reported correctly, when necessary. The initial process includes the use of LIMS QC Checking tools that the analyst and any later peer reviewer can use to evaluate whether reportable client data entered in LIMS is correctly referenced (or linked) to the correct supporting QC data. A Data Assessment checklist is prepared during the initial review of the data by the analyst.

14.4.1.2 A second peer review is performed by a qualified analyst or supervisor. The same LIMS QC checks are reviewed and include search for the required QC sample types to assure that all supporting QC data are present in LIMS for evaluation against the QC acceptance criteria stored in LIMS for each test performed. A nominal 10 % of the raw data is reviewed to verify the correct data has been calculated and entered correctly.

14.4.1.3 QC exceedances are identified in LIMS by the application of the appropriate data qualifying flags. A list of the most common data qualifiers can be found in Appendix E. The data qualifying flags may either initiate corrective actions for nonconforming data and/or require supporting comment information to be entered into LIMS batch report or entered into the batch data review checklist exception report

14.4.1.4 Comments for data flags are documented in LIMS and in the batch data review checklist exception report for inclusion in the project Case Narrative, as necessary.

14.4.1.5 A Final Project Manager review of the data is performed to review the data for completeness against any client specified requirements, evaluate the reasonableness of results and prepare a narrative to discuss any anomalies associated with assigned data flags.

14.4.1.6 QA Department reviews data as appropriate and during internal method audits.

15) Control of Non-Conforming Environmental Testing Work

The laboratory takes all appropriate steps necessary to ensure all sample results are reported with acceptable quality control results. When sample results do not conform to established quality control procedures, responsible management will evaluate the significance of the nonconforming work and take corrective action to address the nonconformance.

Non-conforming work is work that does not meet acceptance criteria or requirements. Non-conformances can include unacceptable quality control results or departures from standard operating procedures or test methods. Requests for departures from laboratory procedures are approved by Quality Assurance Manager or the Technical Director and documented, see SOP HS-GEN005, Departures from Approved Procedures.

The policy for control of non-conforming work is to identify the non-conformance, determine if it will be permitted, and take appropriate action. All employees have the authority to stop work on samples when any aspect of the process does not conform to laboratory requirements.

The responsibilities and authorities for the management of non-conforming work are detailed in SOP HS-QS003: “Nonconformance and Corrective Action Procedure”. The laboratory evaluates the significance of the nonconforming work, and takes corrective action immediately, when necessary. The client is notified if their data has been impacted. Resumption of work after non-conformance is authorized by the Quality Assurance Manager or the Technical

Director.

For nonconforming work performed by vendors, for example calibrations, the nonconforming items are checked and deviations if any recorded by the personnel who requested the test. Tested items that do not conform to specifications will not be used in the performance of analysis for any lab data.

16) Corrective Action and Preventive Action.

16.1 **Corrective action** is the action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence.

16.1.1 Deficiencies cited in external assessments, internal quality audits, data reviews, customer feedback/complaints, control of nonconforming work or managerial reviews are documented and require corrective action. Corrective actions taken are appropriate for the magnitude of the problem and the degree of risk.

16.1.2 Any of the Technical Staff (e.g. an analyst, supervisor or project manager) may initiate a corrective action when performing a routine data review. All deficiencies are investigated and a corrective action plan developed and implemented if determined necessary. The implementation is monitored for effectiveness. Corrective action reporting for routine, non-recurring exceedances can be records in logbooks, email, or other informal documents. More serious corrective actions require a more formal corrective action report that is reported to the QA department for monitoring as per SOP HS-QS003: "Nonconformance and Corrective Action Procedure". The QA Manager is responsible for monitoring and recording corrective actions in these cases in the ALS Global Sharepoint website. Specific corrective action protocols specified in test methods may over-ride general corrective action procedures specified in this manual.

16.1.3 Selection and Implementation of Corrective Actions: Once an exceedance or nonconformance is noted, the first action is an investigation to determine the root cause. The root cause is investigated to define the condition or event that, if corrected or eliminated, would prevent the recurrence of the noted deficiency. Based on the root cause investigation potential corrective actions, most likely to prevent recurrence of the nonconformance, are identified. Records are maintained of non conformances requiring corrective action to show that the root cause(s) was investigated, and includes the results of the investigation where uncertainty arises regarding the best approach for analysis of the cause of an exceedance that require corrective action, the appropriate personnel (e.g. The Technical Director or a Department Supervisor) will recommend corrective action to be initiated and completed within the agreed upon time frame.

16.1.4 Monitoring of Corrective Action: Corrective actions are monitored to ensure the successful implementation of changes in laboratory processes as a result of a corrective action plan. Monitoring is executed by the QA Manager, in cooperation with the Department Supervisor. Department supervisors are responsible for monitoring corrective actions associated with routine laboratory activities, including implementation of procedural changes as

stated in the appropriate SOP. Serious corrective actions, those related to systematic problems, are monitored by the QA Manager. All monitoring of Corrective Actions is documented through the NCAR database in Sharepoint. All tracking of NCARs is accomplished though use of Microsoft Teams. This keeps all stakeholders up-to-date on the status of NCARs.

16.1.5 Additional Audits: Additional audits are required when non conformances or departures cast doubt on the laboratory's compliance with approved policies and procedures, or with standards on which these policies and procedures are based (i.e., TNI Standard, or DOD Standard). These audits are conducted as soon as possible according to SOP HS-QS012 Internal Auditing.

16.1.6 Technical Corrective Actions: A cause analysis in corrective action investigates the root cause of the problem. Sample data associated with an exceeded quality control are evaluated for the need to be reanalyzed or qualified. Unacceptable quality control results are documented, and if the evaluation requires cause analysis, the cause and solution are recorded. The analyst is responsible for initiating or recommending corrective actions and ensuring that exceedances of quality control acceptance criteria are documented. Analysts routinely implement corrective actions for data with unacceptable QC measures. First level correction may include re-analysis without further assessment. If the test method SOPs addresses the specific actions to take, they are followed. Otherwise, corrective actions start with assessment of the cause of the problem. Area supervisors review corrective action results and suggest improvements, alternative approaches, and procedures where needed.

16.1.7 If the data reported are affected adversely by the nonconformance, the client is notified in writing. The discovery of a non-conformance for results that have already been reported to the client must be immediately evaluated for significance of the non-conformance, its acceptability to the client, and determination of the appropriate corrective action. Where possible, samples are reported only if all quality control measures are acceptable. Where unacceptable, quality control measures must be reported, all sample associated with the failing control measures are reported with the appropriate data qualifiers.

16.1.8 Departures from Approved Procedures: SOP HS-GEN005, Departures from Approved Procedures allows exceptionally permitting departures from documented policies and procedures, the laboratory allows the release of non-conforming data only with approval by the Technical Director or his designee on a case-by-case basis (e.g. meeting a client specification). Planned departures from procedures or policies do not require audits or investigations. Permitted departures for non-conformances, such as QC exceedances, are fully documented and include the reason for the departure, the affected SOP(s), the impact of the departure on the data, and the data. Refer to.

16.2 **Preventative action** is a pro-active process to identify opportunities for improvement, rather than a reaction to the identification of problems or complaints. The process maximizes the quality of service provided by the laboratory.

16.2.1 Opportunities for improvement and potential sources of non conformances, either technical or concerning the quality system, are proactively identified through various actions including, but not limited to, review of QC data to

identify quality trends (SOP HS-QS004 Control Charts), regularly scheduled staff quality meetings (SOP HS-GEN-006 Resource Review), and annual managerial reviews (SOP HS-QS017 Management Review), scheduled instrument maintenance (SOP HS-EQ004 Preventative Maintenance), running a new LIMS system in tandem with the old system to assure at least one working system (SOP HS-IT002 Computer Software Installation and Maintenance) and other actions taken to prevent problems.

16.2.2 Once potential preventive actions are identified, an action plan is developed, implemented, and monitored to reduce the likelihood of the nonconformance occurrence and to tack advantage of the opportunity for improvement.

16.2.3 All employees have the authority to recommend preventive action procedures, however management is responsible for implementing and monitoring the effectiveness of preventive actions.

17) Control of Records

Laboratory records are a subset of documents, usually data recordings that include annotations, such as daily refrigerator temperature recordings, raw data entered laboratory logbooks, spreadsheets, analyst notes on a chromatogram, and copies of test reports, etc. Records may be on any form of media, including electronic and hard copy. Records allow for the historical reconstruction of laboratory activities related to sample handling and analysis.

17.1 Records Maintained

Records of all procedures to which a sample is subjected while in the possession of the laboratory are kept. The laboratory retains all original observations, calculations and derived data (with sufficient information to produce an audit trail), calibration records, personnel records and a copy of the test report for a minimum of ten (10) years from generation of the last entry in the records. At a minimum, the following records are maintained by the laboratory to provide the information needed for historical reconstruction:

All raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' worksheets and data output records (chromatograms, strip charts, and other instrument response readout records);

17.1.1 A written description or reference to the specific method(s) used, which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value (a copy of all pertinent Standard Operating Procedures);

17.1.2 Laboratory sample ID code;

17.1.3 Date of analysis;

17.1.4 Time of analysis is required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., extractions and incubations);

17.1.5 Instrumentation identification and instrument operating conditions/parameters (or reference to such data);

17.1.6 All manual calculations (including manual integrations);

17.1.7 Analyst's or operator's initial/signature or electronic identification;

17.1.8 Sample preparation, including cleanup, separation protocols, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;

17.1.9 Test results (including a copy of the final report);

17.1.10 Standard and reagent origin, receipt, preparation, and use;

17.1.11 Calibration criteria, frequency and acceptance criteria;

17.1.12 Data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;

17.1.13 Quality control protocols and assessment;

17.1.14 Electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries;

17.1.15 Method performance criteria including expected quality control requirements;

17.1.16 Proficiency test results;

17.1.17 Records of demonstration of capability for each analyst;

17.1.18 Record of names, initials, and signatures for all individuals who are responsible for signing or initialing any laboratory record;

17.1.19 Correspondence relating to laboratory activities for a specific project;

17.1.20 Corrective action reports;

17.1.21 Preventive action records;

17.1.22 Copies of internal and external audits including audit responses;

17.1.23 Copies of all current and historical laboratory SOPs, policies and Quality Manuals, both electronic and original hard copies;

17.1.24 Sample receiving records (including information on any inter laboratory transfers);

17.1.25 Sample storage records;

17.1.26 Data review and verification records;

17.1.27 Personnel qualification, experience and training records;

17.1.28 Archive records; and

17.1.29 Management reviews.

17.2 Records Management and Storage

These procedures are described in more detail in Laboratory SOPs HS-QS011 for Record Archival Procedures and HS-QS014, Document Control and Laboratory Records. These procedures require that all records, as either hard copy or electronic, be maintained for a period of at least ten (10) years. The records are stored in secure storage to protect them from deterioration or damage and to protect client confidentiality. In the event that the laboratory transfers ownership or goes out of business, records are maintained or transferred according to the clients' instructions. All electronic records are backed-up daily by the IT Department. Access to protected records is limited to laboratory management or their designees to prevent unauthorized access or amendment.

17.3 Legal Chain of Custody Records are managed when projects request the use of internal chain of custody procedures as described in SOP HS-SM001 Sample Log-in Procedures.

18) Audits

Quality audits are an essential part of the Quality Assurance program. Audits measure laboratory performance and verify compliance with accreditation/ certification and project requirements. Audits specifically provide management with an on-going assessment of the quality system. They are also instrumental in identifying areas where improvement in the quality system will increase the reliability of data. Audits are of four main types: internal, external, performance, and system.

18.1 Internal Audits – The laboratory periodically conducts internal audits in all areas of the laboratory to ensure that its operations continue to comply with the requirements of the Quality System as well as requirements of the standards on which the Quality System is based. The internal audit reviews laboratory conformance in two areas: quality system procedures and analytical method procedures. Analytical method evaluations include a review of how analysts perform preparation and analysis steps in conformance to approved laboratory standard operating procedures. All areas of the quality system must be conducted annually at a minimum, but any area assessments may be performed monthly or quarterly until all areas are performed. Should an area be found in nonconformance, a corrective action must be designated to the responsible individuals. Upon completion of the corrective action, re-auditing must be performed as verification.

It is the responsibility of the Quality Manager to plan and organize audits as required by the schedule and requested by management. These audits are carried out by trained and qualified personnel who are, wherever resources permit, independent of the activity to be audited. All tracking of Internal Audits is accomplished though use of Microsoft Teams. This keeps all stakeholders up-to-date on the status of Internal Audits.

Analytical method audits must be conducted in a manner such that each technology is audited at least once annually for at least one analytical method that is routinely performed and is representative of the majority of methods performed by that department. The method audited for that technology must be rotated over the course of no more than five years. After an audit is performed, a report is generated and given to management and each supervisor of the department audited. This report includes

the findings and observations and the recommendations for improvement or correction. Time-lines for responses and corrections are provided so they may be addressed in a timely fashion. The supervisors of each area provide responses to any findings with demonstration of corrections as needed.

18.1.1 An annual inspection/audit of the LIMS is performed by the quality manager or designee to ensure the quality of electronic data. Checks are done by hand calculating data, with the objective of arriving at at the same result as LIMS. This calculation report is signed and stored by the QA department. It is supplemented by a review of 10% of reports by the QA Department that verifies the existence of all required elements including a check that the data in LIMS has not changed since the report was generated.

When an audit finding casts doubt on the effectiveness of the operation or on the correctness or validity of test results, the laboratory shall notify affected clients in writing within seven days.

All investigations that result in findings of inappropriate activity are documented and include any disciplinary actions, corrective action and appropriate notifications of clients.

18.2 External Audits - It is the laboratory's policy to cooperate and assist with all external audits, whether performed by a client or an accrediting authority. All external audits are fully documented and tracked to closure. Management ensures that all areas of the laboratory are accessible to auditors as applicable and that appropriate personnel are available to assist in conducting the audit. Any findings related to an external audit follow corrective action procedures. Management ensures that corrective actions are carried out within the timeframe specified by the auditor(s).

18.3 Performance Audits - Performance audits may be Proficiency Test Samples, double-blind samples through a provider or client, or anything that tests the performance of the analyst and method.

TNI Proficiency Test (PT) samples are scheduled twice annually for each TNI field of accreditation per matrix. The PT samples tested are purchased from a TNI approved PT provider. The results assess analyst proficiency when conducting analyses for specific analyte(s) on a matrix specific basis. PT sample management, analysis and reporting of PT sample results are to be conducted in the same manner as real environmental samples utilizing the same staff and methods as used for routine analysis. This requires use of the same procedures, equipment, facilities, and frequency of analysis.

PT sample results are forwarded by QA Manager or designee to the PT provider via the provider supplied reporting format (i.e. fax, mail or internet reporting). After closing of a PT study, results are evaluated by the provider and reported directly to the primary TNI Accrediting Authority (TCEQ) and secondary TNI Accrediting Authorities when required (e.g. LDEQ), to other non-TNI State Accrediting Authorities as required, and to the laboratory. All recent results of the PT studies are posted in the laboratory and made available to the staff and interested clients. For those results that deviate from the accepted values, a nonconformance corrective action (NCAR) must be issued to the appropriate departmental supervisor or analyst to investigate and report the findings. The NCAR process typically requires analysis of another PT to verify the adequacy of the corrective action. The QA Department maintains records of the corrective action PT and related documents. The results of PT corrective actions and corrective action PT are reported to the accrediting authority as required by the respective program. Corrective

PT studies are sent directly to all respective accrediting authorities

18.4 System Audits

A quality system audit reviews general laboratory cleanliness, employee training documentation, support systems, equipment and facilities maintenance and repair records, sample handling and record-keeping practices. Various checklists may be used including, but not exclusively, the Combined ISO/IEC 17025:2017, NELAC TNI 2016 Module 2 and DoD QSM Version 5.4 Quality System Requirements from A2LA, the TNI 2009 and DoD/DOE QSM Version 5.4 Checklist from PJLA, the TNI 2016 Standard Checklist from The NELAC Institute, or one developed by ALS Environmental. Quality (or Management) System Audits are conducted annually, usually in the first quarter of the new year. The Laboratory's management system is also audited though annual management reviews. Refer to Sections 19 – "Management Review" and SOP CE-QA001 Internal Audits for further discussion of systems audits.

18.5 Handling Audit Findings

Internal or external audit findings are responded to within the time frame agreed to at the time of the audit. The response may include action plans that could not be completed within the response time frame. A completion date is established by management for each action item and included in the response.

The responsibility for developing and implementing corrective actions to findings is the responsibility of the Quality Assurance Manager or the Technical Director. Corrective actions are documented through the corrective action process described in Section 16 – "Corrective Actions".

Audit findings that cast doubt on the effectiveness of the laboratory operation to produce data of known and documented quality or that question the correctness or validity of sample results must be investigated. Corrective action procedures described in SOP HS-QS003: "Nonconformance and Corrective Action Procedure" must be followed. Clients must be notified in writing if the investigation shows the laboratory results have been negatively affected and the client's requirements have not been met. The client must be notified within one business day after the laboratory discovers the issue. Laboratory management will ensure that this notification is carried out within the specified time frame.

All investigations that result in findings of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients

19) Management Review

19.1 Top management reviews the management system on an annual basis and maintains records of review findings and actions. The review ensures that the quality system of the laboratory continues to conform to the requirements of the ISO 17025:2017 and various accrediting authorities, including NELAP/TNI and the current DoD QSM.

19.2 Management Review Topics

The following are reviewed to ensure their suitability, adequacy, and effectiveness:

- Changes in internal and external issues that are relevant to the laboratory
- Fulfilment of objectives
- The suitability of policies and procedures;
- Status of actions from previous management reviews
- Reports from managerial and supervisory personnel;
- The outcome of recent internal audits;
- Corrective and preventive actions;
- Assessments by external bodies;
- The results of inter laboratory comparisons or proficiency tests;
- Changes in the volume and type of the work;
- Customer and personnel feedback;
- Complaints;
- Recommendations for improvement;
- Effectiveness of any implemented improvements
- Results of risk and opportunity identification
- Outcomes of the assurance of the validity of results
- Other relevant factors, such as quality control activities, resources, and staff training.

19.3 The procedure for Management Review can be found in SOP HS-QS017. Findings and follow-up actions from management reviews are recorded. Those outputs will examine the effectiveness of the management system and its processes, improvement of the laboratory activities, provision of required resources, and any need for change. Management will determine appropriate completion dates for action items and ensure they are completed within the agreed upon time frame.

20) Personnel

ALS employs competent personnel based on education, training, experience and demonstrated skills as required. The laboratory's organization chart can be found in Appendix B.

20.1 Overview

20.1.1 Training begins on the first day of employment at the laboratory when the company policies are presented and discussed. Safety and Quality System requirements are integral parts of initial and ongoing training processes at the laboratory. Safety training begins with the reading of the ALS Environmental Health and Safety Manual. Employees are also required to attend periodic safety meeting where additional safety training may be performed by the Environmental, Health, and Safety Officer.

20.1.2 Quality Systems training begins with QA orientation for new employees, which includes ethics/data integrity introductory training, and reading the QA Manual. During the employee's first year, the employee attends additional core ethics training and further learns about the laboratory quality systems as they relate to

specific job functions. Each employee participates in annual ethics refresher training.

20.1.3 All personnel are responsible for complying with all quality and data integrity policies and procedures that are relevant to their area of responsibility.

20.1.4 All personnel who are involved in activities related to sample analysis, evaluation of results or who sign test reports, must demonstrate competence in their area of responsibility. Appropriate supervision is given to any personnel in training and the trainer is accountable for the quality of the trainees work. Personnel are qualified to perform the tasks they are responsible for based on education, training, technical knowledge, experience and demonstrated skills as required for their area of responsibility.

20.1.5 The laboratory provides goals with respect to education, training and skills of laboratory staff. Training needs are identified at the time of employment and when personnel are moved to a new position or new responsibilities are added to their job responsibilities. Ongoing training, as needed, is also provided to personnel in their current jobs. The effectiveness of the training must be evaluated before the training is considered complete.

20.1.6 An overview of top management's responsibilities are included in Section 3 – "Management". Job descriptions include the specific tasks, minimum education and qualifications, skills, and experience required for each position. Job description for staff not in management can be found in their individual personnel folder.

20.2 Training

20.2.1 SOP-HS-QS013 Employee Training requires all analysts to be trained in the elements of this QA Manual, and that they must sign a method qualification statement that they have read, understand and agree to follow the technical SOPs they perform.. This information must be on file in the QA department after completion and it the responsibility of each departmental supervisor that these items are completed and approved before any work is commenced.

20.2.2 All personnel are appropriately trained and competent in their assigned tasks before they can contribute to functions that can affect data quality. It is management's responsibility to assure personnel are trained. Training records are used to document management's approval of personnel competency. The date on which authorization and/or competence is confirmed is included.

Training records are maintained by the Quality Assurance Manager and include Demonstrations of Capability (Initial and Continuing), Experience Documentation, and Ongoing Training.

Staff members are given the following ongoing training:

20.2.2.1 All staff members are given refresher data integrity training as outline in §20.3.1. This training is documented by the ALS Human Resources Department.

20.2.2.2 The employee attests, through signature, that they have read, understood, and agree to perform the latest version of the Quality Manual and any SOPs or policies that the analyst is responsible for following.

20.2.2.3 Annually, the analyst shows continued proficiency in each method they perform by Continuing Demonstration of Capability or by passing a Performance Evaluation Sample, see § 12.2

20.3 Ethics and Data Integrity Training

20.3.1 Employees are required to understand that any infractions of the laboratory data integrity procedures shall result in a detailed investigation that could lead to very serious consequences including immediate termination, debarment or civil/criminal prosecution. This is discussed in the Ethics and Data Integrity Policy that every employee is required to to review upon onboarding and every January after that. No employee is allowed to conduct tests in the lab (including the iDOC described in §12.1) until they have completed this Ethics and Data Integrity Training. The following topics are covered:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting
- How and when to report data integrity issues
- Record keeping
- Training, including discussion regarding all data integrity procedures
- Data integrity training documentation
- In-depth data monitoring and data integrity procedure documentation
- Specific examples of breaches of ethical behavior such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards.

20.3.2 SOP CE-GEN001 Laboratory Ethics and Data Integrity Procedures- provides guidance and direction for employees when generating laboratory data and a thorough understanding of what constitutes an improper, unethical or illegal action and consequences of such action. The ethics policy specifically defines employee responsibility and accountability with the following being required of all personnel:

20.3.2.1 ALS Group USA, Corp employees shall at all times conduct themselves and the business of the Company in an honest and ethical manner.

20.3.2.2 ALS Group USA, Corp employees shall comply with the terms of the ethics policy, and as a condition of employment is required to sign the Ethics Training confirmation.

20.3.2.3 The willful act of improper manipulation or falsification of data will not be tolerated and is subject to punitive measures up to and including dismissal and subsequent legal action.

20.3.2.4 Observance of unethical behavior shall be immediately reported to a supervisor, a manager, or the QA Manager. Failure to report such activity is considered to be in support of the unethical activity and shall be dealt with in those terms.

20.3.2.5 Unauthorized release of confidential information about the Company or its customers shall be subject to disciplinary action, up to and including dismissal and subsequent legal action.

20.3.3 Employees are trained to understand that improper or unethical actions are serious matters that can have a very negative effect on the laboratory. The actions can result in any of the following: potential civil or criminal liability for ALS Group USA, Corp and employees; cost in time and resources of defending data before auditors; loss of client trust; loss of business and potential fines and imprisonment of employees involved. In order to maintain the integrity and reputation of ALS Group USA, Corp, it is most important that all the data released in projects be as factual as possible. Therefore, misrepresentation of any data by an ALS Group USA, Corp employee is not allowed. Any employee who knowingly releases false data values will be subject to disciplinary action, up to an including possible termination of employment and legal action.

20.3.4 Periodic monitoring of data integrity is performed by the QA department when performing laboratory data audits as part of SOP HS-QS012 Internal Audits or at any time by the QA Department should an inappropriate action be suspected or a lack of proper training be evident. In addition to periodic monitoring QA will on a periodic based perform an in-depth monitoring following the procedure in the process that includes items such as preparation, equipment, software, calculations and quality control.

20.3.5 Documented data integrity procedures are part of training provided in SOP HS-QS016 Manual Integration Policy and SOP HS-QS009 Data Reduction, Review and Validation.

21) Reporting of Results

The laboratory reports the analytical data produced in its laboratories to the client via the Analytical Report. This report includes a transmittal letter, a case narrative, client project information, sample receipt and chain of custody information, specific test results, quality control data (as requested), and any other project-specific support documentation.

The results shall be provided accurately, clearly, unambiguously and objectively, usually in a report, and shall include all the information agreed with the customer and necessary for the interpretation of the results and all information required by the method used. All issued reports shall be retained as technical records.

The following procedures describe the procedures used for data reduction, validation and reporting.

21.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the raw data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the SOP CE-QA007, *Making Entries onto Analytical Records*.

The resulting data set is either manually entered (e.g., titrimetric or spectrophotometer data) into an electronic report form or is electronically transferred into the report. Once the complete data set has been transferred into the proper electronic report form(s), it is then printed. The resulting hardcopy version of the electronic report is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the data and report hardcopy is forwarded to the supervisor or second qualified analyst who reviews the data. Where calculations are not performed using a validated software system, the reviewer rechecks a minimum of 10% of the calculations. Analysts performing routine testing are responsible for generating a data quality narrative or data review document with every analytical batch processed. This report also allows the analyst to provide appropriate notes and/or a narrative if problems were encountered with the analyses. A Nonconformance and Corrective Action Report (NCAR) may also be attached to the data prior to review. Supervisors or qualified analysts review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and addressed. Data review procedures are described in SOP *HRMS Data Review and Processing* (HE-HMS003) or *Data Reduction, Review, and Validation* (HS-QS009).

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the “before” and “after” integrations and including them in the raw data records. The policies and procedures are described in SOP HS-QS016, *Manual Integration Policy*.

The QA Manager or designee must review 10% of all DoD final reports issued by the laboratory on a quarterly basis. The reviewer must also review laboratory data package for technical completeness and accuracy on a quarterly basis to evaluate correctness of all action taken during the course of sample analysis. Errors discovered in this stage of review require the issuance of a nonconformance and corrective action report (NCAR). Report revisions recommended as part of a corrective action investigation will be coordinated with the Project Manager. Client must be notified within 15 days if data quality issues are discovered.

The results shall be reviewed and authorized prior to release. Any error discovered in this stage of review will require the issuance of a correction action. Report revision recommended as part of the corrective action will be coordinated with the Project Manager.

21.2 Validation of Results

The validity of the data generated is assessed through the evaluation of the sample results, calibrations, and QC samples (method blanks, laboratory control samples, sample duplicates, matrix spikes, trip blanks, etc.). A brief description of the evaluation of these analyses is described below, with details listed in applicable SOPs. The criteria for evaluation of QC samples are listed within each method-specific SOP. Other data evaluation measures can include verifications of accuracy, QC samples, and system sensitivity check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

Note: Within the scope of this document, all possible data assessment requirements for various project protocols cannot be included in the listing below. This listing gives a general description of data evaluation practices used in the laboratory in compliance with TNI Quality Systems requirements. Additional requirements exist for certain programs, such as projects under the DoD QSM protocols, and project-specific QAPPs.

- Initial Calibration – Following the analysis of calibration standards according to the applicable SOP the data is fit to an applicable and allowed calibration model (correlation coefficient, linear, average response factor, quadratic, etc.) and the resulting calibration is compared to specified criteria. If the calibration meets criteria analysis may continue. If the calibration fails, any problems are isolated and corrected and the calibration standards reanalyzed. Following calibration and analysis of the independent calibration verification standard(s) the percent difference for the ICV is calculated. If the percent difference is within the specified limits the calibration is complete. If not, the problem associated with the calibration and/or ICV are isolated and corrected and verification and/or calibration is repeated.
- Continuing Calibration Verification (CCV) – Following the analysis of the CCV standard the percent difference is calculated and compared to specified criteria. If the CCV meets the criteria analysis may continue. If the CCV fails, routine corrective action is performed and documented and a 2nd CCV is analyzed. If this CCV meets criteria, analysis may continue, including any reanalysis of samples that were associated with a failing CCV. If the routine corrective action failed to produce an immediate CCV within criteria, then either acceptable performance is demonstrated (after additional corrective action) with two consecutive calibration verifications or a new initial calibration is performed.

- Method Blank – Results for the method blank are calculated as performed for samples. If results are less than the MRL (<½ MRL for DoD projects), the blank may be reported. If not, associated sample results are evaluated to determine the impact of the blank result. If possible, the source of the contamination is determined. If the contamination has affected sample results the blank and samples are reanalyzed. If positive blank results are reported, the blank (and sample) results are flagged with an appropriate flag, qualifier, or footnote.
- Sample Results (Inorganic) – Following sample analysis and calculations (including any dilutions made due to the sample matrix) the result is verified to fall within the calibration range. If not, the sample is diluted and analyzed to bring the result into calibration range. When sample and sample duplicates are analyzed for precision, the calculated RPD is compared to the specified limits. The sample and duplicate are reanalyzed if the criteria are exceeded. The samples may require re-preparation and reanalysis. For metals, additional measures as described in the applicable SOP may be taken to further evaluate results (dilution tests and/or post-digestion spikes). Results are reported when within the calibration range, or as estimates when outside the calibration range. When dilutions are performed the MRL is elevated accordingly and qualified. Efforts are made to meet the project MRL's including alternative analysis.
- Sample Results (Organic) – For GC/MS analyses, it is verified that the analysis was within the prescribed tune window. If not, the sample is reanalyzed. Following sample analysis and calculations (including any dilutions made due to the sample matrix) peak integrations, retention times, and spectra are evaluated to confirm qualitative identification. Internal standard responses and surrogate recoveries are evaluated against specified criteria. If internal standard response does not meet criteria, the sample is diluted and reanalyzed. Results outside of the calibration range are diluted to within the calibration range. For GC and HPLC tests, results from confirmation analysis are evaluated to confirm positive results and to determine the reported value. If obvious matrix interferences are present, additional cleanup of the sample using appropriate procedures may be necessary and the sample is reanalyzed. When dilutions are performed the MRL is elevated accordingly and qualified. Efforts are made to meet the project MRL's including additional cleanup.
- Surrogate Results (Organic) – The percent recovery of each surrogate is compared to specified control limits. If recoveries are acceptable, the results are reported. If recoveries do not fall within control limits, the sample matrix is evaluated. When matrix interferences are present or documented, the results are reported with a qualifier that matrix interferences are present. If no matrix interferences are present and there is no cause for the outlier, the sample is re-prepared and reanalyzed. However, if the recovery is above the upper control limit with non-detected target analytes, the sample may be reported. All surrogate recovery outliers are appropriately qualified on the report.
- Duplicate Sample and/or Duplicate Matrix Spike Results – The RPD is calculated and compared to the specified control limits. If the RPD is within the control limits the result is reported. If not, an evaluation of the sample is made to verify that a homogenous sample was used. Despite the use of homogenizing procedures prior to sample preparation or analysis, the sample may not be homogenous or duplicate sample containers may not have been sample

consistently. If non-homogenous, the result is reported with a qualifier about the homogeneity of the sample. Also, the results are compared to the MRL. If the results are less than five times the MRL, the results are reported with a qualifier that the high RPD is due to the results being near the MRL. If the sample is homogenous and results above five times the MRL, the samples and duplicates are reanalyzed. If re-analysis also produces out-of-control results, the results are reported with an appropriate qualifier.

- Laboratory Control Sample Results – The LCS percent recovery is calculated and compared to specified control limits. If the recovery is within control limits, the analysis is in control and results may be reported. If not, this indicates that the analysis is not in control. Samples associated with the 'out of control' LCS, shall be considered suspect and the samples re-extracted or re-analyzed or the data reported with the appropriate qualifiers. For analysis where a large number of analytes are in the LCS, it becomes more likely that some analytes (marginal exceedences) will be outside the control limits.
- Matrix Spike Results – The MS percent recovery is calculated and compared to specified control limits. If the recovery is within control limits the results are reported. If not, and the LCS is within control limits, this indicates that the matrix potentially biases analyte recovery. It is verified that the spike level is at least five times the background level. If not, the results are reported with a qualifier that the background level is too high for accurate recovery determination. If matrix interferences are present or results indicate a potential problem with sample preparation, steps may be taken to improve results; such as performing any additional cleanups, dilution and reanalysis, or re-preparation and reanalysis. Results that do not meet acceptance limits are reported with an appropriate qualifier.

21.3 Qualitative Data Evaluation

All sample results and QC results are reviewed to ensure correct identification of target analytes, when not inherent to the test method. Details particular to each analysis are given in the analytical SOP.

Identification criteria for GC, LC or GC/MS methods are summarized below:

- GC and LC Methods
  - The analyte must fall within the retention time window specified in the applicable SOP. The retention time window is established prior to analysis and documented.
  - For analyses all positive results are confirmed by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis. Confirmation data will be provided as specified in the method.
  - When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.
- GC/MS and LC/MS Methods – Two criteria are used to verify identification:
  - Elution of the analyte is at the same relative retention time (as defined by the method) as demonstrated in the standard.

- The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.
- When Tentatively Identified Compounds are to be reported for GC/MS, the spectrum for non-target peaks is compared to the current GC/MS reference library.

21.4 Data Reporting

It is the responsibility of each laboratory unit to provide the Project Manager with a final report of the data for each analysis, accompanied by signature approval. When the entire data set has been found to be acceptable, a final copy of the report is generated and approved by the laboratory supervisor, departmental manager or designated laboratory staff. ALS Environmental- Houston has procedures in place to guard against improper use of the electronic signature and have the required "signatories", signing the reports. The entire data package for the analysis is then placed into the service request file, and an electronic copy of the final data package is forwarded to the appropriate personnel for archival. Footnotes and/or narrative notes must accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate Project Manager.

When all analyses and departmental reports are completed the Project Manager reviews the entire collection of analytical data for completeness and to ensure that any and all client-specified objectives were successfully achieved. A report narrative is written by the Project Manager to explain any unusual problems with a specific analysis or sample, etc. Prior to release of the report to the client, the Project Manager reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw data, along with a copy of the final report, is scanned and archived by service request number.

The laboratory reports results based on the sample provided by the customer. If ALS reports to a specification it is only for the sample results and not involved with decision rules applied to the sampling site.

To the extent possible, samples shall be reported only if all QC measures are acceptable. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The SOPs *HRMS Data Review and Reporting* (HE-HMS003) and *Data Reduction, Review, and Validation* (HS-QS009) address the flagging and qualification of data. The ALS-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the Project Manager to explain problems with a specific analysis or sample, etc.

If opinions and interpretations are expressed, either verbally or in reports, based on the results obtained from the tested items, the laboratory will ensure that only personnel authorized for the expression of opinions and interpretations release the respective statement. The laboratory will also document the basis upon which the opinions and interpretations have been made and also retain record of such dialogue to the client. ALS at this time however, does not make any statements concerning opinions and interpretation of results.

When requested by the client or relevant to the validity of reported results, the estimation of measurement uncertainty will be provided to a client or regulatory agency. How the uncertainty will be reported may be dictated by the client's reporting specifications. Where applicable, the measurement of uncertainty should be presented in the same unit as that of the measure or in a term relative to the measure, when: it is relevant to the validity of the test result, a customer requires or if the measurement uncertainty affects conformity to a specification limit. Additional information that may be required by specific methods, authorities, customers or groups of customers should also be put in the report if it enhances interpretation of results. Where necessary for better interpretation of test results the report will also include Procedures for determining and reporting uncertainty are given in SOP CE-QA010, *Estimation of Uncertainty of Analytical Measurements*.

When an issued report needs to be changed, amended or re-issued, any change of information shall be clearly identified and, where appropriate, the reason for the change included in the report.

For subcontracted analyses, the Project Manager verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed for each sample as requested, a report with clear identification that results are from an external provider is sent to the client.

21.5 Deliverables

In order to meet individual project needs, the laboratory provides several levels of analytical reports. Standard specifications for each level of deliverable are described in Table 21-1. Variations may be provided based on client or project specifications. This includes (but is not limited to) deliverables for DoD QSM projects and state-specific drinking water formats.

Each report sent out to the clients shall include at least: the name and contact information of the customer and a statement indicating that the results relate only to the items tested. The laboratory is responsible for all the information provided in the report, except for information provided by the customer. Data provided by a customer shall be clearly identified. In addition, a disclaimer shall be put on the report when the information is supplied by the customer and can affect the validity of the results. It shall state in the report that the results provided apply to the sample as received.

When requested, the laboratory provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. The laboratory is capable of generating EDDs with many different formats and specifications. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the hard-copy report for accuracy.

Table 21-1

Descriptions of ALS Environmental – Houston Standard Data Deliverables*
Tier I. Routine Analytical Report includes the following:
• Transmittal letter
• Chain of custody documents and sample/cooler receipt documentation
• Sample analytical results
• Method blank results
• Surrogate recovery results and acceptance criteria for applicable organic
• Dates of sample preparation and analysis for all tests
• Case narrative – optional
Tier II. In addition to the Tier I Deliverables, this Analytical Report includes the following:
• Laboratory Control Sample results with calculated recovery and associated acceptance criteria
• Matrix spike results with calculated recovery and associated acceptance criteria
• Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
• Case narrative – optional
Tier III. Data Validation Package. In addition to the Tier II Deliverables, this CAR includes the following:
• Case narrative - required
• Summary forms for all associated QC and Calibration parameters, with associated control criteria/acceptance limits
• Other summary forms specified in QAPPs or project/program protocols, or those related to specialized analyses such as HRGC/MS are included.
Tier IV. Full Data Validation Package.
• All raw data associated with the sample analysis, including but not limited to: • Preparation and analysis bench sheets and instrument printouts, • For organics analyses, all applicable chromatograms, spectral, confirmation, and manual integration raw data. For GC/MS this includes tuning results, mass spectra of all positive results, and the results and spectra of TIC compounds when requested.
• QC data
• Calibration data (initial, verification, continuing, etc.),
• Calibration blanks or instrument blanks (as appropriate to method).

* If a project QAPP or program reporting protocol applies the report will be presented as required for the project.

21.6 A statement of compliance/non-compliance when requirements of the quality systems are not met, including identification of test results that do not meet TNI sample acceptance requirements, such as holding time, preservation, etc., are included in the project narrative;

21.6.1 When requested by the client, a statement on the estimated uncertainty of the measurement is included in the project narrative as per ALS SOP HS-QS024 "Trending, Control Limits, and Uncertainty" .

21.7 Electronic Transmission of Results

All test results transmitted by telephone, fax, telex, e-mail, or other electronic means comply with the requirements of the TNI Standard and associated procedures to protect the confidentiality and proprietary rights of the client. Electronic Data Deliverables are provided to the client as needed and as defined by the client.

21.8 Advertising Policy

21.8.1 ALS's TNI accredited laboratories can use the TNI accredited logo by adherence to the following:

21.8.1.1 Where the TNI name and/or logo is used on general literature such as letterhead and advertisement, it shall always be accompanied by the word "accredited".

21.8.1.2 While there are no restrictions on the size and color of the TNI accredited logo reproduction, the logo must maintain its form.

21.8.1.3 The TNI accredited logo may be generated electronically provided that the prescribed formats and forms are retained.

21.8.1.4 When promoting or providing proof of accreditation, accredited laboratories should use the scope(s) of accreditation, as this document details the specific tests which are accredited. The certificate should be used for display purposes and may also accompany the scope.

21.8.1.5 When the TNI accredited logo is used to endorse test results, it shall always be accompanied by the TNI accreditation number(s).

21.8.1.6 When the TNI accredited logo is used on a business solicitation document such as a proposal or quotation form, the laboratory has the responsibility to distinguish between those proposed tests that fall within the laboratory's scope of accreditation and those that do not. This is done by attaching a copy of the current TNI Scope of Accreditation sheet and Supplement to the Scope, if appropriate, or by noting which tests or calibration is non-accredited.

21.8.1.7 The TNI accredited logo and/or reference to the laboratory's accreditation may be made in advertisements provided the requirements of this document are strictly followed.

21.8.1.8 Upon suspension or termination of accreditation, a laboratory must immediately cease to issue test reports displaying the logo and shall cease publishing documents containing the logo.

21.8.2 ALS's PJLA accredited laboratories can use the PJLA accredited logo by

adherence to the following:

21.8.2.1 ALS must fully comply with the most current revision of PJLA SOP-3 Accreditation Symbol Procedure.

21.8.2.2 Upon suspension or termination of accreditation, a laboratory must immediately cease to issue test reports displaying the logo and shall cease publishing documents containing the logo.

22) Continuous Improvements

22.1 ALS Environmental routinely engages in quality improvement through ongoing use of internal systems and evaluation of external feedback. Senior management supports this policy by making continuous improvement one of the ALS Core Values, see SOP CE-GEN 016 Continuous Quality Improvement Policy.

22.1.1 Management Role

ALS management is committed to improvement of the management and quality systems through compliance with its own policies and procedures; and evolving these policies and procedures as needed.

Senior management, Laboratory Directors, and laboratory management teams support improvement activities and processes. Improvement is effected through ongoing management review and evaluation of improvement opportunities and using available input.

22.1.2 Quality System Role

Quality systems are designed to meet the requirements of various certification and accreditation protocols and standards, as well as various program and project requirements. As these requirements change or new ones become applicable, ALS will pursue improvements to the quality systems and protocols as warranted.

As part of the quality system several procedures and policies are in place which include a component of improvement. Quality programs at ALS laboratories will ensure that these procedures and policies are implemented.

22.2 Improvement in the overall effectiveness of the laboratory management system is a result of the implementation of the various aspects of the laboratory's management system: quality policy and objectives (QAM Section 3 – "Management"); internal auditing practices (SOP HS-QS012 Internal Audits); the review and analysis of data (SOP HS-QS009 Data Reduction, Review and Validation); corrective action (SOP HS-QS003 Nonconformance / Corrective Action Reporting) and preventive action (QAM Section 16 – "Preventative Action") process; and the annual management review of the quality management system (SOP HS-QS017 Management Review) where the various aspects of the management/quality systems are summarized, and evaluated and plans for improvement are developed.

23) Management of Change

23.1 This procedure is to be utilized by ALS-Environmental USA laboratories where required by certification or accreditation, project specifications, or contract to make changes in a planned or systematic way, to reduce negative impacts upon the organization, staff, and clients. See SOP CE-GEN015 Management of Change for policy and produces. Tracking of change is accomplished though use of Microsoft Teams. This keeps all stakeholders up-to-date on the status of changes.

23.1.1 Changes to be managed may lie within the organization and controlled by the organization; or may be internal changes that have been triggered by external events originating outside the organization, over which we have little or no control (e.g. regulatory changes, actions of competitors, or technological changes).

23.1.2 The scale and potential impact of the proposed change will indicate whether or not the use of this procedure is required. For example, purchase and introduction of a new pH meter would have little impact on the laboratory; whereas purchase and introduction of instrumentation not previously used could have a major impact on the laboratory (i.e. training required, allocation of laboratory space, changes to sample preparation and work procedures etc.) and therefore would require implementation of this procedure.

23.2 Actions to Address Risks and Opportunities

23.2.1 ALS Environmental - Houston views risk management as a key component of its corporate governance responsibilities and an essential process in achieving and mandating a viable organization. ALS Environmental - Houston is committed to enterprise-wide risk management to ensure its corporate governance responsibilities are met and its strategic goals are realized.

Refer to ALS Environmental - Houston Limited Risk Management Policy and Framework CAR-GL-GRP-POL-007 and Risk Appetite and Tolerance Statement CAR-GL-POL-011 for details.

Risk is defined at ALS Environmental - Houston as the effect of uncertainty on objectives. Objectives for the organization have different attributes and aspects, such as financial, service, quality, health & safety, environmental

stewardship, and are considered at different levels, such as enterprise-wide, operational, and project levels. ALS Environmental - Houston interprets risk as anything that could impact meeting its corporate strategic objectives and believes risks can provide positive opportunities as well as having negative impacts.

Tools for evaluating and managing risk include routine procedures such as employee evaluations, control limits trending, RLVS data evaluation, corrective action reports, nonconforming events, SOP review, internal and external audits, and PT results.

Risk reporting mechanisms vary from routine reporting mechanisms and immediate action for lower risk situations to immediate notification of the ALS Environmental - Houston CEO in extreme cases.

Regardless of the mechanism used, the policies and tools provide a framework for categorizing, assessing, analyzing, and addressing risk, as well as monitoring and reviewing actions taken. Roles and responsibilities are defined in the relevant procedures.

Risk severity is evaluated during the decision-making process. For each risk there is an opportunity.

23.2.2 Risks to our business and how we address them include:

23.2.2.1 **Chemical Exposure**

Failure to practice procedures as trained, issues with the facility, and poor engineering controls can result in injury to employees, lost time, med/hospital situation, contamination, and can close the site.

We have policies, chemical exposure training, and readily available SDS sheets. Employees are expected to offer suggestions for improvement and formally report any conditions where concern for safety is recognized.

23.2.2.2 **Explosion/Chemical Fire**

Improper chemical storage and usage along with lack of equipment and facility upkeep can result in loss of life, loss of property, and laboratory down time.

We perform inspections and training, keep an inventory of chemicals, establish storage locations, and maintain minimal quantities of chemicals.

23.2.2.3 **Supply Disruption**

Natural disaster and vendors unable to provide needed supplies can disrupt the business, increase expenses, and result in lost production and lost clients.

We maintain multiple sources for supplies, develop relationships with our vendors, and emphasize communication between analysts, managers, purchasing and vendors.

23.2.2.4 **Loss of Key Employees**

Resignation, leave for personal reasons or for other employment can negatively impact the business.

Communication, cross-training, designated backups, and having a pool of potential replacements minimizes this risk. We provide a positive atmosphere for employees and provide small perks to reward dedication.

23.2.2.5 **Computer and Instrument Issues**

Computer, instrument, or other IT failures can result in loss of revenue, loss of service, and loss of data.

We provide necessary IT resources for instruments and computers including replacing older computers, keeping related systems in good repair, and replacing when necessary. We continue to build robust data systems and make provisions for stellar back-up storage for all data.

23.2.2.6 **Reputation**

Falsifying test results can result in loss of credibility, loss of clients, loss of revenue, and suspension.

All new employees must have initial ethics and data integrity training and sign an acknowledgement to that effect. Annually, all employees must take ethics and data integrity refresher training. All data undergoes a proper peer review. We maintain a strong quality system.

23.2.2.7 **Legal Ramifications**

Not following workplace and environmental laws and failure to practice procedures as trained can result in license revocation, fines, and disruption of the business.

Targeted and ongoing training, inspections, and having established procedures minimizes this risk. We continue to follow all laws and regulations.

23.2.2.8 **Loss Time Injury**

Failure to practice procedures as trained and not having proper safeguards in place can result in injury to employees, lost time, med/hospital situation, contamination, and can close the site.

Policies, specific task related training, targeted and ongoing training, inspections, workplace safeguards, cross training, and designated backups, minimize this risk. We continue to grow the safety program and culture.

23.2.2.9 **Loss of Revenue**

Can be caused by various audit fines and contract penalties for late data resulting in loss of revenue and disruption in business.

Policies, specific quality training, targeted and ongoing training, inspections, workplace safeguards, and internal audits minimize this risk. We continue to perform lab operations at the highest level.

24) Summary of Changes and Document History

Revision Number	Effective Date	Document Editor	Description of Changes
12.0	03/31/2022	M.B. Johnston	Eliminated Appendices C (Ethics & Data Integrity Agreement), E (Equipment List), G (SOPs list), I (External Documents list). Replaced with a reference to their location in the Quality System.
12.0	03/31/2022	M.B. Johnston	§23.2: Add Risk & Opportunities section
12.0	03/31/2022	M.B. Johnston	Combine ALSHS (Full Service Lab) QAM and ALSHE (HRMS/Specialties Lab) QAM
11.6	09/11/2020	E. Marinez	Update subsections for 21.5 Advertizing Policy to remove references to L-A-B and replace with proper references to PJLA.
11.6	09/11/2020	E. Marinez	Appendix J Laboratory Accreditations and Scopes Update Certificate numbers, where applicable. Remove ANAB certificate and scope. Replace with PJLA certificate and scope.
11.6	9/11/2020	E. Marinez	Section 25 References Update references to current versions where applicable. Remove any references to ANAB. Insert references to PJLA.
11.6	9/11/2020	E. Marinez	Appendices updated to most current lists and information, where applicable.
11.5	12/21/2019	G. Moulton	Sec 8.1: The laboratory collaborates with clients and/or their representatives in clarifying their requests and in monitoring of the laboratory performance related to their work. Each request is reviewed to determine the nature of the request and the laboratory's ability to comply with the request within the confines of prevailing statutes and/or regulations without risk to the confidentiality of other clients.
11.5	12/21/2019	G. Moulton	Sec 8.1.1: The laboratory actively seeks client feedback, both positive and negative, to identify areas of improvement within the quality system, testing activities and service to the client.
11.5	12/21/2019	G. Moulton	Sec 8.1.2: The laboratory will clarify requests if the customer has specified incorrect, obsolete, or improper methods.
11.5	12/21/2019	G. Moulton	Sec 8.1.3: The laboratory will notify customers when methods require modifications to ensure achievement of project-specific objectives contained in planning documents (e.g., difficult matrix, poor performing analyte).
11.5	12/21/2019	G. Moulton	Sec 8.1.4: The laboratory will communicate with customers when project planning documents (e.g., QAPP or Sampling and Analysis Plan (SAP)) are missing or

Revision Number	Effective Date	Document Editor	Description of Changes
			requirements (e.g., action levels, detection and quantification capabilities) in the documents require clarification.
11.5	12/21/2019	G. Moulton	Sec 8.1.5: The laboratory will notify customers when a problem has been encountered with sampling or analysis that may impact results (e.g., improper preservation of sample).
11.5	12/21/2019	G. Moulton	Sec 19.1 Updated elements of a management review added new elements from ISO 17025.
11.4	12/21/2018	G. Moulton	Updated cover and quality manager
11.4	12/21/2018	G. Moulton	Split QAM into two sections to allow for the Appendices to be upldated regularly without affecting the body of the QAM.
11.4	12/21/2018	G. Moulton	Revised numbering for sections 1.3.1 to 1.3.3, 2.1.1 to 2.1.3, 3.1.1 to 3.1.11.6, 3.5.2.1 to 3.5.2.5, 3.5.3.1 to 3.5.5.1, 3.7.1 to 4.2, 4.7.1 to 4.7.2, 5.1 to 10.4, 11.2.2.1 to 11.2.2.12.1, 11.2.4.2 to 11.4.1 , 12.3.3.1TO 12.3.3.4, 12.5.4.1 to 12.5.4.3, 12.8.1.1 to 12.8.2.6, 12.8.3.1 to 12.8.3.1.2. 13.1.9.1 to 13.1.9.3, 14.1.8.1 to 14.4.1.6, 16.1 to 16.1.2, 16.2 to 16.2.3, 17.1.1 to 17.1.29, 18.5.1 to 18.5.4, 20.1.1 to 20.1.4, 20.2.2.1 to 20.2.2.3, 20.3.2.1 to 20.3.2.6, 21.1.1.1 to 21.1.1.11, 25.1 to 25.1.22.
11.4	12/21/2018	G. Moulton	Appendices: Removed resumes, Updated Org chart, Added signatories for reports, Updated External documents list, Updated SOP list, Added certs with expiration dates. 18.1.2 Added LIMS inspection.
11.4	12/21/2018	G. Moulton	Modified sec. 2.2 (added responsible individual Hoai Van). 2.4: agreements and impartiality. sec: 3.2.7 (sample management Supervisor). Modified 3.4 Quality policy. 3.5.4.5, modified 3.7.(elements of a SOP). Modified sec 4.5, and 4.6.1 update and location of controlled doc.Modified sec 5.3 add SOP HS-GEN009 and current version of DOD QSM, Modified sec 9.2, 9.3 and 9.4 To improve complaint resolution. Modified 10.5: added sec 10.5, sec 11.1 (coc for evidentiary purpose), Inserted SOP HS-HS019, 12.5.2 (Inserted sop HS-QS009). 12.5.4 (Inserted sop HS-IT007), Modified 12.6.6 IT Secutity. Modified sec 13.1.9.1

Revision Number	Effective Date	Document Editor	Description of Changes
			(bracketing range of use, weights certified every year). Sec 20.1.4: included where staff job descriptions can be found.
11.4	12/21/2018	G. Moulton	Reworded sec 10.3 (power loss), reworded last line of sec 12.2 (IDOC requirement). 12.3.1 and 12.3.2 (LODs/LOQ analyzed on a quarterly basis)
11.4	12/21/2018	G. Moulton	Added sec 8.2.6 and 8.2.7 – Client confidentiality.
11.4	12/21/2018	G. Moulton	Removed last two sentences of 10.4
11.4	12/31/17	T. Yen	3.5.4 - 3.5.5 Ethics and Data Integrity Investigation and Notification.
11.3	06/19/2017	T. Yen	General review.
11.3 – Section 4.4.3	06/19/2017	T. Yen	Preparation and Management of SOP
11.3 – Section 6	06/19/2017	T. Yen	Subcontracted testing procedure consolidated
11.3 – Section 11	06/19/2017	T. Yen	Sample Management procedures
11.3 – Sections 20.3 & 3.5	06/19/2017	T. Yen	Ethic and Data Integrity moved to Section 20.3 and 3.5.
11.3 Section 12.6.5	06/19/2017	T. Yen	Validation of New Equipment Identification
11.3 Sections 12.6.7 & 12.6.8	06/19/2017	T. Yen	Out of Service Equipment
11.3 – Section 12.6.9	06/19/2017	T. Yen	Equipment status documentation.
11.3 – Section 12.8.2	06/19/2017	T. Yen	Continuing Calibration Blanks (CCB)
11.3 – Sections	06/19/2017	T. Yen	Record retention standardized to 10 years

Revision Number	Effective Date	Document Editor	Description of Changes
17.1 & 17.2			
11.3 – Section 21.1.9	06/19/2017	T. Yen	Procedure of amending report for correction or additional testing.
11.3 – Section 25	06/19/2017	T. Yen	References update.
11.3 – Section Appendix G 11.3 Appendix A	06/19/2017 06/19/2017	T. Yen T. Yen	Master SOP update. Acronym Update-Add Management of Change
11.3 – Section 22	06/19/2017	T. Yen	New section on Continuous Improvements
11.3-Section 23	06/19/2017	T. Yen	New Section on Management of Change
11.2	11/30/2016	T. Yen	Minor revision, update to certificates, staff and equipment list.
11.2 – Section 9.0	11/30/2016	T. Yen	Online survey procedure.
11.2 – Appendices	11/30/2016	T. Yen	Appendices updated.
11.1	7/31/2015	T. Yen	Minor revision, update to certificates, staff and equipment list.
11.1- Section 2.2	7/31/2015	T. Yen	SOP HS-GEN002 changed to CE-GEN001
11.1- Appendix J	7/31/2015	T. Yen	TX Cert updated to new version T104704231-15-15.
11.1- Appendix J	7/31/2015	T. Yen	LDEQ Cert update July1, 2015 – June 30, 2016.
11.0	2/28/2015	T. Yen	Minor revision, update to certificates, staff and equipment list.
10.0	2/28/2015	T. Yen	QAM format and sections.
10.0	2/28/2015	T. Yen	References for TCEQ QAPP 2014, DOD QSM 5.0, TNI 2009 updated
10.0 – Section 4.5	2/28/2015	T. Yen	Electronic Signature Policy added to QAM.
10.0 – Section 16.14.3	2/28/2015	T. Yen	QA in depth data monitoring.
10.0 – Section 21.1.1	2/28/2015	T. Yen	Non-accredited tests and analytes must clearly identified in reports.
10.0 Appendix J	2/28/2015	T. Yen	Primary TNI certificate insert to document accredited testing methods and

Revision Number	Effective Date	Document Editor	Description of Changes
			compounds.
09.2 09.1	11/19/2012 07/15/2012	T. Yen J. Cady	Management of Change in Appendix G Minor Revision – Utilized updated TNI acronym. Updated Organizational chart, Equipment list, SOP list, and Accreditation list. Logo policy included.
09.0	08/05/2011	J. Cady	Major Format Revision to 2009 TNI Standard
08.1	03/31/2011	I. Williams	Applied new document format. Deleted the following appendices: F-MDL/PQL G-LCS Limits

25) References for Quality System Standards, External Documents, Manuals, and Test Procedures

25.1 The following list represents key references for the laboratory quality program and systems.

25.1.1 TNI Standard – Environmental Laboratory Sector, Volume 1, Modules 1-Modules 7, Management and Requirements for Laboratories Performing Environmental Analysis, EL-V1M1 thru EL-V1M7, TNI 2009/2016

25.1.2 International Standard – General Requirements for the Competence of Testing and Calibration Laboratories, ISO/IEC 17025:2017(E)

25.1.3 Selected USEPA Approved Methods, 40 CFR, Part 136 including changes incorporated in the Methods Update Rule (MUR) published in 2019.

25.1.4 USEPA Methods published in Appendix A, B and C of 40 CFR, Part 136.

25.1.5 Standard Methods for the Examination of Water and Wastewater, 18th through Current Editions, Hard copy and/or Electronic Version.

25.1.6 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, through Updates III (December 1996) and Update IV (February 2007), and new published methods online at http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm.

25.1.7 Selected USEPA Drinking Water methods published by the USEPA Office of Ground Water and Drinking Water

25.1.8 Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, (Revised March 1983).

25.1.9 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100 (August 1993).

25.1.10 USEPA SW-846 Test Methods for Evaluating Solid Waste, 3rd Edition, through Updates III and VI, and published new methods from SW-846 (e.g. SW8270E).

25.1.11 *Methods for the Determination of Metals in Environmental Samples*, EPA/600/4-91/010 (June 1991) and Supplements.

25.1.12 *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*,

25.1.13 EPA 600/4-82-057.

25.1.14 *Methods for the Determination of Organic Compounds in Drinking Water*,

25.1.15 EPA/600/4-88/039 and Supplements.

25.1.16 Selected APHA, AWWA, and ASTM methods.

25.1.17 *DoD Quality Systems Manual for Environmental Laboratories,* Current version

25.1.18 *Manual for the Certification of Laboratories Analyzing Drinking Water*, 5th Edition, EPA 815-B-97-001 (January 2005).

25.1.19 US EPA Region 9 QC Database, epa.gov/region9/qa/datatables.html.

25.1.20 State approved UST methods for TPH (e.g. TPH by TCEQ1005, Rev 3, June 2001).

25.1.21 TCEQ Quality Assurance Project Plan For Environmental Monitoring and Measurement Activities Relating to the Resource Conservation and Recovery Act (RCRA) & Underground Injection Control (UIC), Current Fiscal Year.

25.1.22 Perry Johnson Laboratory Accreditation, Inc. (PJLA), SOP-3 Accreditation Symbol Procedure Revision 1.7, October 2019.

25.1.23 *Procedure Manual for the Environmental Laboratory Accreditation Program,* Washington Department of Ecology, 10-03-048, September 2010.

25.1.24 Analytical Methods for Petroleum Hydrocarbons, ECY 97-602, Washington State Department of Ecology, June 1997.

25.1.25 Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, for USEPA and USACE (March 1986), with revisions through April 1997.

25.1.26 WDOE 83-13, Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulations (March 1982) and as Revised (July 1983 and April 1991).

25.1.27 Identification and Listing of Hazardous Waste, California Code of Regulations, Title 22, Division 4.5, Chapter 11.

25.1.28 Analytical Methods for the Determination of Pollutants in Pulp and Paper Industry Wastewater, EPA 821-R-93-017 (October 1993).

25.1.29 Analytical Methods for the Determination of Pollutants in Pharmaceutical Manufacturing Industry Wastewaters, EPA 821-B-98-016 (July 1998).

25.1.30 National Council of the Pulp and Paper Industry for Air and Stream Improvement (NCASI)

26) Appendices

APPENDIX A – Glossary

The following are a list of acronyms used in this document and their definitions

AB	-	Accrediting Body
ANSI	-	American National Standards Institute
ASQC	-	American Society for Quality Control
ASTM	-	American Society for Testing and Materials
Blk	-	Blank
˚C	-	Degrees Celsius
cal	-	Calibration
CAS	-	Chemical Abstract Service
CCV	-	Continuing Calibration Verification
CoA	-	Certificate of Analysis
COC	-	Chain of Custody
DO	-	Dissolved Oxygen
DOC	-	Demonstration of Capability
DoD	-	Department of Defense
EPA	-	Environmental Protection Agency
g/L	-	Grams per Liter
GC/MS	-	Gas Chromatography/Mass Spectrometry
ICAL	-	Initial Calibration
ICP-MS	-	Inductively Coupled Plasma-Mass Spectrometry
ICV	-	Initial Calibration Verification
ISO/IEC	-	International Organization for Standardization/International Electrochemical Commission
lb/in2	-	Pound per Square Inch
LCS	-	Laboratory Control Sample
LCDS	-	Laboratory Control Duplicate Sample
LFB	-	Laboratory Fortified Blank
LOD	-	Limit of Detection
LOQ	-	Limit of Quantitation

MOC		-Management of Change
MDL	-	Method Detection Limit
mg/kg	-	Milligrams per Kilogram
mg/L	-	Milligrams per Liter
MS	-	Matrix Spike
MSD	-	Matrix Spike Duplicate
NELAC	-	National Environmental Laboratory Accreditation Conference
NELAP	-	National Environmental Laboratory Accreditation Program
NIST	-	National Institute of Standards and Technology
PT	-	Proficiency Test(ing)
PTP	-	Proficiency Testing Provider
PTPA	-	Proficiency Testing Provider Accreditor
QA	-	Quality Assurance
QAD	-	Quality Assurance Department
QAM	-	Quality Assurance Manager
QC	-	Quality Control
QM	-	Quality Manual
RL	-	Reporting Level
RPD	-	Relative Percent Difference
RSD	-	Relative Standard Deviation
SOPs	-	Standard Operating Procedures
SPK	-	Spike
STD	-	Standard
SV	-	Semi-Volatile (Organic Compound)
TNI	-	The NELAC Institute
ug/L	-	Micrograms per Liter
UV	-	Ultraviolet
VOC	-	Volatile Organic Compound

For the purpose of this Standard, the relevant terms and definitions conform to ISO/IEC 17011:2004 and ISO/IEC 17025: 2017. Additional relevant terms are defined below.

Accreditation Body: The territorial, state or federal agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation.
Accreditation Field of Proficiency Testing: Same as “Field of Proficiency Testing”.

Analysis Date: The calendar date of analysis associated with the analytical result reported for an accreditation or experimental field of proficiency testing.
Experimental Field of Proficiency Testing (Experimental FoPT): Analytes for which a laboratory is required to analyze a PT sample if they seek or maintain accreditation for the field of accreditation but for which successful analysis is not required in order to obtain or maintain accreditation.
Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT): Analytes for which a laboratory is required to successfully analyze a PT sample in order to obtain or maintain accreditation, collectively defined as: matrix, technology/method, analyte.
Primary Accreditation Body (Primary AB): The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Proficiency Testing (PT): A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program): The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PTP): A person or organization accredited by the TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT program.
Proficiency Testing Provider Accreditor (PTPA): An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Sample (PT Sample): A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing Study (PT Study): A single complete sequence of circulation of proficiency testing samples to all participants in a proficiency test program.
PT Study Closing Date: The calendar date for which analytical results for a PT sample shall be received by the PT provider from the laboratory.
PT Study Opening Date: The calendar date that a PT sample is first made available to any laboratory by a PT provider.
Revocation: The total or partial withdrawal of a laboratory's accreditation by an accreditation body.
Study: This term refers to a PT Study or Supplemental PT Study.
Supplemental Proficiency Testing Study (Supplemental PT Study): A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard but that does not have a pre-determined opening date and closing date.
Suspension: The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed six (6) months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
TNI PT Board: A board consisting of TNI members or affiliates, appointed by the TNI Board of Directors, which is responsible for the successful implementation and operation of the TNI Proficiency Testing Program. The duties of the TNI PT Board are defined in the TNI PT Board Charter.
Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analytical Uncertainty: A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation).
Audit: A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.
Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be twenty-four (24) hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed twenty (20) samples.
Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. Blanks include:
Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Calibration: A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.

1) In calibration of support equipment the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI).
2) In calibration according to methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

Calibration Curve: The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Standard: A substance or reference material used for calibration.
Certified Reference Material (CRM): Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody Form: Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of

containers; the mode of collection; the collector; time of collection; preservation; and requested analyses.

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: Second column confirmation, Alternate wavelength, Derivatization, Mass spectral interpretation, Alternative detectors, or Additional cleanup procedures.

Data Reduction: The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more useful form.

Demonstration of Capability: A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision.

Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Finding: An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement.

Holding Times: The maximum time that can elapse between two specified activities.

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

Legal Chain of Custody Protocols: Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain of
Custody Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.

Limit(s) of Detection (LOD): A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility.

Limit(s) of Quantitation (LOQ): The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.

Matrix: The substrate of a test sample.

Matrix Duplicate: A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.

Matrix Spike (spiked sample or fortified sample): A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Measurement System: A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s).

Method: A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.

Mobile Laboratory: A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts.

Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.

National Institute of Standards and Technology (NIST): A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (NMI).

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

Preservation: Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis.

Procedure: A specified way to carry out an activity or process. Procedures can be documented or not.

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source.

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.

Protocol: A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed.

Quality Assurance: An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality Control: The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.

Quality Control Sample: A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance (QA) and quality control (QC) activities.

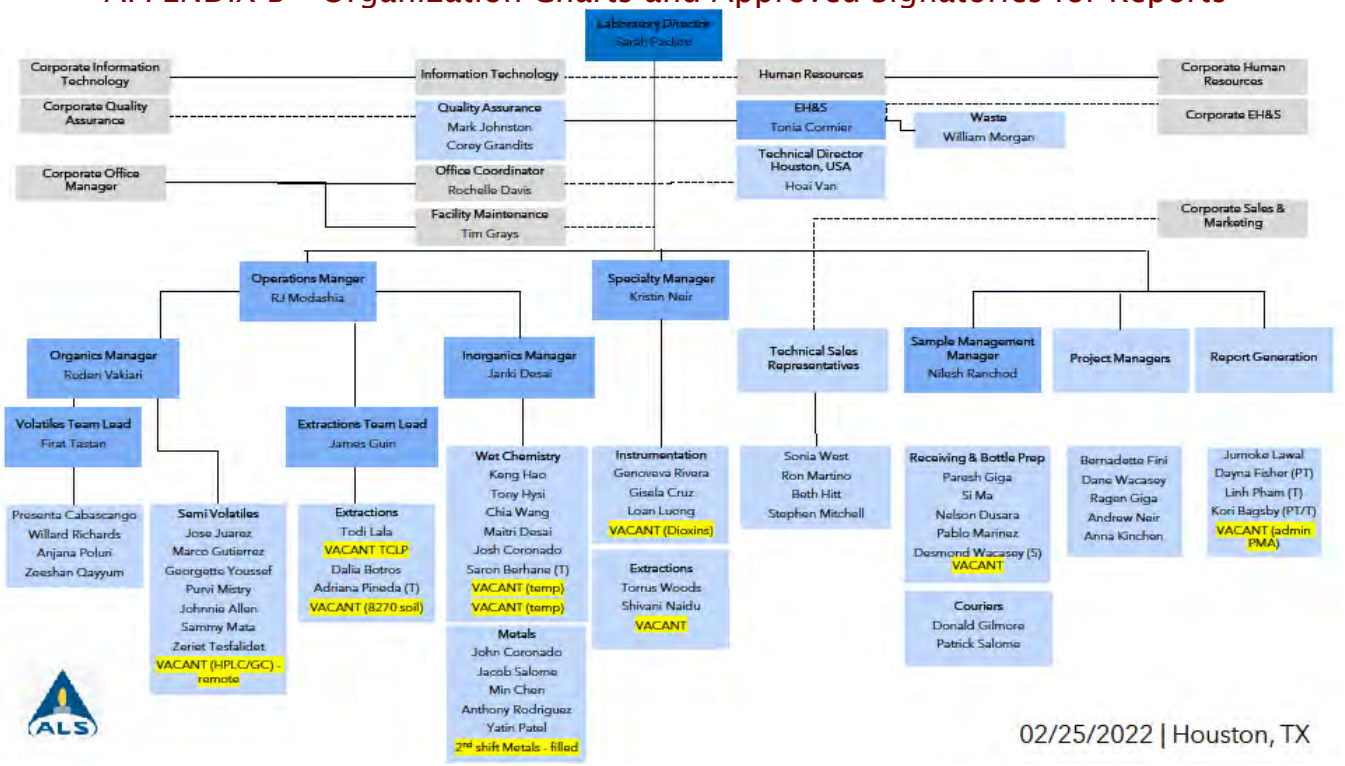
Quality System Matrix: These matrix definitions are to be used for purposes of batch and quality control requirements:

- **Air and Emissions:** Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device.

- **Aqueous:** Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, ground water effluents, and TCLP or other extracts.
- **Biological Tissue:** Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.
- **Chemical Waste:** A product or by-product of an industrial process that results in a matrix not previously defined.
- **Drinking Water:** Any aqueous sample that has been designated a potable or potential potable water source.
- **Non-Aqueous Liquid:** Any organic liquid with <15% settleable solids.
- Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.
- **Solids:** Includes soils, sediments, sludges and other matrices with >15% settleable solids.

Raw Data: The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Reference Material: Material or substance one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Standard: Standard used for the calibration of working measurement standards in a given organization or at a given location.
Sampling: Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selectivity: The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity: The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard Operating Procedures (SOPs): A written document that details the method for an operation, analysis, or action, with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Technology: A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Traceability: The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Verification: Confirmation by examination and objective evidence that specified requirements have been met. NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment. The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

APPENDIX B – Organization Charts and Approved Signatories for Reports

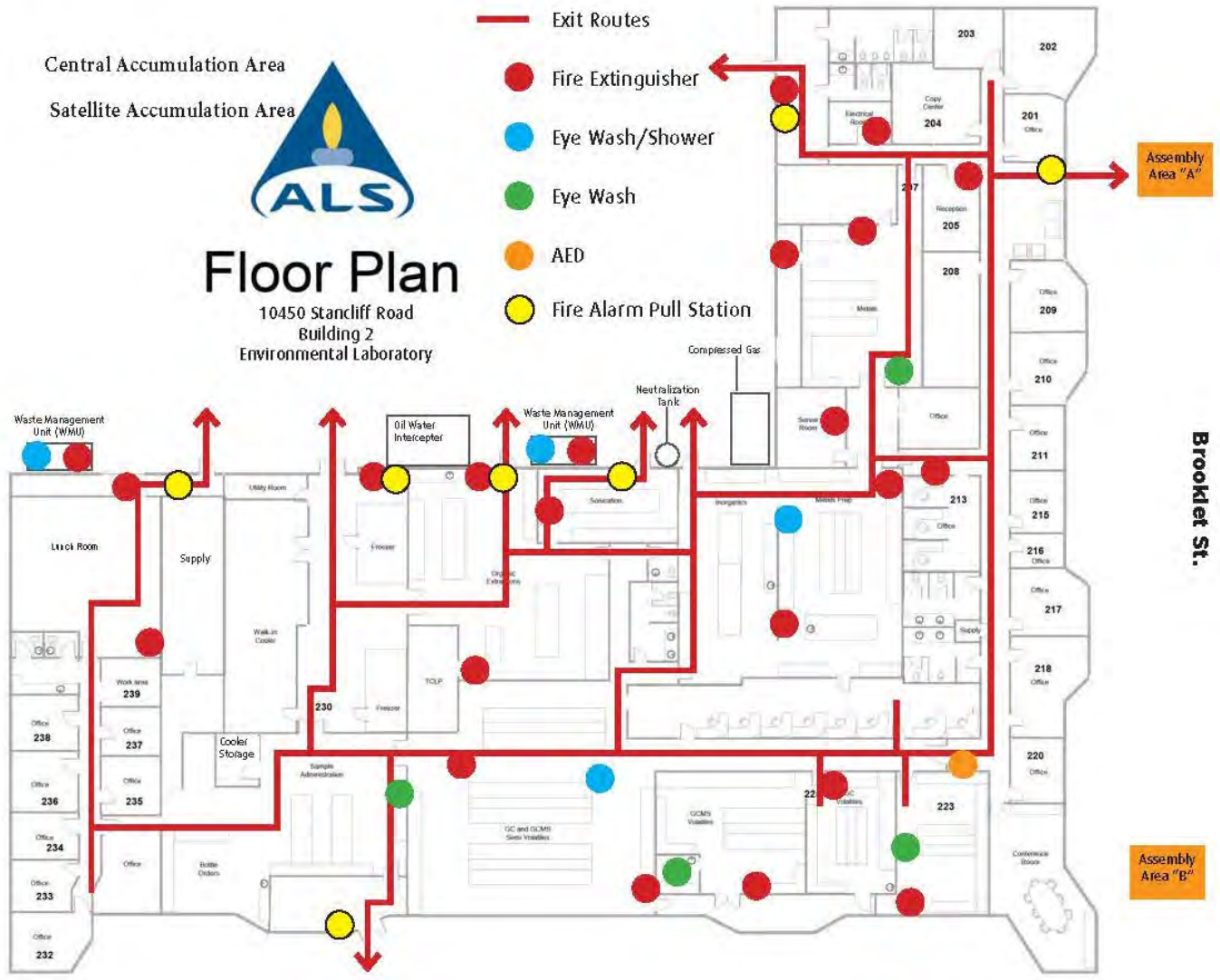


Approved Signatories for Analytical Reports only

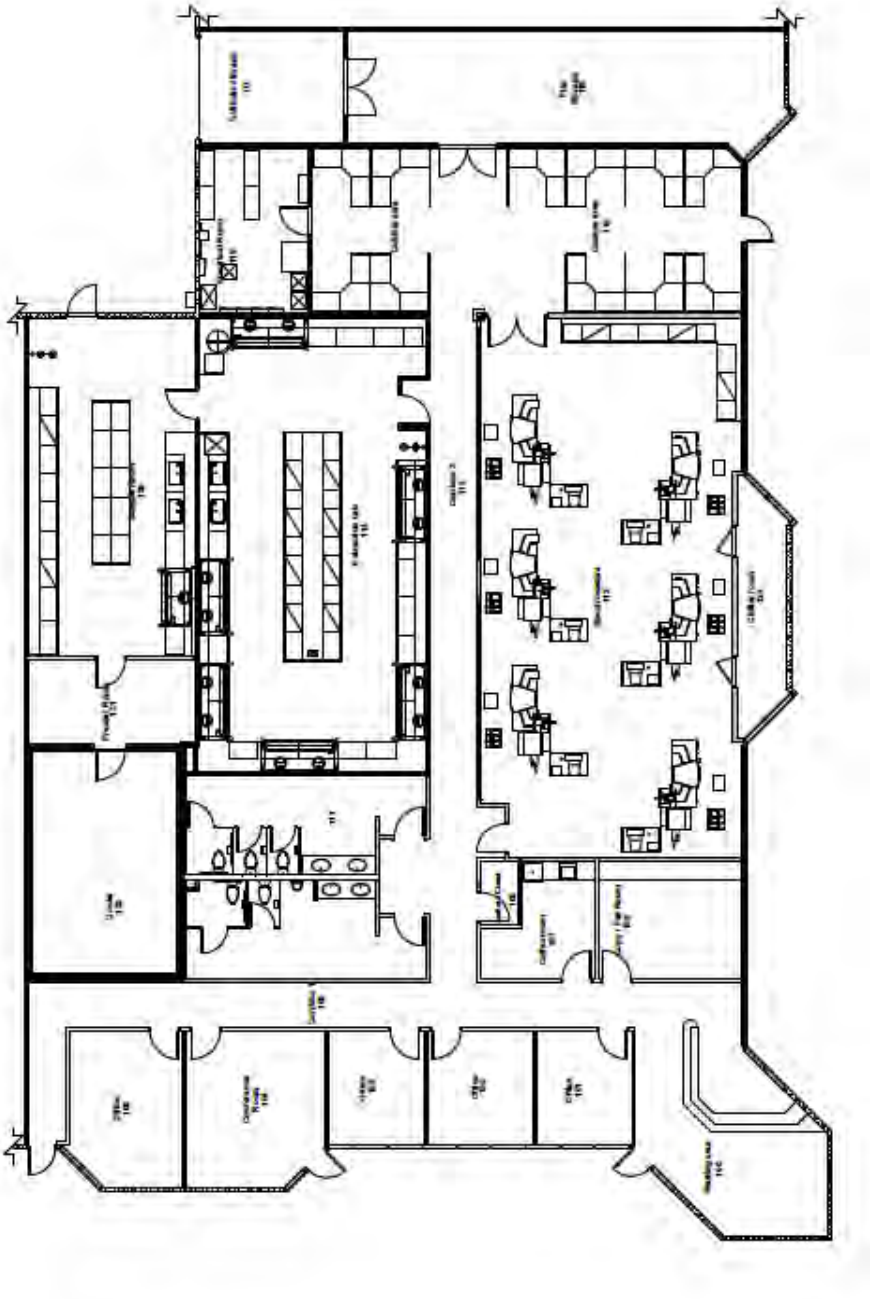
Sarah Packett	Laboratory Director
Hoai Van	Technical Director
Kristin Neir	HRMS Department Manager
Mark B. Johnston	Quality Manager
Bernadette Fini	Project Manager
Ragen Giga	Project Manager

Dane Wacasey	Project Manager
Corey Grandits	Project Manager/QA Generalist

APPENDIX C.1 –FS Laboratory Floor Plan



APPENDIX C.2 – HRMS Laboratory Floor Plan



APPENDIX D – Containers, Preservation and Holding Times

Parameter	Containers [1]	Preservative	Holding Time [2]
Acidity / E305.1	P, G - 250 mL	>0 to 6 ° C	14 days
Alkalinity / SM 2320B – E310.1	P, G - 250 mL	>0 to 6 ° C	14 days
Ammonia as N	P, G – 250 or 500 mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Bacterial Tests (Coliform, Total, Fecal and *E. Coli*)	PA, G – 125-mL	Cool <10 ° C; 0.008% $Na_2S_2O_3$ if Cl_2 present	8 hours
Biological Oxygen Demand (BOD)	P, G – 1000 mL	>0 to 6 ° C	48 hours
(Carbonaceous) Biological Oxygen Demand (CBOD)	P, G – 1000 mL	>0 to 6 ° C	48 hours
Bromide	P, G – 500 mL	None required	28 days
(Total Organic) Carbon (TOC) / SW 9060	P, G – 125 amber mL or 40 mL amber vial	>0 to 6 °C; HNO_3 or H_2SO_4 to pH<2	28 days
Chemical Oxygen Demand (COD)	P, G – 250 mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Chloride	P, G – 250 mL	None required	28 days
Chlorine, Residual	P, G – 120 mL	>0 to 6 ° C	15 minutes
Color	P, G – 250 mL	>0 to 6 ° C	48 hours
Conductivity (Spec. Conductance)	P, G – 250 mL	>0 to 6 ° C	28 days
(Reactive) Cyanide	P, G – 4 oz wm	None required	14 days
Cyanide (Total and Amenable to Chlorination)	P, G - 500 mL	>0 to 6 ° C; NaOH to pH>12; 0.6g ascorbic acid	14 days
Cyanide (Total or Reactive) / Soil	P, G – 100 g in 250-ml wm bottle.	>0 to 6 ° C	14 days
Fluoride	P – 250 mL	None required	28 days
Hardness	P, G – 250 mL	HNO_3 or H_2SO_4 to pH<2	6 months
Nitrate as N	P, G – 250 mL	>0 to 6 ° C	48 hours
Nitrate-Nitrite as N	P, G – 250 mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Nitrite as N	P, G – 250 mL	>0 to 6 ° C	48 hours
(Total Kjeldahl) Nitrogen	P, G – 250 mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Oil and Grease	G – 1000 mL wm	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Oxygen, Dissolved	P, G – 1000 mL	>0 to 6 ° C	15 minutes
pH (hydrogen ion)	P, G – 250 mL	>0 to 6 ° C	15 minutes
(Total) Phenols (wet method)	G / amber – 1000 mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
(*ortho*-) Phosphate	P, G – 250 mL	Filter immediately; >0 to 6 ° C	48 hours
(Total) Phosphate	P, G – 250 mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Residue (Total Solids)	P, G – 500 mL	>0 to 6 ° C	7 days
Residue (Dissolved Solids) (TDS)	P, G – 500 mL	>0 to 6 ° C	7 days
Residue (Suspended Solids) (TSS)	P, G – 1000 mL	>0 to 6 ° C	7 days
Residue (Settleable)	P, G – 1000 mL	>0 to 6 ° C	48 hours
Residue (Total Volatile) (TVS)	P, G – 500 mL	>0 to 6 ° C	7 days

Parameter	Containers [1]	Preservative	Holding Time [2]
Residue (Volatile Suspended) (TVSS)	P, G – 1000 mL	>0 to 6 ° C	7 days
Silica	P – 500 mL	>0 to 6 ° C	28 days
Sulfite	P, G – 250 mL	>0 to 6 ° C	15 minutes
Chromium VI	P, G – 250 mL	>0 to 6 ° C	24 hours
Chromium VI (soil)	P, G – 4 oz wide mouth	>0 to 6 ° C	24 hours
Mercury	P, G – 500 mL	HNO_3 to pH<2	28 days
Mercury (soil)	P, G – 4 oz wm bottle	None	28 days
Metals (except Chromium IV and Hg)	P, G – 500 mL	HNO_3 to pH<2	6 months
Metals (except CrVI and Hg)/ (soil)	P, G – 50 g in 120 mL bottle	None	6 months
TCLP Mercury	P, G – 1000 mL	>0 to 6 ° C	28 days to extract; 28 days after extraction to analysis
TCLP Metals (except Mercury)	P, G – 1000 mL	>0 to 6 °C	180 days to extract; 180 days after extraction to analysis
Dioxins/Furans in water or drinking water EPA 1613B	G – 2 x 1L amber	>0 to 6 ° C; 0.008% $Na_2S_2O_3$ if Cl_2 is present	1 year [7]
Dioxins/Furans in soil EPA 1613B	G – wide-mouth 4 oz amber jar	Transport: <4°C; dark Storage: <10°C; dark	Samples:1 year Extracts: 1 year
Dioxins/Furans in tissue EPA 1613B	G – wide-mouth 4 oz amber jar	Transport: <4°C; dark Storage: <10°C; dark	Samples:1 year Extracts: 1 year
Dioxins/Furans in water EPA 8290A	G – 2 x 1L amber	>0 to 6 ° C	30 days to extract; 45 days after extraction to analysis
Dioxins/Furans in soil EPA 8290A	G – wide-mouth 4 oz amber jar	Transport: <4°C; dark Storage: <10°C; dark	30 days to extract; 45 days after extraction to analysis
Dioxins/Furans in tissue EPA 8290A	G – wide-mouth 4 oz amber jar	Transport: <4°C; dark Storage: <10°C; dark	30 days to extract; 45 days *after collection* to analysis
Dioxins/Furans in Air EPA Method 23	XAD	>0 to 6 ° C; dark	30 days to extract; 45 days after extraction to analysis
Dioxins/Furans in Air EPA TO-9A	PUF	>0 to 6 ° C; dark	7 days to extract; 40 days after extraction to analysis
Pesticides in Soil (Organochlorine) 8081B	G, 4 oz wide mouth	>0 to 6 °C	14 days to extract; 40 days after extraction to analysis
Pesticides – water (Organochlorine)/8081B	Amber G, 2 x 1L	>0 to 6 °C; adjust pH to 4-5	7 days to extract; 40 days after extraction to analysis
Perchlorate in water EPA 6850	P- 125 mL with headspace	>0 to 6 °C; filter (0.2 µm PTFE) in field if possible	28 days

Parameter	Containers [1]	Preservative	Holding Time [2]
Perchlorate in Soil EPA 6850	G – wide-mouth 4 oz amber jar	>0 to 6 °C	28 days to extract; 28 days after extraction to analysis
PCBs in Soil [4] SW 8082A	G, 4 oz wide mouth	>0 to 6 ° C	14 days to extract; 40 days after extraction to analysis
PCBs in water[4,5] SW 8082A / EPA 608	Amber G; 2 x 1L	>0 to 6°C; adjust pH to 4-5	7 days to extract; 40 days after extraction to analysis
(Total) Petroleum Hydrocarbons (TPH) Water – by TX 1005	G – 2 x 40 mL with no headspace	>0 to 6 °C; HCl to pH<2	14 days to extract; 14 days after extraction to analysis
(Total) Petroleum Hydrocarbons (TPH) Water – by TX 1005	2 - 5 gram samples in pre-tared 40 ml VOA vial	>0 to 6 ° C; freeze samples to –12 to -20 ° C within 48 hrs	14 days to extract; 14 days after extraction to analysis
Polynuclear Aromatic Hydrocarbons (PAHs) / (soil)	G, 4 oz wide mouth	>0 to 6 ° C; store in the dark	14 days to extract; 40 days after extraction to analysis
Polynuclear Aromatic Hydrocarbons (PAHs) by 8270 (water)	Amber G; 2 x 1L LVI: AG – 3 x 40 mL with no headspace	>0 to 6 ° C	7 days to extract; 40 days after extraction to analysis
Semi-Volatiles (BNAs) in soil	G, 4 oz wide mouth	>0 to 6 ° C	14 days to extract; 40 days after extraction to analysis
Semi-Volatiles (BNAs)	Amber G, 2 x 1L	>0 to 6 ° C	7 days to extract; 40 days after extraction to analysis
Semi-Volatiles (TCLP)	G, 4 o wide mouth	>0 to 6 ° C	14 days to TCLP extraction; 7 days from TCLP extraction to BNA extraction; 40 days after BNA extraction to analysis
Total Organic Halogens (TOX) / SW9020	Amber G, 250mL	>0 to 6 ° C; H_2SO_4 to pH<2	28 days
Volatiles (water) SW 8260B	G – 3 x 40 mL with no headspace	>0 to 6 ° C; HCl to pH<2	14 days
Volatiles (TCLP)	G, 2 x 4 oz wide mouth	>0 to 6 ° C	14 days to extract; 14 days after extraction to analysis
Volatiles (low level soil by 5035A, where soil likely contain VOCs < 200 ppb)	Collect sample using approved coring device (EnCore, etc) or field preserve 5 gram sample in pre-tared 40 ml VOA vial, containing 5ml of organic free water, 1g sodium bisulfate & stir bar	>0 to 6 ° C; or freeze[3] samples to –12 to -20 ° C as an alternative to preservation with sodium bisulfate as a means to inhibit biodegradation.	48 hrs to transfer contents of core device to a 40 ml VOA vial , containing 5ml of organic free water, 1g sodium bisulfate & stir bar; analyze transferred sample 14 days from collection

Parameter	Containers [1]	Preservative	Holding Time [2]
Volatiles (high level soil by 5035A, where soil may contain VOCs >200 ppb)	Collect sample using approved coring device (EnCore, etc) or field preserve samples in pre-tared 60 ml glass bottles with methanol	>0 to 6 ° C; or freeze[3] samples to -12 to -20 ° C as an alternative to preservation with methanol as a means to inhibit biodegradation.	48 hrs to transfer contents of core device to a 40 ml VOA vial , containing 10 ml of purge and trap grade methanol; analyze methanol preserved sample 14 days from collection
Volatiles (Soil)	G, 2 oz wide mouth[6]	>0 to 6 ° C	14 days
Alpha, Beta, and Radium	P, G – 1000 mL	HNO_3 to pH<2	6 months

[1] (P) polyethylene/plastic; (G) Glass; (PA) Autoclavable Plastic, PUF = Polyurethane foam plug, XAD = XAD filled glass trap

[2] Recommended Holding Times from 40CFR136 and/or USEPA SW-846.

[3] Option to freeze core soil must be approved by regulatory agency or QA Project Plan.

[4] SW-846, Revision 4, February 2007, Chapter 4, Table 4-1, No Holding Time for PCBs.

[5] 40 CFR Part 136, (7-1-09 Edition), Table II, Maximum Holding Time1 year until extraction, 1 year after extraction.

[6] The prefer solid volatiles sampling method for TCEQ is 5035A and if sample in bulk jar, reports must be narrate as being receipt in improper containers.

[7] Manual for the Certification of Laboratories Analyzing Drinking Water, fifth Ed, Chapter IV, page 27 recommends a 40 day holding time for extracts analyzed by 1613B.

APPENDIX E – Data Qualifiers

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
n	Not offered for accreditation
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
P	Chlorodiphenyl ether interference was present at the Retention Time of the target analyte. Reported result should be considered an estimate. HRMS only
Q	Monitored lock-mass indicates matrix interference. Reported result should be considered an estimate. HRMS only
S	Signal saturated the detector. Result reported from dilution. HRMS only
X	See case narrative
Y	Isotopically Labeled Standard recovery outside of acceptance limits. In all cases, the signal-to-noise ratios are greater than 10:1, making the recoveries acceptable. HRMS only
K	The ion abundance ratio between the primary and secondary ions were outside of theoretical acceptance limits. Reported result should be considered an estimate. HRMS only
i	The MDL/MRL have been elevated due to a matrix interference. HRMS only

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

APPENDIX F – Laboratory Accreditations and Scopes

Accrediting Body	Certificate Number*	Expiration Date
Arkansas	21-022-0	3/27/2022
California	2919	4/30/2022
Arizona	AZ0793	5/27/2022
DoD (PJLA) ***	L21-682; L22-90	12/31/2023;2/28/2022
Florida*	E87611	6/30/2022
Hawaii	---	4/30/2022
Illinois	2000322020-4	5/9/2022
Kansas	E-10352	7/31/2022
Kentucky	123043	4/30/2022
Louisiana**	03087	6/30/2022
Louisiana DoH	LA028	12/31/2022
Maryland	343	6/30/2022
Maine	2020016	6/5/2022
Michigan	9971	4/30/2022
Minnesota	2228443	12/31/2022
Nebraska	NE-OS-25-13	4/30/2022
New Hampshire	209421	4/24/2022
New Jersey	TX008	6/30/2022
New York	11707	3/31/2022
Nevada	TX026932022-1	7/31/2022
North Carolina	624	12/31/2022
North Dakota	R-193	4/30/2022
Oklahoma	2021-080	8/31/2022
Pennsylvania	015	6/30/2022
Tennessee	04016	4/30/2022
Texas**	T1014704231-21-28	4/30/2022
Utah	TX026932021-12	7/31/2022
Washington	C819-21	11/14/2022
USDA Soil Permit	P330-19-00299	10/10/2022

All certificates and scopes can be found on the laboratory's secure network and through the Certificates database in Sharepoint.

*Certificate number at time of QAM generation, Certificate Number or list may have changed, please contact lab most recent listing.
**Primary TNI Accreditation Body
***The scope for DoD is attached per current QSM requirement at §4.2.8.4 y).

Primary Scope of Accreditation for DoD (double-click on each page to obtain the full scope)

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Group USA Corp
10450 Stancliff Road, Suite 210, Houston, TX 77099

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2017 General Requirements for the competence of Testing and Calibration Laboratories and the United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP) requirements identified within the DoD/DOE Quality Systems Manual (DoD/DOE QSM) Version 5.3 May 2019 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Environmental Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
August 21, 2020	November 9, 2021	December 31, 2023

Accreditation No.:	*Certificate No.:*
111808	L21-682

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

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PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Houston
10450 Stancliff Rd. Suite 115, Houston, TX 77099

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2017) General Requirements for the competence of Testing and Calibration Laboratories and the United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP) requirements identified within the DoD/DOE Quality Systems Manual (DoD/DOE QSM) Version 5.4 October 2021 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Environmental Testing
(As detailed in the supplement)

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For PJLA:

Tracy Szerszen
President

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
October 25, 2021	January 27, 2022	March 31, 2024

Accreditation No.:	*Certificate No.:*
116454	L22-90

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

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APPENDIX G – Calibration Criteria and DQOs

Table K.1 Calibration And Maintenance Schedule – Houston Facility

Instrument	Activity	Frequency	Documentation
pH Meters	Calibration: pH buffer aliquots are used only once Buffers used for calibration will bracket the pH of the media, reagent, or sample tested.	Before use	Worksheet/log book
pH/Specific Ion Meter	Calibration/check slope Clean electrode	Daily As required	Worksheet/log book
pH probe / ISE probes	Maintenance: Use manufacturer's specifications	As needed	Worksheet/log book
UV-Vis Spectrophotometer	Clean ambient flow cell Precision check/alignment of flow cell Wavelength verification check with color standards Empty Waste and/or Fill Rinse Containers (Gallery)	As required As required Semi-annually As Needed	Worksheet/log book Post service date on Unit
Refrigerators/ Freezers	Temperature monitoring Temperature adjustment Defrosting/cleaning	Daily As required As required	Temperature Tracking Log Maintenance Logbook
BOD Incubator	Temperature monitoring Coil and incubator cleaning	Daily Monthly	Temperature Tracking Log Maintenance Logbook
Refrigerators, Freezers, and BOD incubators	1. Thermometers are immersed in liquid to the appropriate immersion line 2. The thermometers are graduated in increments of 0.5°C or less	Temperatures are recorded each day in use	Worksheet/log book
DO Meter	Calibrate as specified in SOP	Before use	Worksheet/log book
DO probe	Maintenance as specify by manufacturer	As needed	Worksheet/log book
CETAC Mercury Analyzer	Check tubing for wear Fill rinse tank with 10% HCl Insert clean drying tube filled with Magnesium Perchlorate Fill reductant bottle with 10% Stannous Chloride	Daily Daily Daily Daily	Worksheet/log book

Table K.1 Calibration And Maintenance Schedule – Houston Facility

Instrument	Activity	Frequency	Documentation
	Clean/ Align/ Lubricate Autosampler	As Needed	
	Linear Range Study	Semi-annually	
ICP/MS	Check pump tubing	Daily	Worksheet/log book
	Check liquid argon supply	Daily	
	Check fluid level in waste container	Daily	
	Check filters	Weekly	
	Clean or replace filters	As required	
	Check torch	Daily	
	Check sample spray chamber for debris	Monthly	
	Clean and align nebulizer	Monthly	
	Check entrance slit for debris	Monthly	
	Change printer ribbon	As required	
	Replace pump tubing	As required	
	Install cleaned/new skimmer cones	As needed	
	Linear Range Study	Semi-annually	
GC/MS Systems	Ion gauge tube degassing	As required	Worksheet/log book
	Pump oil-level check	Monthly	
	Diffusion Pump oil changing	Annually	
	Analyzer bake-out	As required	
	Analyzer cleaning	As required	
	Resolution adjustment – Tune MSD	As required	
	Auto sampler maintenance	As required	
	Purge and Trap maintenance	As required	
Electron Capture Detector (ECD)	Detector wipe test (Ni-63)	Semi-annually	Worksheet/log book
	Detector cleaning	As required	
	Detector refoiled	As needed	
Gas Chromatograph	Compare standard response to previous day or since last initial calibration	Daily	Worksheet/log book
	Check carrier gas flow rate in column	Daily via use of known RT	
	Check temp. of detector, inlet, column oven	Daily	
	Septum replacement	As required	
	Glass wool replacement	As required	
	Check system for gas leaks with SNOOP	W/cylinder change as required	
	Check for loose/fray wires and insulation	Monthly	
	Bake injector/column	As required	
	Change/remove sections of guard column	As required	
	Replace connectors/liners	As required	
	Change/replace column(s)	As required	
	Autosampler Maintenance	As required	

Table K.1 Calibration And Maintenance Schedule – Houston Facility			
Instrument	**Activity**	**Frequency**	**Documentation**
Flame Ionization Detector (FID)	Detector cleaning	As required	Worksheet/log book
Photoionization Detector (PID)	Change O-rings Clean lamp window Replace PID Lamp	As required As required As needed	Worksheet/log book
HPLC / IC units	Change guard columns Change lamps Change pump seals Replace tubing Change fuses in power supply Filter all samples and solvents Change autosampler rotor/stator	As required As required Semi-annually or as required As required As required Daily As required	Worksheet/log book
TOC Analyzer	Check Sample Delivery Tubing Check Gas and Reagent supplies Replace Catalyst IR Detector cleaning	Daily Daily As required As required	Maintenance Log
Balances	Class "S" traceable weight check Clean pan and check if level Field service	Daily, when used Daily At least annually	Calibration Log
Conductivity Meter	0.01 M KCl calibration Conductivity cell cleaning	Daily, when used As required	
Turbidimeter	Check light bulb Calibrate using three points, use fresh standards daily Linear Range Study	Daily, when used Daily Semi-annually	
Deionized Water	Check resistance Check deionizer light Monitor for VOA's Replace cartridge & large mixed bed resins	Daily Daily Daily As required	DI Water Log
Drying Ovens	Temperature monitoring Temperature adjustments	Daily As required	Temperature Tracking Log
Auto analyzer (Gallery)	Clean surfaces and waste container Clean cuvette waste bin, racks, probes, mixer paddle, wash wells and wipe off moisture. Clean incubator and water containers	Daily Weekly Monthly	Maintenance Log
Auto analyzer (Mantech)	Empty waste, check pH, keep rinse solution clean Replace seed lines Replace dilution, inhibitor line Replace all tubes, electrodes Clean Carboys	Daily Quarterly Semi-annually As Needed Weekly	Maintenance Log
Microwave Oven	Clean Cavity Replace Door Shield	Daily As Needed	

Table K.1 Calibration And Maintenance Schedule – Houston Facility			
Instrument	**Activity**	**Frequency**	**Documentation**
Water Chiller	Clean Coils Add coolant	Monthly As Needed	

APPENDIX B EXAMPLE CHAIN-OF-CUSTODY FORM

Chain of Custody Form

Page _____ of _____

ALS Environmental
North America Corporate Office
10450 Stancliff Road, Suite 210
Houston, TX 77099
+1 800 695 7222

ALS Project Manager:		Work Order #:	

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name		A	
Work Order		Project Number		B	
Company Name		Bill To Company		C	
Send Report To		Invoice Attn.		D	
Address		Address		E	
				F	
City/State/Zip		City/State/Zip		G	
Phone		Phone		H	
Fax		Fax		I	
e-Mail Address		e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s): Please Print & Sign	Shipment Method:	Required Turnaround Time:	Results Due Date:
		☐ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour ☐ Other _____	

Relinquished by:	Date:	Time:	Received by:	Notes:
Relinquished by:	Date:	Time:	Received by (Laboratory):	Cooler Temp.
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	

QC Package: (Check Box Below)

	Level II: Standard QC		TRRP-Checklist
	Level III: Std QC + Raw Data		TRRP Level IV
	Level IV: SW846 CLP-Like		
	Other: _____		

Preservative Key: 1-HCL 2-HNO3 3-H2SO4 4-NaOH 5-Na2S2O3 6-NaHSO4 7-Other 8-4 degrees C 9-5035

Note: Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.

APPENDIX C ERM PERSONNEL RESUMES

Peter J. Gagnon, P.E., BCEE

Senior Partner

Peter is a senior partner with experience in site assessment and remediation, solid and hazardous waste management, environmental due diligence, and multi-media permitting. Peter's primary focus is assisting clients manage environmental liabilities in a manner that aligns with their strategic and business objectives while maintaining a positive relationship with external stakeholders. He has directed site assessments using a variety of investigative technologies and implemented both active and passive remediation technologies. He has led numerous domestic and international environmental due diligence projects for both acquisition and divestiture transactions.

EXPERIENCE: Over 29 years working with clients in the oil & gas, chemical, transportation (air and rail), power, and manufacturing sectors

LINKEDIN: https://www.linkedin.com/in/peter-gagnon-799639a1/

EMAIL: peter.gagnon@erm.com

EDUCATION

- M.S., Environmental Engineering, University of Massachusetts at Amherst (1994)
- B.Eng., Civil Engineering, Villanova University (1992)

PROFESSIONAL AFFILIATIONS AND REGISTRATIONS

- Licensed Professional Engineer in the States of Texas (#85456), Montana (#17172), and Oklahoma (#33272)
- Board Certified Environmental Engineer in Hazardous Waste Management by the American Academy of Environmental Engineers & Scientists

LANGUAGES

- English, native speaker

FIELDS OF COMPETENCE

- Civil and environmental engineering
- Site investigation and remediation
- Risk assessment (human health and ecological)
- Environmental due diligence
- Resource Conservation and Recovery Act (RCRA)
- Permitting and regulatory compliance

KEY INDUSTRY SECTORS

- Chemical
- Oil & Gas
- Manufacturing
- Power
- Transportation

PUBLICATIONS

- Ostendorf, D.W., DeGroot, D.J., Pollock, S.J., and Gagnon, P.J. 1995. "Aerobic Acetate Degradation Near the Capillary Fringe of Roadside Soil: Field Simulations from Soil Microcosms". Journal of Environmental Quality, 24:334-342.
- Holmes, L., Rinas, R., Goyette, H., and Gagnon, P. September 18, 2006. "Site Remediation MACT – Compliance Strategies for a Cross-Media MACT". 2006 NPRA Environmental Conference.

KEY PROJECTS

Peter has prepared numerous environmental permit applications aimed at providing operational flexibility while maintaining compliance. He has also prepared expert reports and provided deposition and courtroom trial testimony.

Expert Witness Testimony and Expert Report Preparation

Served as an expert witness and factual witness in the matters, Exxon Mobil Corporation v. United States of America S.D. Tex. H-10-2386 and H-11-1814; and Exxon Mobil Corporation v. United States of America Ct. Fed. Cl. 09-165-C and 09-882-C. Prepared Expert Rebuttal Report and Rebuttal Declaration. Deposed by U.S. Department of Justice in July 2013, June 2015, and March 2017. Provided trial testimony in the United States District Court for the Southern District of Texas in March 2020.

Prepared Expert Report in June 2017 for matter of The LETCO Group LLC vs. Larry J. Martin, et al., 11th Civil Court of Harris County, Texas (Cause No. 2015-73446).

Programmatic Refinery Remediation

Partner-in-Charge for assessment, monitoring, and remediation activities at two major Texas Gulf Coast integrated refinery / chemical plant complexes and a refinery in Montana. Ground water

monitoring activities were conducted to maintain compliance with requirements of negotiated enforcement orders and RCRA Permits. Assessment activities were conducted in the context of prioritized RCRA Facility Investigations as well as to address newly discovered releases. Remediation activities included ground water extraction systems, air sparging, monitored natural attenuation programs, excavation, soil covers, and institutional controls as required by negotiated enforcement orders and RCRA Permits.

Programmatic Chemical Plant Remediation

Partner-in-Charge for assessment, monitoring, and remediation activities for specialty chemical manufacturers with active facilities and legacy liabilities in Texas, Louisiana, and Alabama. Routine ground water monitoring activities were conducted as needed to address RCRA, state, and/or U.S. EPA requirements. Assessment activities were performed to address newly discovered releases. Regulatory closures of spills/releases were successfully obtained. In addition, a systematic approach to obtain regulatory closure for the waste management units was implemented at two separate Houston-area facilities after production operations were terminated.

Site Investigation Experience

Extensive experience directing and managing numerous site assessments utilizing a variety of investigatory techniques (including CPT, direct-push, hollow stem auger, mud and air rotary, and sonic drilling) to delineate the extent of affected environmental media at sites throughout the U.S. Constituents of interest that have been assessed include pesticides, herbicides, metals, asbestos, chlorinated solvents, perchlorate, per- and polyfluoroalkyl substances (PFAS), and various petroleum hydrocarbons (including LNAPLs and DNAPLs). Sites included active and idled facilities in the upstream oil & gas, refining, chemical, manufacturing, power, and transportation (air and rail) sectors.

Remediation Experience

Managed and directed the preparation of Response Action Plans/Corrective Measures Studies under various state regulatory programs to evaluate, select, and design potential remedies to achieve desired response action objectives that aligned with client strategic and business objectives. Subsequently oversaw and directed implementation of selected remedial alternatives at sites in Alabama, Louisiana, Montana, Texas, and Oklahoma. Remedies implemented include ground water recovery and treatment systems, in situ treatment of affected soil and ground water (air sparging, chemical oxidation, enhanced bioremediation, monitored natural attenuation), engineered wetlands, excavation of affected soils, and capping.

Risk Assessment Experience

Directed the completion of numerous risk assessments to evaluate the potential risks associated with the exposure of human and environmental receptors to affected media (soil, ground water, surface water, and sediments) under various exposure scenarios for a variety of sites in both industrial, residential, and mixed land use settings.

RCRA Permitting

Partner-in-Charge for preparation of RCRA permit renewal applications for multiple refineries and chemical plants. The permit applications included active, closed, and delay-of-closure solid and hazardous waste units in both detection monitoring and various stages of corrective action. Also prepared a new RCRA permit application for a greenfield chemical plant including a Hazardous Waste Combustion Unit compliant with MACT EEE.

Delisting Hazardous Wastes

Partner-in-Charge for the successful delisting of leachate generated by a land treatment unit (EPA hazardous waste code F039) at a major petroleum refinery in Texas (Final Rule - Federal Register Vol. 77, No. 183, Sept. 20, 2012, pp. 58315 – 58320).

Partner-in-Charge for a petition to delist the API Separator Sludge (EPA hazardous waste code K051) generated at the wastewater treatment system of an active major petroleum refinery in Texas (Proposed Rule - Federal Register Vol. 88, No. 14, Jan. 23, 2023, pp. 3945 – 3953).

Partner-in-Charge for a petition to delist the Primary Oil/Water/Solids Separation Sludge (EPA hazardous waste code F037) generated at the wastewater treatment system of an active major petroleum refinery in Texas (Proposed Rule - Federal Register Vol. 88, No. 15, Jan. 24, 2023, pp. 4120 – 4128).

Partner-in-Charge for a project attempting to delist a waste stream generated at the wastewater treatment system of an active petroleum refinery in Illinois that includes primary separation solids, oily water sewer solids, dissolved air floatation (DAF) float and sludge, and API separator sludge (EPA hazardous waste codes F037, F038, K048, and K051).

Risk-Based Clean Closure of RCRA Hazardous Waste Management Units

Prepared technical justifications and RCRA Permit modifications utilizing U.S. EPA's Contained-in-Policy and site-specific data for the risk-based clean closures of permitted hazardous waste management units at refineries in Montana and Texas. In both cases the agency-approved approach eliminated the need for post-closure care. Ultimately one client redeveloped a former landfarm to accommodate part of a new process unit while the other client realized over $8 million in cost savings by eliminating the need for an engineered closure and long-term monitoring of a surface impoundment.

Operation and Closure of a RCRA Hazardous Waste Management Unit

Partner-in-Charge for compliance of an operating RCRA permitted hazardous waste landfarm at a major petroleum refinery in Texas. Assisted the Client maintain compliance with the various elements of its RCRA Permit for the LTU during its operational life. Successfully negotiated with the TCEQ to allow revision of the approved closure plan to eliminate a vegetated cover in favor of durable cover option. This approach allowed the refinery client to utilize the 44-acre farmer landfarm area for contractor parking during a major facility expansion and turn-around. As part of the closure plan and permit modifications, also addressed removal of associated tankage from hazardous waste management service.

Reduction of the Post-Closure Care Period for RCRA Land Treatment Unit

Partner-in-Charge for preparation of a technical justification to reduce the Post-Closure Care Period for a RCRA Land Treatment Unit (LTU) at a refinery in Montana. A request for an Administrative Order of Consent (AOC) was also concurrently prepared. By successfully reducing the post-closure care period from 30 to 21 years and converting the regulatory status of the LTU from a RCRA permitted unit to a Solid Waste Management Unit (SWMU) the unit could be removed from the RCRA Permit; eliminating the need for the Permit for the refinery and resulting in a series of cost savings to client. Under the AOC, an expanded set of land use options for redevelopment of the LTU became available to the client.

Closure of a RCRA Solid Waste Management Unit

Partner-in-Charge for closure of a solid waste management unit at an active refinery. A hand-held X-ray fluorescence unit was used to delineate the extent of lead-affected surface soils, thereby reducing the overall footprint of the soil cover. ERM identified an on-site source of fill for use as material for the 5-acre soil cover resulting in a direct cost savings of over $800,000.

Closure of RCRA a Hazardous Waste Management Unit

Partner–in-Charge for the successful negotiation to allow closure of a RCRA landfarm that had managed listed hazardous waste without the need for an engineered or vegetated cover. Limited soil removal was required but the client was ultimately able to use the land for a flare and material storage.

Post Hurricane Harvey Chemical Plant Remediation

Partner-in-Charge for assessment and remediation activities to address releases resulting from the inundation of a chemical plant in the Houston area during Hurricane Harvey in 2017. Rapid response activities included preparation and implementation of a site-wide Sampling and Analysis Plan, Assessment activities included collection of surface water samples and soil samples within the chemical plant as well as on several off-site properties in the surrounding area. Remediation activities included soil excavation and vegetation removal. Subsequently Affected Property Assessment Reports were prepared and submitted to TCEQ.

Perchlorate Assessment and Remediation

Partner-in-Charge for the assessment of perchlorate affected soil, sediment, surface water, and ground water at a site in Oklahoma. Affected ground water plume extended over a mile in length and impacted numerous residential water supply wells. Interim remedial measures implemented at the site included ground water extraction and treatment by ion exchange, injection of substrate to promote in situ biodegradation, and construction of a biocell, a bioreactor, and an engineered treatment wetland.

Waste Management Unit Closures – Former Chemical Plants

Partner-in-Charge and certifying Professional Engineer for the closure of waste management units at two separate chemical plants in the greater Houston area after manufacturing operations concluded. Waste management units closed included container storage areas, tanks, sumps, and

impoundments. Closure certification activities included visual inspections, reviewing inspection records, hydrostatic testing, rinseate sampling, and soil and ground water sampling.

CERCLA Remedial Design

Served as design engineer for the implementation of the various remedial elements in the EPA-approved ROD for the Tex Tin Superfund Site in Texas City, Texas including a RCRA Subtitle C-equivalent landfill cap, a cover for a NORM disposal cell, and a cover on a low level radioactive waste landfill. Design responsibilities included preparation of text, design drawings and engineering analyses for the Remedial Action Work Plans and Construction Quality Assurance Plans for the various Work Packages included in the phased design/build approach used at the site.

Chemical Plant RD/RA

Designed and implemented the corrective measures for a Site-wide Remedy at a chemical plant near Mobile, Alabama including source removal (excavation) and source reduction (in situ chemical oxidation) which allowed the termination of a ground water pump-and-treat system that had operated at the plant for over 20 years.

Pesticide Site RD/RA

Developed design drawings and specifications and oversaw the excavation of over 9,000 cubic yards of affected soil at a former pesticide blending facility near Waco, Texas. Subsequently directed routine ground water monitoring activities for 16 years until pesticide concentrations achieved risk-based limits facilitating final site closure.

RCRA Corrective Action

Partner-in-Charge for the establishment of a Facility Operations Area (FOA) to implement corrective action in the operational area of a major Texas Gulf Coast petroleum refinery in accordance with the Texas Risk Reduction Program. The FOA allowed response actions for multiple releases to be consolidated for purposes for an area-wide approach to remediation resulting in significant cost savings and flexibility to the client.

Municipal Settings Designation

Partner-in-Charge for successful application for a Texas-specific Municipal Settings Designation (MSD) for a commercial property in Beaumont, Texas. The MSD is an official state designation given to a property within a municipality that certifies that designated ground water is not and will not be used as potable water because ground water is impacted in excess of the applicable protective concentration level. The prohibition was by restrictive covenant and filed in the property records.

Drinking Water Sampling – Major Airline

Partner-in-Charge for a major airline's drinking water sampling program. Sampling teams were located across all regions of the United States to coordinate and conduct weekly sampling events to comply with the US EPA Aircraft Drinking Water Rule.

Site Investigation at Major US Airport

Partner-in-Charge for the soil and ground water assessment of the airplane fueling hydrant system and other components of airport operations at Houston's Bush Intercontinental Airport to facilitate a terminal expansion.

Storm Water and Wastewater Discharge Permitting

Partner-in-Charge for preparation of numerous storm water and industrial wastewater permit applications for multiple industrial clients at active and idled facilities in Alabama, Oklahoma, and Texas. Activities have also included preparing storm water pollution prevention plans and/or sampling plans as required by various permit requirements.

Storm Water Resiliency Study

Partner-in-Charge for the assessment of the storm water management at two Houston-area chemical plants. Subsequently, ERM recommended upgrades the storm water management systems to improve drainage, reduce high water conditions, and protect critical equipment against the threat of flooding.

Upstream O&G Environmental Due Diligence

Partner-in-Charge for the successful completion of an environmental due diligence project for a $172.6 MM transaction involving the acquisition of over 1,000 proved developed producing oil and gas wells, 2 saltwater disposal wells, and 65 miles of gathering lines in 11 counties in north Texas. Assets were also evaluated for compliance against regulatory requirements.

Programmatic Oil Field Service Company Environmental Due Diligence

Partner-in-Charge leading all acquisition due diligence activities for a Houston-based oil field services company from 2017 through 2022. As part of this program, directed domestic and international teams completing numerous confidential Phase I environmental due diligence assessments and limited compliance reviews of multiple target company assets throughout North America, South America, Europe, Asia, and the Middle East.

Chemical Plant Environmental Due Diligence

Partner-in-Charge for environmental due diligence project for the acquisition of a specialty chemical company by an oil field services company. In addition to the traditional environmental due diligence, this project included a review of the facility's Process Safety Management System, Chemical Stewardship Program, and an assessment of air permitting requirements for potential production capacity increase/expansion.

Oil Field Service Company Environmental Due Diligence

Partner-in-Charge for environmental due diligence project for the acquisition of a compressor service, sales and rental company primarily servicing the oil industry. Deployed numerous assessors to complete 22 site visits in the U.S. and Australia in a 10-day period.

Oil Field Service Company Environmental Due Diligence

Partner-in-Charge leading an international team that completed Phase I and Phase II environmental due diligence assessments of multiple assets in the Russian Federation for an Oil & Gas services company prior to acquisition of these assets.

Chemical Company Environmental Due Diligence

Partner-in-Charge for environmental due diligence project for the acquisition of a chemical company. Directed environmental due diligence with limited compliance assessments for nine manufacturing facilities in the U.S. and Europe.

Upstream O&G Desktop Environmental Due Diligence

Partner-in-Charge for the completion of several desktop environmental due diligence assessments for acquisition of upstream oil and gas lease acreage in Oklahoma, Louisiana, and Texas. Utilizing on-line databases, publicly available information, regulatory documents, historical data, and remote sensing information, ERM screened the target acreage in a matter of days to identify sensitive receptors, areas of risk to the client, and potential environmental compliance or liability issues to facilitate rapid decision-making and negotiation regarding the acquisitions.

Oil Field Service Company Environmental Due Diligence

Partner-in-Charge for the completion of divestiture of upstream oil & gas services companies assets in Texas. Activities induced completion of Phase I and Phase II activities, regulatory closure of waste management units, decontamination and decommissioning of facility assets, and remediation of affected soils.

Oil Field Service Company Environmental Due Diligence

Partner-in-Charge leading an international team that completed Phase I environmental due diligence and limited compliance assessments of multiple assets in seven U.S. states and two Canadian provinces for an Oil & Gas services company prior to acquisition of these assets. Following the acquisition, led Phase II efforts to assess locations with RECs.

Capital Project Support – RCRA and UIC

RCRA and environmental due diligence subject matter expert supporting confidential major capital projects involving development of two new chemical plants in Texas. Provided permitting strategy support for RCRA compliance including development of an approach to employ the Totally Enclosed Treatment Facility exemption. Also supported efforts to permit hazardous and non-hazardous waste disposal wells.

Capital Project Support – RCRA

Waste and spill subject matter expert on a compliance assurance team for a confidential capital project. Project activities included doing a detailed regulatory, permit, and internal standard applicability determination, identification and review of operational controls in place, gap identification and closure, and verification control and task development.

NAPL Mobility Assessments

Conducted recoverability assessments for NAPL plumes at two Texas Gulf Coast refineries using site-specific data and the models included in API Publications. Residual NAPL saturation, volumes of readily recoverable NAPL, and temporal variation of NAPL recovery rates were estimated while also assessing the fate and transport of the associated dissolved phase plumes.

Portfolio Management - Railroad Sites

Managed a portfolio of associated sites in San Antonio, Texas for a major railroad. Activities included routine ground water monitoring, soil and ground water assessment, remedial construction, and site inspection.

RCRA Investigation and Corrective Action at Former Wood Treating Facility

Managed a RCRA corrective action program at a former wood treating facility in Houston, Texas. Directed activities necessary to maintain compliance with the site's RCRA Permit and Compliance Plan. Provided leadership to technical teams for the investigation of DNAPL in a highly complex hydrogeologic setting, assessment of risk and the evaluation of potential remedial alternatives in accordance with RCRA and TRRP.

Portfolio Management of Retail Service Sites

Managed remedial and investigative activities for a portfolio of gasoline retail facilities in Houston and Austin, Texas. Responsibilities included client and agency interaction; coordinating day-to-day activities; directing numerous subsurface investigations and routine ground water monitoring activities; overseeing the removal of 11 UST systems; and completing required reports in compliance with State requirements.

Site Remediation MACT Compliance

Completed Site Remediation MACT applicability determinations for refineries and chemical plants. As part of these determinations, assessed various remediation system components and activities subject to emission controls and provided methods of achieving compliance including modifying existing facility procedures, developing Site Remediation MACT-compliant Sampling and Analysis Plans, and Soil Management Plans.

Site Remediation MACT Auditing

Served as Lead Assessor for an audit team reviewing all aspects of a Texas refinery/petrochemical complex's compliance with Site Remediation MACT.

Site Remediation MACT Compliance

Trained over 100 employees over a three-day period at a refinery in the U.S. Virgin Islands on the implementation of new or updated procedures designed to maintain the refinery's compliance with Site Remediation MACT.

Site Remediation MACT Compliance

Developed a spreadsheet-based tool for use by a major energy corporation to assess the applicability of Site Remediation MACT at its 16 U.S. refineries. Subsequently conducted an

internet-based training session for corporate and facility personnel to demonstrate the use of the tool and the MACT requirements.

Retail Gasoline Service Station Environmental Due Diligence

Directed Phase II due diligence for the acquisition of gasoline retail stations in an abbreviated time schedule to estimate the environmental liabilities associated with the assets.

Cecilia Anderson, PG

Principal Consultant, Geologist

Cecilia is a Principal Consultant and Professional Geologist based in ERM's Houston office with over 18 years' experience working with energy sector clients to manage complex contaminated site portfolios. She has extensive experience leading project teams, performing detailed planning for site remediation and investigations, project budgeting, coordination of field activities, technical support, data quantification, analysis, and reporting. She partners with clients to implement risk management strategies that minimize liability while meeting compliance obligations.

EXPERIENCE: Over 18 years' experience assisting client's manage their environmental liabilities including site investigation, remediation, and property divestment

LINKEDIN: https://www.linkedin.com/in/cecilia-anderson-p-g-3010b655/

EMAIL: cecilia.anderson@erm.com

EDUCATION

- M.S., Geology, Michigan Technological University, 2006
- B.S., Environmental Geosciences, University of Michigan, 2004

PROFESSIONAL AFFILIATIONS AND REGISTRATIONS

- Registered Professional Geoscientist in the State of Texas

LANGUAGES

- English, native speaker

FIELDS OF COMPETENCE

- Program and Project Management
- RCRA Corrective Action Process
- Remediation management under EPA regulations including Superfund Sites
- TCEQ Risk Reduction Rules and Risk Reduction Program
- Site management under the Railroad Commission of Texas

- Phase I and Phase II site investigation
- Waste management unit closure
- Hydrogeology
- Monitor well design, installation, and abandonment technology

KEY INDUSTRY SECTORS

- Oil and Gas
- Power
- Chemical
- Manufacturing

KEY PROJECTS

Project Manager, Chemical Plant, US

Seconded as client project manager for active chemical plant with RCRA, Superfund, and consent decree obligations. Directing client-contracted consultants on strategy and implementation of remedial remedies, monitoring and reporting. Lead communications with EPA and state regulators. Oversees project budgets, strategy, and overall execution of remediation activities.

Project Leader, Former Chemical Plant, TX

Project manager and geologist for a former chemical plant in the process of closing solid waste management units and preparing strategic response to soil contamination on the site. Included modifications to their RCRA Permit to incorporate operational, property, and corrective action changes.

Project Management, Oil Refineries, TX, IL

Project Manager and technical SME for hazardous waste delisting petition process at two U.S. refineries. Project includes sampling and analysis of WWTP solids to determine if they meet waste delisting requirements, preparation of delisting petitions and communication and meetings with TCEQ and Illinois EPA.

Program Management, Power Generation, U.S.

Program manager responsible for leading the disposition of retired and generating power plants as well as additional excess properties for a national power company. Activities included direct coordination with client's environmental, operations, accounting, and legal groups, and collaboration with various third-party legal firms for coordination of due diligence documents, land documents, and various marketing information. Coordinated nation-wide team to meet client deadlines, contributed in meetings with potential buyers, and supported strategy development.

Project Management, Legacy Site, AK

Managed a corrective action implementation at two legacy drill sites on Alaska's North Slope during winter 2015 and follow up work in 2015-2019. Scope of projects included closure of two drill pads (including removal of petroleum-impacted gravel) and a reserve pit. Tracked project

budget and schedule, led subcontractor management, safety stewardship, client communications, and reporting.

Project Leader, Former Chemical Plant, TX

Project manager and geologist for a ground water monitoring and recovery for a former chemical plant in Texas. Oversaw team responsible for ground water monitoring and reporting to EPA, ground water recovery, waste management. Assisted client with disposition of the property through seller-side environmental support.

Subject Matter Expert, Chemical Plant, TX

Subject matter expert for the application for a new RCRA Hazardous waste permit at a proposed chemical plant in Texas. Prepared application per TCEQ requirements, managed ongoing agency communications, and facilitated regular client interaction for data needs and review of the application sections.

Project Management, Power Generation, TX

Project manager and geologist for Well installation, sampling, and statistical analysis for establishment of ground water monitoring networks at multiple units within a coal-fired power plant as part of the Coal Combustion Residuals Regulations.

Project Leader/Geologist, Oil Refinery, TX

Managed ground water monitoring and recovery for a large (~3,800 acres) refinery in Baytown, Texas. Oversaw ground water monitoring in accordance with site's RCRA permit, Compliance Plan, and Agreed Order along with required operation and maintenance to existing ground water recovery system. Developed and managed budget and schedule, safety stewardship, client communications, and reporting.

Project Management, Legacy Sites, TX

Directed phase II investigations at several legacy upstream oil and gas sites in Texas. Managed budget and schedule, coordinated and enabled client and landowner communications, regulatory interface, subcontractor management, and reporting.

Ashley G. Price

Managing Technical Consultant, Scientist

Ashley has over 18 years of experience in human health and ecological risk assessment, site investigation and remediation, statistical evaluation of soil and ground water data, and soil and ground water remediation. Prepared numerous quantitative human health and ecological risk assessments at CERCLA, RCRA, State Superfund, and Voluntary Action sites in states including Texas, Louisiana, Alabama, Tennessee, Kentucky, South Carolina, and Ohio. Experience with ground water remediation including air sparging, pump and treat, passive NAPL recovery systems, and In-Situ Chemical Oxidation (ISCO).

EXPERIENCE: Over 18 years' experience in oil & gas, chemical and manufacturing sectors

LINKEDIN: https://www.linkedin.com/in/ashley-price-2015639b/

EMAIL: ashley.price@erm.com

EDUCATION

- M.S., Environmental Studies – Medical University of South Carolina/University of Charleston, 1999
- B.S., Biological Sciences – Clemson University, 1996

PROFESSIONAL AFFILIATIONS AND REGISTRATIONS

- Society for Risk Analysis

LANGUAGES

- English, native speaker

FIELDS OF COMPETENCE

- Human health and ecological risk assessment
- Site investigation and remediation
- Environmental statistics
- Toxicological studies
- RCRA facility investigations

- Risk-based closures
- Property due diligence

KEY INDUSTRY SECTORS

- Oil & gas
- Chemical
- Manufacturing

KEY PROJECTS

Managed Corrective Action and Risk Assessment Activities for a Historical Styrene Manufacturing Plant in Baton Rouge, Louisiana

Used innovative remedial approaches, including air sparging, in-situ chemical oxidation (ISCO), and enhanced bioremediation to address ground water affected with phase-separate benzene and related constituents. Identified a relatively small, significant source area for deeper offsite ground water contamination using Membrane Interface Probe (MIP) technology.

Prepared Human Health Risk Assessments

Prepared human health risk assessments for numerous sites using guidance provided in Louisiana's Risk Evaluation/Corrective Action Program (RECAP) regulation and other applicable USEPA guidance.

Prepared a Site-Wide Ecological Risk Assessment for a Naval Weapons Station in Texas

Evaluated potential risks associated with perchlorate (among others) on 24 ecological receptors under the Texas Risk Reduction Program (TRRP) rules. Calculated clean-up levels for perchlorate based on ecological exposure. Identified "hot spots" that were contributing significantly to the estimated risk for focused corrective action.

Prepared an Ecological Risk Assessment at a Former Wood-Treating Facility in Texas with Dioxin-Affected Soil

Negotiated with the Texas Commission on Environmental Quality (TCEQ) on the use of a novel "guild-wide" approach to address unacceptable risk to a specific receptor (American Robin). TCEQ approved the Risk Assessment and granted no-further action (for ecological issues) at the Site.

Prepared a Response to Comments for an Ecological Risk Assessment for a Large Refinery in Texas

Successfully reduced the estimated risk from the previously submitted report based on careful review of EPA modeling guidance. In response to TCEQ comments, submitted revised report showing no significant risk (previous report showed risk). After discussing issues with TCEQ project manager, TCEQ approved the report.

Prepared Multiple Statistical Ground Water Evaluation Reports

Prepared multiple statistical ground water evaluation reports for regulated facilities following USEPA and state-specific guidance.

Prepared Human Health Risk Assessments

Prepared human health risk assessments in support of RCRA closure for several SWMUs and AOCs at a former Naval Base in Charleston, South Carolina.

Prepared a human health risk assessment for a national priorities list (NPL) site in South Carolina following USEPA guidance. Finalized report was approved by the Agencies and was a basis for the final remedy.

Prepared Human Health Risk Assessment

Prepared a human health risk assessment for a former hydraulics facility in Ohio following OEPA's RCRA closure guidance. Developed risk-based clean-up levels for the site.

Prepared Human Health Risk Assessment

Prepared a human health risk assessment for a former dry-cleaning facility in Alabama in support of a no-further action resolution. Used a RBCA approach to develop cleanup levels and calculated an area-weighted average of constituent concentrations using thiessen polygons for comparison to cleanup levels.

Developed Water Quality Standards for the Protection of Human Health and Aquatic Life

Developed water quality standards for the protection of human health and aquatic life for chemicals detected in surface water at two sites in Texas which lacked relevant state or federal standards using guidance provided in 30 TAC 350.

Managed Investigation and Corrective Action Activities

Managed investigation and corrective action activities associated with a highly litigious oil-field services site that had entered into a consent agreement with the Louisiana Department of Environmental Quality (LDEQ). Prepared a risk assessment for the site addressing soil and ground water issues that was approved by the LDEQ in less than one month. Industrial Site received a no-further action with no conveyance notification requirements (i.e. was closed to non-industrial standards).

Coordinated Toxicity Testing

Coordinated additional toxicity testing for an industrial polymer for which workplace exposure was likely. Acted as lab contact and technical consultant during the course of the studies.

Performed Phase I Site Assessments/Limited Compliance Audits

Performed Phase I site assessments/limited compliance audits at multiple sites in conformance with ASTM Standard E 1527-00.

Sampled Volatile Emissions from Ground Water to Outdoor Air

Sampled volatile emissions from ground water to outdoor air using a vapor flux chamber in order to evaluate potential exposure to residents in the vicinity of a NAPL plume.

Site-safety Officer for the Installation of Salt Water Injection Well

Acted as Site-safety Officer (SSO) for the installation of a 3,800 foot salt water injection well within an active natural gas production facility.

Managed Remediation, Investigation, and Risk Assessment at a Bulk Terminal Associated with a Major Refinery near New Orleans, LA

Successfully obtained a no-further action determination using risk assessment following three separate significant releases over several years (two diesel releases and one gasoline release). Used risk assessment to demonstrate that excavation was not necessary to address the most recent diesel release, and in the process saved client approximately fifty to one-hundred thousand dollars.

Obtained No-Further Action Resolution

Successfully obtained a no-further action resolution (pending) for a bulk storage facility located in Egan, Louisiana. Used an innovative risk assessment approach in order to develop a site-specific biodegradation rate constant that was used in modeling to develop favorable cleanup standards. As a result, no active remediation was required and the project was completed in a timeframe favorable to the client.

Provided Risk Assessment Support on Numerous Oil Field Legacy Litigation Sites

Supported defense of oil and gas clients against toxic tort claims brought by landowners.

Managed investigation and Corrective Action Activities Associated with a Highly Litigious Oil-Field Services Site

Site had entered into a consent agreement with the Louisiana Department of Environmental Quality (LDEQ). Prepared a risk assessment for the site addressing soil and ground water issues that was approved by the LDEQ in less than one month. Industrial Site received a no-further action with no conveyance notification requirements (i.e. was closed to non-industrial standards).

Daniel Collazos, GIT

Consultant, Geology

Daniel joined ERM's Houston office in October 2022 and is supporting the Liability Portfolio Management & Remediation (LPMR) group with project work such as site investigation and remediation. Daniel brings over five years of experience in geological field work including environmental consulting, construction, & geotechnical site investigation. Daniel has a Bachelor's degree in Geology from Sam Houston State University and is a Geologist in Training through Texas.

EXPERIENCE: Over five years' experience in geotechnical, construction, environmental, & oil/gas sectors

LINKEDIN: https://www.linkedin.com/in/daniel-collazos-git-9436bb179/

EMAIL: daniel.collazos@erm.com

EDUCATION

- B.S., Geology, Sam Houston State University

PROFESSIONAL AFFILIATIONS AND REGISTRATIONS

- Geologist-in-Training – Texas Board of Professional Geologists

LANGUAGES

- English, native speaker

FIELDS OF COMPETENCE

- Geotechnical site investigations
- Geotechnical engineering
- Soil/groundwater sampling & analysis
- Regulatory compliance
- Lead estimator for project scoping

KEY INDUSTRY SECTORS

- Geotechnical
- Construction
- Environmental
- Oil & Gas

KEY PROJECTS PRIOR TO JOINING ERM

Field Geologist/Project Manager, Houston, Texas

Performed cone penetration, seismic cone penetration, and dilatometer testing, piezometer installation, vane shear testing, & full flow penetrometer testing. Coordinated with the client while also assisting in equipment upkeep, shop maintenance, and professional development.

Lead Estimator, Houston, Texas

Inspected 50 project sites per week to keep general contractors in compliance with SWPPP, exceeding NPDES standards. As lead estimator, bid full scoped projects and ensured integrity & completion throughout all phases of project. Averaged an increase of $500,000 to $1 million/month in revenue for the company while maintaining an output rate of about 20 bids per day. Consulted with project managers & coordinators in finding a solution to mitigating site erosion control contention.

Environmental Technician, Spring, Texas

Worked with a small team to complete & fulfill project deadline while leveraging web resources such as USGS, EPA, TCEQ, & FEMA. Assisted with & enforced compliance audits, storm/waste water analysis, Phase I & II ESA reports, regulatory inspections, CHESS compliances, & soil/groundwater sampling & analysis in order to help the company reach its goal of $500,000 per month in revenue. Assisted in creating technical reports.

HEIDI MULHALL

Environmental Advisor

PROFESSIONAL SUMMARY:
Environmental Scientist with over 20 years of environmental compliance, investigation, remediation, and field experience. Successful as an Environmental Advisor, exceling in communication and providing environmental guidance to all levels of personnel. Applied expertise in Illinois and Federal regulations.

LINKEDIN: https://www.linkedin.com/in/heidi-mulhall-29b21b117/

EMAIL: Heidi.L.Mulhall@exxonmobil.com

PROFESSIONAL EXPERIENCE:

Environmental Advisor – ExxonMobil (March 2022- Present)
Environmental Advisor – Airswift (July 2021- March 2022)
Successfully provided environmental guidance within all levels of an Illinois refinery concerning environmental compliance including incident tracking/reporting and environmental federal and state regulations. Responsibilities included:

- Working knowledge of current Illinois and Federal regulations including; RCRA, CERLA, SARA, TSCA, FIFRA, MACT Engines, ODM, UST, and DOT.
- Responsible for providing incident response guidance and conduct agency notifications for environmental incidents.
- Proficient in application of multiple data management software (EDMS, PSIMS, Sphera EQuIS).
- Responsible for the completion of multiple federal and state reports including; Quarterly Sara 311, Annual Sara 312, Annual Sara 313, TSCA, Bi-annual RICE MACT.
- Provide site wide training on various environmental regulations including release reporting, MACT Engines, ODM, and new chemical/SDS management.
- Responsible for stewarding the roll-out of a new chemical management database (Sphera).
- Proficient in Microsoft Excel/PowerPoint/Word/Outlook and DV/PHD.
- Environmental Subteam Leader for multiple PMTs.
- Manage new chemical review process.

Waste Coordinator – Airswift (February 2019 – July 2021)
Waste Coordinator – Waste Management (April 2018 – February 2019)
Successful as the waste coordinator at an Illinois refinery. Responsibilities for this position included:

- Knowledge and understanding of current RCRA and DOT regulations.
- Daily management of waste department personnel.
- Creation and tracking of cost-effective budgets for multiple tasks.
- Responsible for the disposal of hazardous and non-hazardous wastes onsite.
- Oversee the daily and weekly inspections in accordance with onsite consent order and RCRA regulations.
- Assisted with state and federal required reporting activities. Including the Annual Hazardous Waste Report, Annual EPI Report, Annual BWON Report, and the Annual Sara 313 Report.
- Provided regular site wide training to all employees on RCRA and waste best management practices.
- Effective communication skills with all levels of employee's onsite regarding waste and wider environmental concerns.
- Skilled at maximizing OPEX and efficiency on tasks.
- Conducted regular onsite field inspections for identifying and resolving various environmental regulations thought site.

Project Manager – Waste Management (May 2016 – April 2018)
Successfully assisted the environmental waste department in an Illinois refinery. Tasks for this position included:

- Proficient in application of data management software (EDMS).

ExxonMobil

HEIDI MULHALL

Environmental Advisor

- Creation and tracking of cost-effective budgets for multiple tasks.
- Assisted with the determination and disposal of hazardous and non-hazardous wastes onsite.
- Conducted daily and weekly inspections in accordance with onsite consent order and RCRA regulations.
- Assisted with state and federal required reporting activities

Project Environmental Scientist - St. John–Mittelhauser & Associates, Inc. (2009 – May 2016)
Successfully developed, scheduled, managed, and conducted multiple tasks for an Illinois refinery under a State Consent Order, addressing LNAPL, groundwater, sediment, and soil issues. Successful tasks for this multi-million dollar project include:

- Developing and managing/executing comprehensive, cost effective, and regulatory agency approved SOWs.
- Creation of cost-effective budgets for multiple tasks.
- Preparing regulatory agency approved reports using risk-based approaches addressing groundwater, sediment, and soil.
- Budget tracking and schedule development/tracking for multiple concurrent activities.
- Interpreting geologic/hydrogeological and chemical analytical data.
- Characterizing LNAPL data and distribution.
- Preparing QAPPs and SOPs.

Environmental Scientist - Project Manager – Bureau Veritas (fka *Clayton Group Services*) (2000 – 2008)
Successfully developed, scheduled, managed, and conducted multiple tasks for a petroleum impacted municipality in southern Illinois under a Federal Consent Order and an Illinois refinery under a State Consent Order, including:

- Providing oversight and/or conducting/supporting multiple field activities including subsurface investigation and sampling of groundwater, sediment, soil, and LNAPL.
- Design and installation of piezometers, wells, and vapor probes in complex LNAPL-impacted settings.
- Analyses of complex geological and hydrogeological data including generation of geologic cross-sections, hydrographs, and presentation of groundwater flow conditions.
- Evaluation of field-generated and analytical LNAPL data and graphical presentation of LNAPL conditions.
- Creation of regulatory agency approved reports using risk-based approaches addressing groundwater and soil investigations.

EDUCATION:

B.S. Benedictine University, Lisle IL: Environmental Science with a concentration in Biology (2000)

CERTIFICATIONS:

- OSHA 40-Hour Hazwoper / 8-Hour Refresher Training
- RCRA Hazardous Waste Management
- DOT Hazmat Advanced General Awareness

APPENDIX D FIELD SAMPLING RECORDS

PTS Sampling Checklist

Sampler: Heidi Mulhall Time: 8:20 Date: 7/27/23
Position Held: Environmental Advisor
Contact Information (phone/email): HeidiL.Mulhall@exxonmobil.com / 815-860-7020
Outdoor Sampling Conditions (*i.e.*, Temperature, Precipitation):
Sunny 83° F

PTS Sample

Sample ID:	Time collected:	Date:
PTS-01-SL-20230727	845	7/27/23
Dup-01-SL-20230727	8:50	7/27/23
TB-01-SL-20230727	—	7/27/23

Sampling Notes: Collected PTS-01-SL-20230727 and Duplicate, Dup-01-SL-20230727 for appendix IX constituents and Hazardous Characteristics (40CFR 261.24) and (40CFR 261.40) as listed in table 1 & 2 (attached) Samples was composite

CENTRIFUGE

Model: CS16-43	Date/time Ran: 7/25/23 8:00	Origin Tank of Solids Run:
Make: Centrisys	Duration of Run: ongoing	Tank 585

Decon Procedures: Decond Sampling equipment at 830 including shovel, trowel and Stainless Steel mixing bowl with 3-Step process of Alconox wash followed by tap water rinse, followed by Distilled water rinse

Summary of Daily Tasks: Decond Sampling equipment at 8:30; collect Samples PTS-01-SL-~~20230727~~ 20230727 and duplicate Sample Dup-01-SL-20230727 and decond equipment at 9:05 after completion of Sampling

If any, what scope of work changes occurred during this sampling?

None

ALS Laboratory information

Name of Lab Courier:	Time/Date of Sample Relinquist:
	11/27/23 / 11:21

Sampler Signature: [signature] Date: 7/27/23

PTS Sampling Checklist

Sampler: Heidi Mulhall Time: 8:15 Date: 8/30/23
Position Held: Environmental Advisor
Contact Information (phone/email): Heidi.L.Mulhall@Exxonmobil.com / 815-860-7020
Outdoor Sampling Conditions (*i.e.*, Temperature, Precipitation):
Sunny, 65°F

PTS Sample

Sample ID:	Time collected:	Date:
PTS-02-SL-20230830	8:43	8/30/23
TB-02-SL-20230830	—	8/30/23

Sampling Notes: collected PTS-02-SL-20230830 for total & TCLP Metals (SW6020A/7471B), VOCs (SW8260), SVOCs (SW8270), Organochlorine Pesticides (SW8081B), Dioxin & Furans (SW8290A) + TDDD Equivalents are Chlorinated Herbicides (SW8151). Samples were composited

CENTRIFUGE

Model: CS10-43	Date/time Ran: 8/23/23 8:00	Origin Tank of Solids Run:
Make: Centrisys	Duration of Run: ongoing	Tank 580

Decon Procedures: Decon'd sampling equipment at 820 including shovel, trowel, and stainless steel mixing bowl with 3-step process of Alconox wash followed by tap water rinse, to be followed by distilled water rinse

Summary of Daily Tasks: Decon'd sampling equipment at 8:20; collected PTS-02-SL-20230830 at 8:43. Decon'd equipment after completion of collection of sample at 8:59.

If any, what scope of work changes occurred during this sampling?

None

ALS Laboratory information

Name of Lab Courier:	Time/Date of Sample Relinquist:
ALS LABS	8/30/2023 – 12:03 pm

Sampler Signature: Date: 8/30/23

PTS Sampling Checklist

Sampler: Heidi Mulhall Time: 8:55 Date: 10/26/23
Position Held: Environmental Odusor
Contact Information (phone/email): Heidi.L.Mulhall@exxonmobil.com / 815-860-7020
Outdoor Sampling Conditions (*i.e.*, Temperature, Precipitation):
Cloudy, 64°F

PTS Sample

Sample ID:	Time collected:	Date:
PTS-04-SL-20231026	9:26	10/26/23
Dup-04-SL-20231026	9:31	10/26/23
TB-04-SL-20231026	—	10/26/23

Sampling Notes: collect PTS-04-SL-20231026 and duplicate Dup-04-SL-20231026 for appendix IX constituents and Hazardous Characteristic (40 CFR 261.24) and (40 CFR 261.40) as listed in table 1+2 of SAP. Samples collected were composite

CENTRIFUGE

Model: CS10-43	Date/time Ran: 10/19/26	Origin Tank of Solids Run:
Make: Centrisys	Duration of Run: ~~to C~~ 4hr ongoing	Tank 585

Decon Procedures: Decon'd sampling equipment at 8:59 am including shovel, trowel, and stainless steel bowl w/ 3-step process of Alconox wash followed by tap rinse, the distilled water rinse

Summary of Daily Tasks: Decon'd sampling equipment at 8:59 am; collect PTS-04-SL-20231026 at 9:26 and Dup-04-SL-20231026 at 931. Decon'd equipment after completion of sample at 9:43.

If any, what scope of work changes occurred during this sampling?
NONE

ALS Laboratory information

Name of Lab Courier:	Time/Date of Sample Relinquist:
[signature]	10/26/23 / 11[13]
Sampler Signature: [signature]	Date: 10/26/23

PTS Sampling Checklist

Sampler: Heidi Mulhall Time: 9:15 Date: 9/26/23

Position Held: Environmental Advisor

Contact Information (phone/email): Heidi.L.Mulhall@exxonmobil.com / 815-860-7070

Outdoor Sampling Conditions (*i.e.*, Temperature, Precipitation):

Cloudy, 65°F

PTS Sample

Sample ID:	Time collected:	Date:
PTS-03-SL-20230926	9:35	9/26/23
MS-03-SL-20230926	9:40	9/26/23
MSD-03-SL-20230926	9:45	9/26/23
TB-03-SL-20230926	—	9/26/23

Sampling Notes: collected PTS-03-SL-20230926, MS-03-SL-20230926, MSD-03-SL-20230926 for appendix IX constituents and Hazardous characteristics (40CFR 261.24) and (40CFR 261.40) as listed in table 1 & 2 in SAP. Samples were composite

CENTRIFUGE

Model: CS10-43	Date/time Ran: 9/19/23	Origin Tank of Solids Run:
Make: Centrisys	Duration of Run: Ongoing	Tank 586

Decon Procedures: Decon'd Sampling equipment at 9:20 including shovel, trowel, and stainless steel beaker w/ 3-step process of alconox wash followed by tap water rinse, then Distilled water rinse.

Summary of Daily Tasks: Decon'd sampling equipment at 9:20; collected PTS-03-SL-20230926 at 9:35, and MS-03-SL-20230926 at 9:40, and MSD-03-SL-20230926 at 9:45. Decon'd equipment after completion of collection of composited Sample at 9:53.

If any, what scope of work changes occurred during this sampling?

None

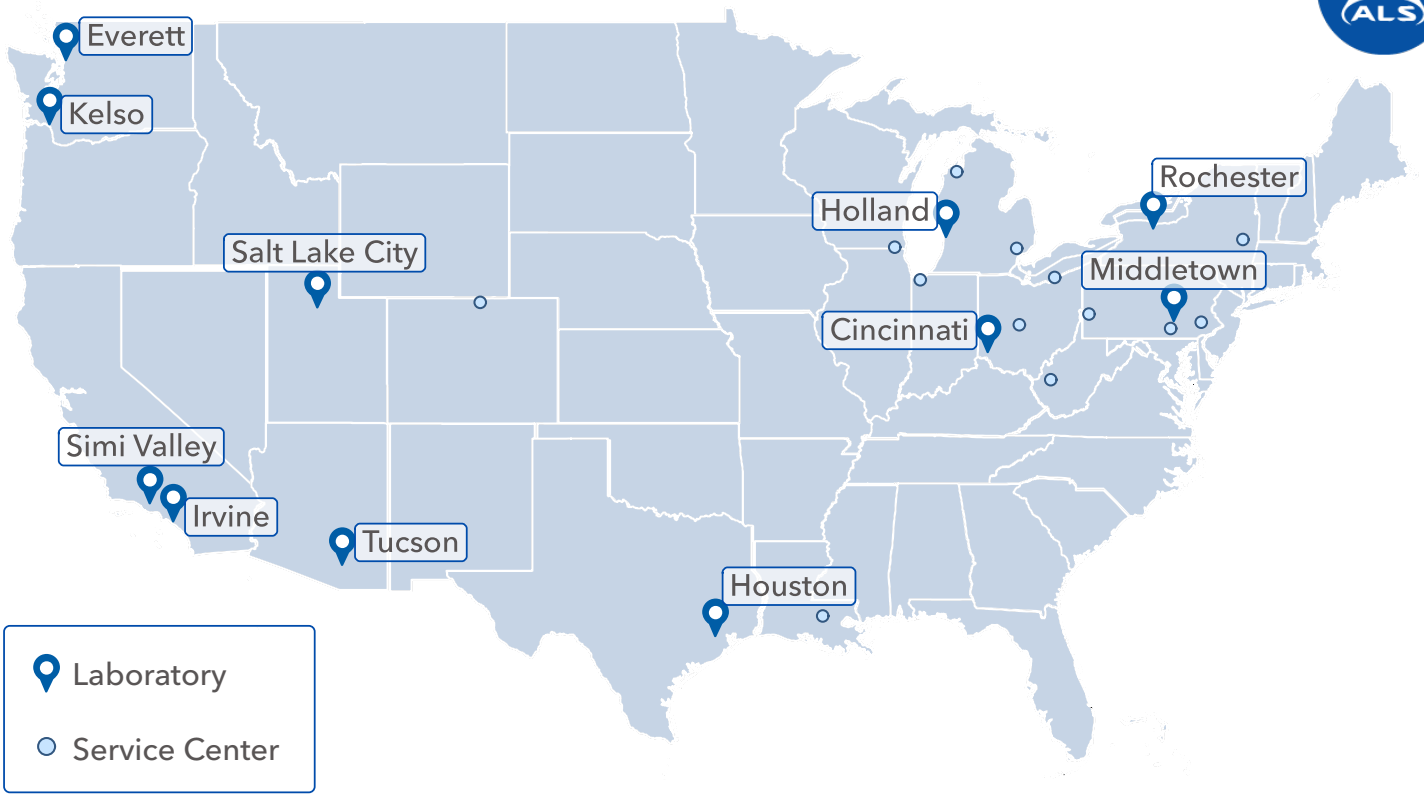
ALS Laboratory information

Name of Lab Courier:	Time/Date of Sample Relinquist:
[illegible]	11:45 AM SEP 26, 2023

Sampler Signature: [signature] Date: 9/26/23

APPENDIX E ALS LABORATORY GROUP COMPANY PROFILE

ENVIRONMENTAL & OCCUPATIONAL HYGIENE



Laboratories

Tucson, AZ	4208 S Santa Rita Ave, Tucson, AZ 85714	(520) 573-1061
Irvine, CA	3337 Michelson Dr. Suite CN750, Irvine, CA 92612	(714) 730-6239
Simi Valley, CA	2655 Park Center Drive, Suite A, Simi Valley, CA 93065	(805) 526-7161
Holland, MI	3352 128th Avenue. Holland, PA 49424	(616) 399-6070
Rochester, NY	1565 Jefferson Road, Bldg 300, Suite 360, Rochester, NY 14623	(585) 288-5380
Cincinnati, OH	4388 Glendale-Milford Road, Cincinnati, OH 45242	(513) 733-5336
Middletown, PA	301 Fulling Mill Road, Middletown, PA 17057	(717) 944-5541
Houston, TX	10450 Stancliff Road, Suite 210, Houston, TX 77099	(281) 530-5656
Salt Lake City, UT	960 W. LeVoy Drive, Salt Lake City, UT 84123	(801) 266-7700
Everett, WA	8620 Holly Drive, Suite 100, Everett, WA 98208	(425) 356-2600
Kelso, WA	1317 S. 13th Avenue, Kelso, WA 98626	(360) 577-7222

Service Centers

Denver, CO	965 E 11th Street, Loveland, CO 80537	(970) 556-2426
Chicago, IL	765 N. Route 83, Suite #114, Bensenville, IL 60106	(616) 201-9965
Valparaiso, IN	2400 Cumberland Dr, Valparaiso, IN 46383	(616) 836-2964
Baton Rouge, LA	12232 Industriplex Boulevard, Suite 21, Baton Rouge, LA 70809	(346) 242-2973
Detroit, MI	33087 8 Mile Road, Livonia, MI 48152	(248) 987-4712
Traverse City, MI	781 Industrial Circle, Traverse City, MI 49686	(231) 421-3204
Albany, NY	23A Walker Way , Section 2, Albany, NY 12205	(518) 313-7688
Cleveland, OH	6180 Halle Dr #4636, Valley View, OH 44125	(216) 674-4600
Columbus, OH	6431 Busch Blvd, Columbus, OH 43229	(513) 763-0728
Pittsburgh, PA	300 Merchant Lane, Suite 311, Pittsburgh, PA 15205	(616) 344-8085
Spring City, PA	10 Riverside Drive, Spring City, PA 19475	(610) 948-4903
York, PA	2323 Carlisle Road, Pork, PA 17408	(717) 505-5280
South Charleston, WV	1740 Union Carbide Drive, South Charleston, WV 25303	(304) 356-3168

ALS laboratory network in the USA

The ALS network consists of **11 laboratories and 13 service centers nationwide**. The service centers are local offices providing non-testing services to local client. These services will typically include sampling containers, courier services and transport of samples to the performing laboratory.

ALS' network is in constant development, and it is the intention of ALS to be in the geographies where clients need us. Please contact your nearest laboratory or service center to get more information of how ALS service your region.

New England / Northeast

(EPA REGIONS 1, 2, 3)

ALS is represented by two full-service environmental laboratories in the region: **Middletown, Pennsylvania** and **Rochester, New York**.

The Middletown laboratory is specialized in drinking water testing, and the Rochester facility is the ALS center for passive samplers. The service centers in the region are in Pittsburgh, PA, Philadelphia, PA and Albany, NY.

	Water and soil	Air testing	Emerging contaminants	PFAS
Middletown, PA	Yes	No	Yes	No
Rochester, NY	Yes	No	No	No

Southeast

(EPA REGION 4)

For the states included in EPA Region 4, ALS has a limited physical presence with a small laboratory in **Charleston, WV**. Several ALS laboratories have state certifications offering accreditation coverage, and the nearest full-service laboratory is located in **Middletown, PA** with a service center in Pittsburgh, PA.

	Water and soil	Air testing	Emerging contaminants	PFAS
Middletown, PA	Yes	No	Yes	No
Charleston, WV	Limited	No	No	No

Midwest & Great Lakes

(EPA REGIONS 5 & 7)

There are several ALS laboratories and service centers within this region, including the main laboratory in **Holland, Michigan**, which offers a full scope of analytical services including PFAS as well as aquatic toxicology testing. The second laboratory in the region is in **Cincinnati, OH**, which is a combined environmental and industrial hygiene laboratory. To support the two local laboratories, ALS has 5 service centers.

	Water and soil	Air testing	Emerging contaminants	PFAS
Holland, MI	Yes	No	No	Yes
Cincinnati, OH	Yes	Yes	No	No

Atlantic South & Gulf Coast
(EPA REGIONS 4 & 6)

The southern part of the US, including the gulf coast, is served by the ALS laboratory located in **Houston, Texas**. The laboratory offers full-service environmental, in addition in-house capabilities for PFAS and dioxins.

To support the Houston locations, ALS operates service centers in Corpus Christi, Dallas, and Baton Rouge.

	Water and soil	Air testing	Emerging contaminants	PFAS
Houston, TX	Yes	No	Yes	Yes

Southwest
(EPA REGIONS 8 & 9)

In addition to the two ALS laboratories in California, ALS operates two specialty laboratories in Tucson, Arizona and Salt Lake City, Utah. The Tucson laboratory specializes in solid fuel testing and mining related services, while the Salt Lake City laboratory has an extensive portfolio of industrial hygiene and air testing capabilities including TO-15.

The region is also supported by a service center in Denver, CO.

	Water and soil	Air testing	Emerging contaminants	PFAS
Tucson, AZ	No	No	No	No
Salt Lake City, UT	No	Yes	No	No

Pacific Northwest
(EPA REGIONS 8 & 10)

Clients located in the Northwest have two regional ALS laboratories to rely on for their testing needs; located in **Everett, Washington**, a smaller laboratory offering standard environmental services, and an ALS HUB lab located in **Kelso, Washington**.

The Kelso laboratory is one of the largest and most complex laboratories in the ALS network, and in addition to standard environmental capabilities the laboratory offers a range of specialized testing for emerging compounds, including PFAS, and non-standard matrices (like sediments and tissue). Certification span several states also outside of the Northwest, as well as DoD certification.

	Water and soil	Sediment and Tissue	Emerging contaminants	PFAS
Kelso, WA	Yes	Yes	Yes	Yes
Everett, WA	Yes	No	No	No

California
(EPA REGION 9)

ALS operates two laboratories in Southern California, located in **Irvine** and **Simi Valley**.

The Irvine laboratory is a smaller facility servicing regional clients in the local area, with capabilities that include standard soil and water testing.

The largest air and vapor testing laboratory in the global ALS network, as well as one of the in the entire USA, is in Simi Valley, California. Testing services include most whole-air analyses (including TO-15 and TO-3), as well as thermal desorption methods TO-17 and EPA 325B. With an inventory of over 3,000 summa canisters, the Simi Valley laboratory is equipped to provide canisters even during peak vapor intrusion season.

	Water and soil	Air testing	Emerging contaminants	PFAS
Simi Valley, CA	Yes	Yes	No	No
Irvine, CA	No	No	No	No

ALS offers a large number of specialty services throughout our nationwide laboratory network. Most-requested test services include:

PFAS

Method	Matrices
EPA 1633	Soil, water, Tissue
EPA 537.1 and EPA 533	Drinking water and UCMR 5
EPA 537 modified	All matrices
EPA 8327	Water
ASTM D8421	Water
ASTM D7968	Soil
ASTM D7979	Water

Air

Method	Matrices
TO-15	Ambient air
TO-3	Ambient air
EPA 325B, Fenceline Monitoring	Ambient air

Emerging contaminants

Method	Matrices
EPA 1613B, Dioxins	Soil, Water, Tissue
PPCP	Water
1,4-dioxane	

Explosives

Method	Matrices
Explosives and breakdown products, EPA 8330	Soil and water
Perchlorate, EPA 6850 or EPA 332.0	Soil and water
White phosphorous, EPA 7580	Soil

Certifications & Accreditations

To ensure all analyses are compliant with industry standards, ALS laboratories have met accreditation, licensing, and certification requirements in various programs.

To access the current *Scope of Accreditation* for a State Program, click on the link in the State Name, and for international programs, select the link in the row and column of interest. If there is no link for a program, please contact the laboratory directly.

For those States that accept NELAP accreditation (**) or are part of NELAP (*), all ALS NELAP laboratories (*) may perform testing for any non-State and/or ELAP programs, depending on testing required and capabilities of the lab.

Letter abbreviations under a lab column indicate that location holds active status for that program in that State. The main testing focus for the ALS Laboratory is indicated.

	Available State Programs covered by ALS	Cincinnati*, OH enviro, industrial hygiene, asbestos, lead	Everett, WA enviro	Holland*, MI enviro	Houston*, TX enviro	Irvine, CA product certification, drug testing, enviro	Kelso*, WA enviro	Middletown*, PA enviro	Rochester*, NY enviro	Salt Lake City, UT industrial hygiene	Simi Valley*, CA air	Spring City, PA micro	South Charleston, WV wastewater	Tucson, AZ asbestos, coal mining, landfills, elemental	Valparaiso*, IN wastewater, limited drinking water, micro
INTERNATIONAL PROGRAMS															
ISO 17025		✓			✓	✓	✓		✓	✓	✓			✓	
ISO 17065						ANSI, SCC									
NATIONAL PROGRAMS															
Dept. of Defense (DoD)					✓		✓		✓		✓				
Dept. of Energy (DOE)		IH, AS								✓					
AIHA-LAP	IH, Pb	IH, Pb, AS								IH, AS					
STATE PROGRAMS:															
Alabama**	** for DW only	**		PF	**		**	**	**						**
Alaska**	A, CS, HW, PF, S, W ** for DW only	**		**	**		CS, HW, PF, S, W	**	**		A, CS				**
Arizona	A, DW, PF, S, W				DW, PF, S, W		DW, S				A				
Arkansas**	PF, HW, S, U, W	**		**	**, PF, HW, S, U, W		**, S, W	** W	**		**				**
California**	DW, HW, PF, S, W	**		**	**, PF, HW, S, W	DW, S, W	**, DW, PF, S, W	**	**		**				**
Colorado**	** for DW only	**		**	**		**	**	**						**
Connecticut**	DW, PF, S, W	**		**, DW, PF	**		**	**	**, DW, S, W						**
Delaware**	DW, DNREC	**		**	**		**	**, DW	**, DW, DNREC		**				**
Florida*	A, DW, HW, PF, S, T, U, W	**		**, DW, PF, S, W	**, A, DW, PF, HW, S, T, U, W		**, DW, PF, S, W	**, DW, S, W	**, S, W		**, A				** W
Georgia**		**		**	**		**	**	**		**				**
Hawaii**	DW, PF	**		**	**, DW, PF		**, DW, PF	**	**		**				**
Idaho**	** for DW only	DW		**	**		**	**	**						**
Illinois*	DW, HW, PF, S, W	**		**, DW, HW, PF, S, W	**, HW, PF, S, W		**	**	**		**				**, W
Indiana**	** for DW only	**		**, DW	**		**	**	**						**, DW
Iowa	S, W			S, W											
Kansas*	DW, HW, PF, S, U, W	** DW		**, DW, PF, S, W	**, HW, PF, S, U, W		**	**	**		**				**
Kentucky	U, W	U		U, W	U										
Louisiana*	A, DW, PF, HW, S, T, W	** A, S, W		**	**, A, DW, PF, HW, S, T, W		**, HW, PF, S, T, W	**	**		**, A				**
Maine	A, DW, PF, HW, S, W				HW, PF, S, W		DW, PF, W		DW, S, W		A				
Maryland**	DW, PF	**		**	**, DW, PF		**	**, DW	**		**				**
Massachusetts**	W	**		**	**		**	**	**, W		**				**
Michigan**	DW, PF ** for DW only	DW		DW, PF	DW, PF		**	**	**						DW
Minnesota*	A, DW, HW, PF, S, U, W	**		**, DW, HW, PF, S, U	**, DW, HW, PF, S, W		**, DW, PF, S, U, W	**	**		**, A				**
Mississippi**	** for DW only	**		**	**		**	**	**						**
Missouri**	DW	**		**	**, DW		**	**	**		**				**
Montana**	DW	** DW		**	**		**	**	**		**				**
Nebraska**	** for DW only	DW		**	DW, PF		**	**	**		**				**
Nevada**	DW, HW, PF, S, T, W	**		**	**, HW, PF, S, T, W		**, DW, HW, PF, S, W	**	**		**				**
New Hampshire*	DW, HW, PF, S, W	**		**	**, HW, PF, S, W		**	**	**, DW, S, W		**				**
New Jersey*	A, DW, HW, PF, S, T, W	**		**, DW, PF	**, DW, HW, PF, S, T, W		**, DW, PF, S, T, W	**, DW, S, W	**		**, A				**

	Available State Programs covered by ALS	Cincinnati*, OH enviro, industrial hygiene, asbestos, lead	Everett, WA enviro	Holland*, MI enviro	Houston*, TX enviro	Irvine, CA product certification, drug testing, enviro	Kelso*, WA enviro	Middletown*, PA enviro	Rochester*, NY enviro	Salt Lake City, UT industrial hygiene	Simi Valley*, CA air	Spring City, PA micro	South Charleston, WV wastewater	Tucson, AZ micro, lead, coliforms, mineral, elemental	Valparaiso* IN wastewater, limited drinking water, micro
New Mexico**	DW	** DW		**	**		**	**	**	**	**				**
New York*	A, DW, HW, PF, S, T, W	** DW		**, DW, PF	A, DW, HW, PF, S, T, W		**, DW, PF, S, W	**, DW, S, W	**, DW, S, W		**, A				**
North Carolina	DW, HW, PF, S, U, W	DW			HW, PF, S, U, W		W		DW, S, W						
North Dakota**	S, W	**		**, S, W	**, S, W		**	**	**		**				**
Ohio	DW, PF	DW		DW, PF			DW, PF								
Oklahoma*	A, HW, PF, S, U, W	**		**	**, HW, PF, S, U, W		**	**	**		**, A				**
Oregon*	A, DW, HW, PF, S, T, W	**		**	**, A, DW, PF, S, T, W		**, DW, HW, PF, S, T, W				**				**
Pennsylvania*	A, DW, HW, PF, S, W	**		** DW, HW, PF, S, W	** DW, HW, PF, S, W		**	**, DW, S, W	**, S, W		**, A				** W
Rhode Island	DW, W								DW, W						
South Carolina	W						W								
South Dakota**	** for DW only	**		**	**		**	**	**		**				**
Tennessee**	** for DW only	DW		**	DW, PF		**	**	**		**				**
Texas*	A, DW, HW, PF, S, T, U, W	**		**, HW, S, W	**, DW, HW, PF, S, U, W		**, HW, S, T, W	**	**		**, A				**
Utah*	A, DW, HW, PF, S, W	** DW		**	**, HW, PF, S, W		**	**	**		**, A				**
Vermont**		**		**	**		**	**	**		**				**
Virginia*	DW, S, W	**		**	**		**	**, DW, S	**, S, W		**				**
Washington	A, DW, HW, IH, PF, S, W	DW	S, U, W		HW, PF, S, W		DW, HW, PF, S, W	DW		IH	A				
West Virginia**	DW, HW, PF, S, W	**		**, HW, PF, S, W	**		**, PF	**, DW, S	**		**		W		EPA 218.6
Wisconsin	DW, HW, PF, S, W			DW, HW, PF, S, W											
Wyoming**		**		**	**		**	**	**		**				**
OTHER PROGRAMS															
Corps of Engineers									✓						
EPA Regional Programs	DW			Region 5			Region 8	Region 3							
Drinking Water – Lead and Copper					MD, TN										
NLLAP		✓													
NVLAP	Asbestos	air and bulk													
Perchlorate					NY, WA										
Radiation License		OH								UT					
South Coast Air Quality Management						✓									
USDA	soil permit	✓		✓	✓		✓	✓	✓	✓				✓	
US Navy – Air											✓				
Whole Effluent Toxicity				NJ, NY, PA, WV											

LEGEND

1 = Limited Scope
2 = Certified for some groundwater methods
* = NELAP State / NELAP ALS Lab
**= Able to perform analyses in this state for all parameters that do not fall under specific state certification programs

AIHA-LAP Programs:
IH=Industrial Hygiene
Pb = Environmental Lead

A = Air
AS = Asbestos
CS = Contaminated Sites
DW = Drinking Water
H = HSCA (Delaware)
HW = hazardous waste non-RCRA
LU = Leaking underground storage tank (LUST)

PF = PFAS/PFOS
R = Radio Chemistry
S = Solid/Hazardous Waste (RCRA)
T = Tissue
U = Underground Storage Tank (UST)
W = Waste Water (CWA)

Quality Management Policy

ALS is using the power of testing to solve complex challenges. With a passion for science, we serve clients with data-driven insights for a safer and healthier world. ALS' clients expect our services, reports and data to be of the highest standard. To be the global leader in the discipline of scientific analysis in pursuit of a better world for all, our commitment to our clients will be met by:

- Providing clients with accurate, timely, and legally defensible data and services, whilst ensuring the highest level of impartiality and confidentiality for all our activities.
- Maintaining high standards of professional ethics.
- Continually striving for efficiency in process whilst maintaining or improving the effectiveness of the quality management system, using risk-based thinking aimed at taking advantage of opportunities and preventing undesirable results.
- Innovating, developing, or adopting new technologies / methodologies to ensure that our service offerings meet emerging regulatory, market or client requirements in both capability and detection limits, while improving efficiency, reducing waste, or improving quality.
- Working with our clients to build relationships which are mutually beneficial.
- Ensuring that staff are fully trained and competent in all aspects of our quality management system that pertain to their roles and adhere to documented procedures.
- Encouraging and assisting staff to develop to their full potential whilst contributing to the long-term objectives of the company.
- Developing and reviewing measurable objectives and targets that promote continuous improvement of our quality management system.
- Continually assess risks and opportunities in relation to laboratory activities in order to give assurance that the management system is achieving its intended results.
- Assist in providing a safe working environment, improving aspects related to client and staff safety, and minimizing any negative impact our activities have on the environment.
- Following the quality management and operational guidelines set out in the international standards ISO/IEC 17025 – "*General Requirement for the Competence of Testing and Calibration Laboratories*" and ISO 9001 – "*Quality Management Systems*".

APPENDIX F ANALYTICAL RESULTS

Provided as a separate file

APPENDIX G DRAS MODEL RESULTS

DRAS Report

Petitioner Information

EPA Region	1
EPA Delisting Petition Number	DL-
Name	ExxonMobil
Address	
Address Line 2	
City	
State	IL
Zip Code	
Waste Description	Primary Treatment Solids
Waste Code	
Analysis Performed by:	Ashley Price
Date Created:	3/1/2024
Date Submitted to EPA	3/1/2024
User Comments	

WMU Information

Unique Site Identifier	0
Landfill (LF) or Surface Impoundment (SI)	LF
Risk Factor	1e-06
Hazard Quotient Factor	1.0
Annual Waste Volume	4250.0
Units for Waste Volume 0-yd^3 1-ft^3 2-m^3	0
Active Life of the Waste Management Unit (years)	20.0
Run Detection Limit at Half (0.5) or Full Level(1.0)	0.5

Table 1 Surface Pathway Risk

Chemical Name	Waste Stream Total Conc. (mg/kg)	Cancer Risk Surface Water Ingestion Pathway	Cancer Risk Air Particulate Inhalation Pathway	Cancer Risk Fish Ingestion Pathway	Cancer Risk Soil Ingestion Pathway	Cancer Risk Air Volatile Inhalation Pathway (TCLP-Based for SI)	Surface Pathway Aggregate Cancer Risk
Acenapthylene	6.500E+00	---	---	---	---	---	---
Acetone (2-propanone)	2.450E+00	---	---	---	---	---	---
Acetophenone	3.000E+00	---	---	---	---	---	---
Aniline (benzeneamine)	1.650E+00	1.680E-13	---	3.840E-13	7.700E-14	---	6.290E-13
Anthracene	7.700E+00	---	---	---	---	---	---
Antimony	1.030E+01	---	---	---	---	---	---
Arsenic	8.840E+00	2.370E-10	7.630E-10	2.170E-08	1.090E-10	---	2.280E-08
Barium	1.980E+02	---	---	---	---	---	---
Benz(a)anthracene	8.500E+00	1.520E-11	1.020E-11	5.200E-08	6.960E-12	3.550E-18	5.200E-08
Benzo(a)pyrene	3.900E+00	6.980E-11	4.700E-11	3.210E-07	3.190E-11	5.040E-19	3.210E-07
Benzo(b)fluoranthene	1.500E+00	2.680E-12	1.670E-12	1.570E-08	1.230E-12	3.090E-19	1.570E-08
Benzo(ghi)perylene	1.500E+00	---	---	---	---	---	---
Benzo(k)fluoranthene	1.500E+00	2.680E-13	1.670E-13	1.320E-09	1.230E-13	3.850E-22	1.320E-09
Beryllium	3.120E-01	---	1.500E-11	---	---	---	1.500E-11
Cadmium	1.110E+00	---	4.010E-11	---	---	---	4.010E-11
Chromium (III) (Chromic Ion)	5.110E+01	---	---	---	---	---	---
Chromium (VI) (+6)	8.500E+00	7.600E-11	1.390E-08	1.160E-09	3.480E-11	---	1.520E-08
Chrysene	1.200E+01	2.150E-13	1.340E-13	7.470E-10	9.820E-14	6.430E-16	7.470E-10
Cobalt	9.320E+00	---	1.680E-09	---	---	---	1.680E-09
Copper	5.290E+01	---	---	---	---	---	---
Cresol m-	4.200E+00	---	---	---	---	---	---
Cresol o-	4.200E+00	---	---	---	---	---	---
Cresol p-	4.200E+00	---	---	---	---	---	---
DDD	1.500E-01	6.440E-13	2.010E-13	1.970E-07	2.950E-13	3.760E-19	1.970E-07
DDE	8.000E-02	4.870E-13	---	2.030E-07	2.230E-13	---	2.030E-07
DDT p,p'-	3.250E-02	1.980E-13	6.330E-14	2.890E-07	9.040E-14	5.210E-20	2.890E-07
Dichlorophenoxyacetic acid 2,4-(2,4-D)	4.550E-01	---	---	---	---	---	---
Endrin	1.500E-01	---	---	---	---	---	---
Ethyl methacrylate	6.000E-01	---	---	---	---	---	---
Ethylbenzene	1.200E+00	2.360E-13	5.820E-14	2.760E-11	1.080E-13	1.770E-12	2.980E-11
Fluorene	8.800E+00	---	---	---	---	---	---
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	7.500E-02	1.480E-12	4.670E-13	4.670E-10	6.750E-13	5.510E-15	4.690E-10
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	7.500E-02	8.450E-12	2.710E-12	3.080E-09	3.870E-12	2.560E-16	3.100E-09
HCH, beta- (Hexachlorocyclohexane	1.650E-02	5.310E-13	1.660E-13	1.870E-10	2.430E-13	1.790E-19	1.870E-10

(Hexachlorocyclohexane beta-BHC)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lead	3.210E+01	---	---	---	---	---	---
Mercury (Fish Pathway Only)	3.160E+00	---	---	---	---	---	---
Mercury (Total)	3.160E+00	---	---	---	---	---	---
Methylnapthalene 2-	7.600E+00	---	---	---	---	---	---
Naphthalene	1.650E+00	3.540E-12	1.100E-12	5.390E-10	1.620E-12	2.960E-13	5.450E-10
Nickel	7.240E+01	---	3.490E-10	---	---	---	3.490E-10
Phenanthrene	3.300E+01	---	---	---	---	---	---
Phenol	1.500E+00	---	---	---	---	---	---
Pyrene	2.000E+01	---	---	---	---	---	---
Selenium	6.710E+01	---	---	---	---	---	---
Silver	5.600E-01	---	---	---	---	---	---
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	9.200E-06	2.140E-11	6.670E-12	1.670E-05	9.790E-12	8.070E-21	1.670E-05
Thallium	4.850E-01	---	---	---	---	---	---
Tin	8.730E+00	---	---	---	---	---	---
Toluene	4.600E-01	---	---	---	---	---	---
Vanadium	1.550E+02	---	---	---	---	---	---
Xylenes (total)	6.900E+00	---	---	---	---	---	---
Zinc	4.790E+03	---	---	---	---	---	---
All Constituents		4.390E-10	1.690E-08	1.780E-05	2.010E-10	2.070E-12	1.790E-05

Table 2 Groundwater Pathway Risk

Chemical Name	Dilution Attenuation Factor (DAF)	Waste Volume Adjusted DAF	Waste Stream TCLP Conc. (mg/L)	Cancer Risk Groundwater Ingestion Pathway	Cancer Risk Groundwater Inhalation Pathway	Cancer Risk Groundwater Dermal Absorption Pathway-Adult	Cancer Risk Groundwater Dermal Absorption Pathway-Child	Groundwater Pathway Aggregate Cancer Risk
Acenapthylene	1.610E+01	2.880E+01	2.500E-02	---	---	---	---	---
Acetone (2-propanone)	1.540E+01	2.750E+01	1.000E-01	---	---	---	---	---
Acetophenone	1.540E+01	2.750E+01	2.500E-02	---	---	---	---	---
Aniline (benzeneamine)	1.540E+01	2.750E+01	2.500E-02	7.080E-08	---	1.120E-09	4.890E-10	7.200E-08
Anthracene	1.870E+01	3.340E+01	2.500E-02	---	---	---	---	---
Antimony	2.100E+01	3.760E+01	8.290E-02	---	---	---	---	---
Arsenic	2.380E+01	4.260E+01	3.800E-02	1.830E-05	---	3.570E-08	1.790E-08	1.840E-05
Barium	1.730E+01	3.100E+01	2.400E+00	---	---	---	---	---
Benz(a)anthracene	9.610E+02	1.720E+03	2.500E-02	1.990E-08	1.230E-09	2.730E-07	1.190E-07	2.950E-07
Benzo(a)pyrene	5.880E+06	1.050E+07	2.500E-02	3.260E-11	5.390E-13	7.280E-10	3.170E-10	7.610E-10
Benzo(b)fluoranthene	5.840E+06	1.040E+07	2.500E-02	3.280E-12	2.110E-14	8.550E-11	3.730E-11	8.880E-11
Benzo(ghi)perylene	5.890E+02	1.050E+03	2.500E-02	---	---	---	---	---
Benzo(k)fluoranthene	1.250E+21	2.230E+21	2.500E-02	1.530E-27	1.410E-29	2.870E-26	1.250E-26	3.020E-26
Beryllium	6.110E+01	1.090E+02	1.000E-02	---	---	---	---	---
Cadmium	2.490E+01	4.450E+01	2.500E-02	---	---	---	---	---
Chromium (III) (Chromic Ion)	9.010E+01	1.610E+02	3.060E-02	---	---	---	---	---
Chromium (VI) (+6)	8.420E+01	1.500E+02	5.100E-03	2.320E-07	---	9.030E-10	4.520E-10	2.330E-07
Chrysene	9.610E+02	1.720E+03	2.500E-02	1.990E-10	9.100E-12	2.730E-09	1.190E-09	2.940E-09
Cobalt	3.150E+01	5.630E+01	4.770E-02	---	---	---	---	---
Copper	8.870E+01	1.580E+02	1.000E-02	---	---	---	---	---
Cresol m-	1.540E+01	2.750E+01	2.500E-02	---	---	---	---	---
Cresol o-	1.540E+01	2.750E+01	2.500E-02	---	---	---	---	---
Cresol p-	1.540E+01	2.750E+01	2.500E-02	---	---	---	---	---
DDD	---	---	5.000E-05	9.190E-38	4.630E-39	1.270E-36	5.530E-37	1.370E-36
DDE	3.130E+21	5.590E+21	5.000E-05	4.160E-29	---	1.730E-27	7.530E-28	1.770E-27
DDT p,p'-	---	---	5.000E-05	1.300E-37	6.640E-39	2.880E-36	1.250E-36	3.020E-36
Dichlorophenoxyacetic acid 2,4-(2,4-D)	1.540E+01	2.750E+01	2.400E-04	---	---	---	---	---
Endrin	3.060E+13	5.470E+13	5.000E-05	---	---	---	---	---
Ethyl methacrylate	7.180E+01	1.280E+02	5.000E-02	---	---	---	---	---
Ethylbenzene	1.550E+01	2.770E+01	5.000E-02	2.720E-07	3.570E-07	1.330E-07	5.810E-08	7.620E-07
Fluorene	1.680E+01	3.000E+01	2.500E-02	---	---	---	---	---
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	1.820E+21	3.250E+21	2.500E-05	1.160E-28	1.360E-30	3.980E-29	1.730E-29	1.570E-28
HCH, alpha-(Hexachlorocyclohexane alpha-BHC)	9.030E+23	1.610E+24	2.500E-05	1.340E-30	2.160E-32	5.240E-31	2.280E-31	1.880E-30
HCH, beta-(Hexachlorocyclohexane beta-BHC)	1.560E+01	2.790E+01	2.500E-05	2.210E-08	3.710E-11	8.670E-09	3.780E-09	3.080E-08
Lead	5.610E+01	1.000E+02	2.500E-02	---	---	---	---	---
Mercury (Fish Pathway Only)	1.000E+00	1.000E+00	1.000E-04	---	---	---	---	---
Mercury (Total)	4.180E+01	7.470E+01	2.000E-04	---	---	---	---	---
Methylnapthalene 2-	1.660E+01	2.970E+01	2.500E-02	---	---	---	---	---
Naphthalene	1.550E+01	2.770E+01	5.000E-03	2.960E-07	2.390E-07	1.790E-07	7.790E-08	7.140E-07

Nickel	2.070E+01	3.360E+01	1.800E+00	---	---	---	---	---
Phenanthrene	1.610E+01	2.880E+01	2.500E-02	---	---	---	---	---
Phenol	1.540E+01	2.750E+01	2.500E-02	---	---	---	---	---
Pyrene	6.840E+01	1.220E+02	2.500E-02	---	---	---	---	---
Selenium	2.120E+01	3.780E+01	2.070E-01	---	---	---	---	---
Silver	4.190E+01	7.490E+01	2.500E-02	---	---	---	---	---
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	3.550E+11	6.340E+11	4.600E-07	1.290E-15	2.580E-16	5.530E-14	2.410E-14	5.690E-14
Thallium	1.820E+01	3.250E+01	9.600E-03	---	---	---	---	---
Tin	1.630E+06	2.910E+06	2.500E-02	---	---	---	---	---
Toluene	1.510E+01	2.700E+01	5.000E-02	---	---	---	---	---
Vanadium	2.390E+01	4.270E+01	1.770E-01	---	---	---	---	---
Xylenes (total)	1.550E+01	2.770E+01	5.000E-02	---	---	---	---	---
Zinc	1.820E+01	3.250E+01	6.260E+00	---	---	---	---	---
All Constituents				1.920E-05	5.970E-07	6.350E-07	2.790E-07	2.050E-05

Table 3 Surface Pathway Hazard Quotient

Chemical Name	Waste Stream Total Conc. (mg/kg)	Hazard Quotient Surface Water Ingestion Pathway	Hazard Quotient Air Particulate Inhalation Pathway	Hazard Quotient Fish Ingestion Pathway	Hazard Quotient Soil Ingestion Pathway	Hazard Quotient Air Volatile Inhalation Pathway (TCLP-Based for SI)	Surface Pathway Aggregate Hazard Quotient
Acenapthylene	6.500E+00	---	---	---	---	---	---
Acetone (2-propanone)	2.450E+00	9.480E-11	3.100E-12	3.910E-11	1.970E-10	1.690E-09	2.030E-09
Acetophenone	3.000E+00	1.050E-09	---	1.010E-08	2.170E-09	---	1.330E-08
Aniline (benzeneamine)	1.650E+00	8.210E-09	6.470E-08	2.410E-08	1.710E-08	1.160E-07	2.300E-07
Anthracene	7.700E+00	8.940E-10	2.790E-10	2.270E-06	1.860E-09	1.640E-14	2.270E-06
Antimony	1.030E+01	8.970E-07	---	3.690E-05	1.860E-06	---	3.970E-05
Arsenic	8.840E+00	1.030E-06	2.310E-05	1.210E-04	2.130E-06	---	1.470E-04
Barium	1.980E+02	3.450E-08	1.550E-05	2.250E-05	7.170E-08	---	3.810E-05
Benz(a)anthracene	8.500E+00	---	---	---	---	---	---
Benzo(a)pyrene	3.900E+00	4.530E-07	7.640E-05	2.670E-03	9.410E-07	8.200E-13	2.750E-03
Benzo(b)fluoranthene	1.500E+00	---	---	---	---	---	---
Benzo(ghi)perylene	1.500E+00	---	---	---	---	---	---
Benzo(k)fluoranthene	1.500E+00	---	---	---	---	---	---
Beryllium	3.120E-01	5.430E-09	6.120E-07	3.440E-07	1.130E-08	---	9.730E-07
Cadmium	1.110E+00	7.730E-08	4.350E-06	7.220E-05	1.610E-07	---	7.680E-05
Chromium (III) (Chromic Ion)	5.110E+01	1.190E-09	---	1.210E-09	2.470E-09	---	4.860E-09
Chromium (VI) (+6)	8.500E+00	9.870E-08	3.330E-06	1.930E-06	2.050E-07	---	5.570E-06
Chrysene	1.200E+01	---	---	---	---	---	---
Cobalt	9.320E+00	1.080E-06	6.090E-05	---	2.250E-06	---	6.420E-05
Copper	5.290E+01	1.840E-07	---	1.350E-04	3.830E-07	---	1.350E-04
Cresol m-	4.200E+00	2.930E-09	2.740E-10	5.480E-08	6.080E-09	1.590E-10	6.420E-08
Cresol o-	4.200E+00	2.930E-09	2.740E-10	5.390E-08	6.080E-09	2.580E-10	6.340E-08
Cresol p-	4.200E+00	1.460E-09	2.740E-10	2.650E-08	3.040E-09	1.060E-10	3.130E-08
DDD	1.500E-01	1.740E-07	5.440E-08	6.830E-02	3.620E-07	1.020E-13	6.830E-02
DDE	8.000E-02	9.290E-09	---	4.970E-03	1.930E-08	---	4.970E-03
DDT p,p'-	3.250E-02	2.260E-09	7.080E-10	4.250E-03	4.710E-09	5.820E-16	4.250E-03
Dichlorophenoxyacetic acid 2,4-(2,4-D)	4.550E-01	1.580E-09	4.950E-10	1.310E-07	3.290E-09	2.740E-11	1.370E-07
Endrin	1.500E-01	1.740E-08	---	3.580E-05	3.620E-08	---	3.580E-05
Ethyl methacrylate	6.000E-01	2.320E-10	7.840E-11	4.200E-09	4.830E-10	5.040E-09	1.000E-08
Ethylbenzene	1.200E+00	4.180E-10	4.700E-11	6.280E-08	8.690E-10	1.430E-09	6.560E-08
Fluorene	8.800E+00	7.660E-09	2.400E-09	9.580E-06	1.590E-08	3.580E-12	9.600E-06
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	7.500E-02	8.710E-09	2.720E-09	3.540E-06	1.810E-08	3.210E-11	3.570E-06
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	7.500E-02	3.270E-10	1.020E-10	1.530E-07	6.790E-10	9.630E-15	1.540E-07
HCH, beta- (Hexachlorocyclohexane beta-BHC)	1.650E-02	9.580E-10	2.990E-10	4.320E-07	1.990E-09	3.240E-16	4.350E-07
Lead	3.210E+01	---	---	---	---	---	---
Mercury (Fish Pathway Only)	3.160E+00	---	---	5.750E-01	---	---	5.750E-01
Mercury (Total)	3.160E+00	3.670E-07	4.130E-07	---	7.630E-07	7.230E-10	1.540E-06
Methylnapthalene 2-	7.600E+00	6.620E-08	---	1.020E-06	1.380E-07	---	1.220E-06
Naphthalene	1.650E+00	2.870E-09	2.160E-08	5.610E-07	5.970E-09	5.790E-09	5.970E-07
Nickel	7.240E+01	1.260E-07	2.030E-04	1.010E-05	2.620E-07	---	2.130E-04
Phenanthrene	3.300E+01	---	---	---	---	---	---
Phenol	1.500E+00	1.740E-10	2.940E-10	1.360E-09	3.620E-10	3.990E-10	2.590E-09
Pyrene	2.000E+01	2.320E-08	7.260E-09	1.990E-04	4.830E-08	6.770E-14	1.990E-04
Selenium	6.710E+01	4.670E-07	1.320E-07	6.210E-05	9.720E-07	---	6.370E-05
Silver	5.600E-01	3.900E-09	---	3.530E-07	8.110E-09	---	3.650E-07
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	9.200E-06	4.580E-07	9.020E-09	4.600E-01	9.520E-07	1.090E-17	4.600E-01

Thallium	[illegible]	[illegible]	[illegible]	[illegible]	3.510E-09	[illegible]	1.560E-09
Tin	8.730E+00	5.070E-10	---	---	1.050E-09	---	1.560E-09
Toluene	4.600E-01	2.000E-10	3.610E-12	1.440E-08	4.160E-10	3.640E-10	1.540E-08
Vanadium	1.550E+02	1.080E-06	6.080E-05	1.110E-06	2.240E-06	---	6.520E-05
Xylenes (total)	6.900E+00	1.200E-09	2.700E-09	1.810E-08	2.500E-09	6.800E-08	9.250E-08
Zinc	4.790E+03	5.560E-07	---	1.180E-03	1.160E-06	---	1.180E-03
All Constituents		8.940E-06	4.480E-04	1.130E+00	1.860E-05	2.000E-07	1.130E+00

Table 4 Groundwater Pathway Hazard Quotient

Chemical Name	Waste Stream TCLP Conc. (mg/L)	Dilution Attenuation Factor (DAF)	Waste Volume Adjusted DAF	Hazard Quotient Groundwater Ingestion Pathway	Hazard Quotient Groundwater Inhalation Pathway	Hazard Quotient Groundwater Dermal Absorption Pathway-Adult	Hazard Quotient Groundwater Dermal Absorption Pathway-Child	Groundwater Pathway Aggregate Hazard Quotient
Acenapthylene	2.500E-02	1.610E+01	2.880E+01	---	---	---	---	---
Acetone (2-propanone)	1.000E-01	1.540E+01	2.750E+01	1.080E-04	2.010E-06	3.790E-07	8.250E-07	1.100E-04
Acetophenone	2.500E-02	1.540E+01	2.750E+01	2.420E-04	---	1.170E-05	2.550E-05	2.670E-04
Aniline (benzeneamine)	2.500E-02	1.540E+01	2.750E+01	3.460E-03	8.910E-04	7.030E-05	1.530E-04	4.500E-03
Anthracene	2.500E-02	1.870E+01	3.340E+01	6.640E-05	1.770E-05	2.480E-04	5.400E-04	6.240E-04
Antimony	8.290E-02	2.180E+01	3.890E+01	1.420E-01	---	3.550E-04	8.870E-04	1.430E-01
Arsenic	3.800E-02	2.540E+01	4.550E+01	7.420E-02	---	1.860E-04	4.640E-04	7.470E-02
Barium	2.400E+00	1.810E+01	3.230E+01	9.900E-03	---	2.480E-05	6.190E-05	9.960E-03
Benz(a)anthracene	2.500E-02	9.700E+02	1.730E+03	---	---	---	---	---
Benzo(a)pyrene	2.500E-02	5.930E+06	1.060E+07	2.090E-07	8.690E-07	6.020E-06	1.310E-05	1.420E-05
Benzo(b)fluoranthene	2.500E-02	5.930E+06	1.060E+07	---	---	---	---	---
Benzo(ghi)perylene	2.500E-02	5.950E+02	1.060E+03	---	---	---	---	---
Benzo(k)fluoranthene	2.500E-02	1.260E+21	2.250E+21	---	---	---	---	---
Beryllium	1.000E-02	6.310E+01	1.130E+02	1.180E-03	---	2.950E-06	7.390E-06	1.190E-03
Cadmium	2.500E-02	2.640E+01	4.710E+01	2.830E-02	---	7.070E-05	1.770E-04	2.850E-02
Chromium (III) (Chromic Ion)	3.060E-02	9.030E+01	1.610E+02	3.370E-06	---	8.420E-09	2.110E-08	3.390E-06
Chromium (VI) (+6)	5.100E-03	8.460E+01	1.510E+02	3.000E-04	---	1.500E-06	3.750E-06	3.030E-04
Chrysene	2.500E-02	9.700E+02	1.730E+03	---	---	---	---	---
Cobalt	4.770E-02	3.250E+01	5.800E+01	7.300E-02	---	1.820E-04	4.570E-04	7.340E-02
Copper	1.000E-02	8.960E+01	1.600E+02	1.660E-04	---	4.160E-07	1.040E-06	1.670E-04
Cresol m-	2.500E-02	1.540E+01	2.750E+01	4.840E-04	9.610E-07	4.230E-05	9.210E-05	5.770E-04
Cresol o-	2.500E-02	1.540E+01	2.750E+01	4.840E-04	1.790E-06	4.650E-05	1.010E-04	5.870E-04
Cresol p-	2.500E-02	1.540E+01	2.750E+01	2.420E-04	7.730E-07	2.120E-05	4.610E-05	2.890E-04
DDD	5.000E-05	---	---	2.480E-32	1.260E-33	4.410E-31	9.610E-31	9.870E-31
DDE	5.000E-05	3.170E+21	5.660E+21	7.840E-25	---	4.180E-23	9.110E-23	9.180E-23
DDT p,p'-	5.000E-05	---	---	1.490E-33	7.430E-35	4.230E-32	9.220E-32	9.380E-32
Dichlorophenoxyacetic acid 2,4-(2,4-D)	2.400E-04	1.540E+01	2.750E+01	2.320E-05	6.680E-07	3.220E-06	7.020E-06	3.090E-05
Endrin	5.000E-05	3.060E+13	5.470E+13	8.120E-17	---	1.670E-16	3.630E-16	4.440E-16
Ethyl methacrylate	5.000E-02	7.180E+01	1.280E+02	1.150E-04	1.380E-04	5.440E-06	1.180E-05	2.660E-04
Ethylbenzene	5.000E-02	1.550E+01	2.770E+01	4.810E-04	2.880E-04	3.030E-04	6.600E-04	1.430E-03
Fluorene	2.500E-02	1.680E+01	3.000E+01	5.550E-04	8.000E-05	1.310E-03	2.850E-03	3.490E-03
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	2.500E-05	1.820E+21	3.250E+21	6.830E-25	7.940E-27	3.010E-25	6.560E-25	1.350E-24
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	2.500E-05	9.030E+23	1.610E+24	5.160E-29	8.130E-31	2.600E-29	5.670E-29	1.090E-28
HCH, beta- (Hexachlorocyclohexane beta-BHC)	2.500E-05	1.560E+01	2.790E+01	3.980E-05	6.720E-08	2.010E-05	4.370E-05	8.360E-05
Lead	2.500E-02	5.680E+01	1.010E+02	---	---	---	---	---
Mercury (Fish Pathway Only)	1.000E-04	1.000E+00	1.000E+00	---	---	---	---	---
Mercury (Total)	2.000E-04	4.700E+01	8.400E+01	2.110E-04	1.720E-03	5.290E-07	1.320E-06	1.930E-03
Methylnapthalene 2-	2.500E-02	1.660E+01	2.970E+01	5.610E-03	---	8.840E-03	1.930E-02	2.490E-02
Naphthalene	5.000E-03	1.550E+01	2.770E+01	2.400E-04	4.670E-03	1.860E-04	4.060E-04	5.320E-03
Nickel	1.890E-01	2.140E+01	3.830E+01	6.580E-03	---	1.640E-05	4.120E-05	6.620E-03
Phenanthrene	2.500E-02	1.610E+01	2.880E+01	---	---	---	---	---
Phenol	2.500E-02	1.540E+01	2.750E+01	8.070E-05	8.460E-07	3.650E-06	7.950E-06	8.950E-05
Pyrene	2.500E-02	6.840E+01	1.220E+02	1.820E-04	2.030E-05	1.440E-03	3.150E-03	3.350E-03
Selenium	2.070E-01	2.210E+01	3.950E+01	2.790E-02	---	6.990E-05	1.750E-04	2.810E-02
Silver	2.500E-02	4.740E+01	8.470E+01	1.570E-03	---	3.930E-06	9.840E-06	1.580E-03
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	4.600E-07	3.590E+11	6.410E+11	2.730E-11	3.440E-13	1.500E-09	3.270E-09	3.300E-09
Thallium	9.600E-03	1.830E+01	3.270E+01	7.820E-01	---	1.950E-03	4.890E-03	7.870E-01
Tin	2.500E-02	1.720E+06	3.070E+06	3.610E-10	---	9.030E-13	2.260E-12	3.630E-10
Toluene	5.000E-02	1.510E+01	2.700E+01	6.170E-04	6.330E-05	2.270E-04	4.940E-04	1.170E-03
Vanadium	1.770E-01	2.470E+01	4.420E+01	2.130E-02	---	5.330E-05	1.330E-04	2.150E-02
Xylenes (total)	5.000E-02	1.550E+01	2.770E+01	2.400E-04	3.260E-03	1.580E-04	3.440E-04	3.850E-03
Zinc	6.260E+00	1.860E+01	3.330E+01	1.670E-02	---	4.170E-05	1.040E-04	1.680E-02
All Constituents				1.200E+00	1.120E-02	1.590E-02	3.560E-02	1.250E+00

Table 5 Maximum Allowable Concentrations for Surface Pathways

Chemical Name	Waste Stream Total Conc. (mg/kg)	Delisting Level: Limiting Maximum Allowable Total Conc. (mg/kg) for LF and TCLP Conc. (mg/L) for SI	Max Allowable Total Conc. Surface Water Ingestion Pathway (mg/kg)	Max Allowable Total Conc. Air Particulate Inhalation Pathway (mg/kg)	Max Allowable Total Conc. Fish Ingestion Pathway (mg/kg)	Max Allowable Total Conc. Soil Ingestion Pathway (mg/kg)	Max Allowable Total Conc. (mg/kg) for LF and TCLP Conc. (mg/L) for SI. Air Volatile Inhalation Pathway
Acenapthylene	6.500E+00	---	---	---	---	---	---
Acetone (2-propanone)	2.450E+00	1.450E+09	2.580E+10	7.910E+11	6.270E+10	1.240E+10	1.450E+09
Acetophenone	3.000E+00	2.980E+08	2.870E+09	---	2.980E+08	1.380E+09	---
Aniline (benzeneamine)	1.650E+00	4.300E+06	9.810E+06	2.550E+07	4.300E+06	2.140E+07	1.420E+07
Anthracene	7.700E+00	3.390E+06	8.610E+09	2.760E+10	3.390E+06	4.140E+09	4.700E+14
Antimony	1.030E+01	2.790E+05	1.150E+07	---	2.790E+05	5.520E+06	---
Arsenic	8.840E+00	4.070E+02	3.730E+04	1.160E+04	4.070E+02	8.150E+04	---
Barium	1.980E+02	8.810E+06	5.740E+09	1.280E+07	8.810E+06	2.760E+09	---
Benz(a)anthracene	8.500E+00	1.630E+02	5.590E+05	8.300E+05	1.630E+02	1.220E+06	2.390E+12
Benzo(a)pyrene	3.900E+00	1.220E+01	5.590E+04	5.100E+04	1.220E+01	1.220E+05	4.760E+12
Benzo(b)fluoranthene	1.500E+00	9.560E+01	5.590E+05	8.970E+05	9.560E+01	1.220E+06	4.850E+12
Benzo(ghi)perylene	1.500E+00	---	---	---	---	---	---
Benzo(k)fluoranthene	1.500E+00	1.130E+03	5.590E+06	8.970E+06	1.130E+03	1.220E+07	3.890E+15
Beryllium	3.120E-01	2.080E+04	5.740E+07	2.080E+04	9.060E+05	2.760E+07	---
Cadmium	1.110E+00	1.540E+04	1.440E+07	2.770E+04	1.540E+04	6.900E+06	---
Chromium (III) (Chromic Ion)	5.110E+01	2.070E+10	4.310E+10	---	4.230E+10	2.070E+10	---
Chromium (VI) (+6)	8.500E+00	6.100E+02	1.120E+05	6.100E+02	7.330E+03	2.440E+05	---
Chrysene	1.200E+01	1.610E+04	5.590E+07	8.970E+07	1.610E+04	1.220E+08	1.870E+10
Cobalt	9.320E+00	5.540E+03	8.610E+06	5.540E+03	---	4.140E+06	---
Copper	5.290E+01	3.930E+05	2.870E+08	---	3.930E+05	1.380E+08	---
Cresol m-	4.200E+00	7.660E+07	1.440E+09	1.530E+10	7.660E+07	6.900E+08	2.640E+10
Cresol o-	4.200E+00	7.800E+07	1.440E+09	1.530E+10	7.800E+07	6.900E+08	1.630E+10
Cresol p-	4.200E+00	1.590E+08	2.870E+09	1.530E+10	1.590E+08	1.380E+09	3.960E+10
DDD	1.500E-01	7.620E-01	2.330E+05	7.470E+05	7.620E-01	4.140E+05	3.990E+11
DDE	8.000E-02	3.950E-01	1.640E+05	---	3.950E-01	3.590E+05	---
DDT p,p'-	3.250E-02	1.120E-01	1.640E+05	5.140E+05	1.120E-01	3.590E+05	6.240E+11
Dichlorophenoxyacetic acid 2,4-(2,4-D)	4.550E-01	3.460E+06	2.870E+08	9.180E+08	3.460E+06	1.380E+08	1.660E+10
Endrin	1.500E-01	4.190E+03	8.610E+06	---	4.190E+03	4.140E+06	---
Ethyl methacrylate	6.000E-01	1.190E+08	2.580E+09	7.650E+09	1.430E+08	1.240E+09	1.190E+08
Ethylbenzene	1.200E+00	4.340E+04	5.080E+06	2.060E+07	4.340E+04	1.110E+07	6.780E+05
Fluorene	8.800E+00	9.190E+05	1.150E+09	3.670E+09	9.190E+05	5.520E+08	2.460E+12
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	7.500E-02	1.610E+02	5.080E+04	1.610E+05	1.610E+02	1.110E+05	1.360E+07
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	7.500E-02	2.430E+01	8.870E+03	2.770E+04	2.430E+01	1.940E+04	2.930E+08
HCH, beta- (Hexachlorocyclohexane beta-BHC)	1.650E-02	8.850E+01	3.110E+04	9.960E+04	8.850E+01	6.790E+04	9.200E+10
Lead	3.210E+01	4.890E+06	---	4.890E+06	---	1.770E+07	---
Mercury (Fish Pathway Only)	3.160E+00	5.500E+00	---	---	5.500E+00	---	---
Mercury (Total)	3.160E+00	4.140E+06	8.610E+06	7.650E+06	---	4.140E+06	4.370E+09
Methylnapthalene 2-	7.600E+00	7.460E+06	1.150E+08	---	7.460E+06	5.520E+07	---
Naphthalene	1.650E+00	3.060E+03	4.660E+05	1.490E+06	3.060E+03	1.020E+06	5.570E+06
Nickel	7.240E+01	2.080E+05	5.740E+08	2.080E+05	7.150E+06	2.760E+08	---
Phenanthrene	3.300E+01	---	---	---	---	---	---
Phenol	1.500E+00	1.100E+09	8.610E+09	5.100E+09	1.100E+09	4.140E+09	3.760E+09
Pyrene	2.000E+01	1.010E+05	8.610E+08	2.760E+09	1.010E+05	4.140E+08	2.950E+14
Selenium	6.710E+01	1.080E+06	1.440E+08	5.100E+08	1.080E+06	6.900E+07	---
Silver	5.600E-01	1.590E+06	1.440E+08	---	1.590E+06	6.900E+07	---
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	9.200E-06	5.500E-07	4.300E-01	1.380E+00	5.500E-07	9.400E-01	1.140E+09
Thallium	4.850E-01	2.790E+01	2.870E+05	---	2.790E+01	1.380E+05	---
Tin	8.730E+00	8.290E+09	1.720E+10	---	---	8.290E+09	---
Toluene	4.600E-01	3.190E+07	2.300E+09	1.280E+11	3.190E+07	1.100E+09	1.260E+09
Vanadium	1.550E+02	2.550E+06	1.440E+08	2.550E+06	1.390E+08	6.900E+07	---
Xylenes (total)	6.900E+00	1.010E+08	5.740E+09	2.550E+09	3.820E+08	2.760E+09	1.010E+08
Zinc	4.790E+03	4.060E+06	8.610E+09	---	4.060E+06	4.140E+09	---

Table 6 Maximum Allowable TCLP Concentration Groundwater Pathways

Chemical Name	Waste Stream TCLP Conc. (mg/L)	Limiting Maximum Allowable Receptor Conc. (mg/L)	Dilution Attenuation Factor (DAF)	Waste Volume Adjusted DAF	Delisting Level: Limiting Maximum Allowable TCLP Conc.	Max Allowable Receptor Conc. Groundwater Ingestion Pathway (mg/L)	Max Allowable Receptor Conc. Groundwater Inhalation Pathway (mg/L)	Max Allowable Receptor Conc. Groundwater Dermal Absorption Pathway-Adult (mg/L)	Max Allowable Receptor Conc. Groundwater Dermal Absorption Pathway-Child (mg/L)	Max Allowable Receptor Conc. MCL (mg/L)

Acenapthylene	2.500E-02	---	1.000E+00	1.000E+00	---	---	---	---	---	---
Acetone (2-propanone)	1.000E-01	3.380E+01	1.540E+01	2.750E+01	9.300E+02	3.380E+01	1.810E+03	9.590E+03	4.400E+03	---
Acetophenone	2.500E-02	3.750E+00	1.540E+01	2.750E+01	1.030E+02	3.750E+00	---	7.770E+01	3.570E+01	---
Aniline (benzeneamine)	2.500E-02	1.280E-02	1.540E+01	2.750E+01	3.530E-01	1.280E-02	1.020E+00	8.100E-01	1.860E+00	---
Anthracene	2.500E-02	1.390E+00	1.870E+01	3.340E+01	4.630E+01	1.130E+01	4.240E+01	3.020E+00	1.390E+00	---
Antimony	8.290E-02	6.000E-03	2.040E+01	3.640E+01	2.190E-01	1.500E-02	---	6.010E+00	2.400E+00	6.000E-03
Arsenic	3.800E-02	4.870E-05	3.250E+01	5.810E+01	2.830E-03	4.870E-05	---	2.500E-02	5.000E-02	1.000E-02
Barium	2.400E+00	2.000E+00	1.730E+01	3.090E+01	6.180E+01	7.510E+00	---	3.000E+03	1.200E+03	2.000E+00
Benz(a)anthracene	2.500E-02	5.320E-05	9.610E+02	1.720E+03	9.140E-02	7.310E-04	1.190E-02	5.320E-05	1.220E-04	---
Benzo(a)pyrene	2.500E-02	3.270E-06	5.880E+06	1.050E+07	3.430E+01	7.310E-05	2.710E-03	3.270E-06	7.500E-06	2.000E-04
Benzo(b)fluoranthene	2.500E-02	2.800E-05	5.840E+06	1.040E+07	2.920E+02	7.310E-04	1.130E-01	2.800E-05	6.430E-05	---
Benzo(ghi)perylene	2.500E-02	---	1.000E+00	1.000E+00	---	---	---	---	---	---
Benzo(k)fluoranthene	2.500E-02	3.900E-04	1.250E+21	2.230E+21	8.710E+17	7.310E-03	7.950E-01	3.900E-04	8.960E-04	---
Beryllium	1.000E-02	4.000E-03	3.570E+01	6.380E+01	2.550E-01	7.510E-02	---	3.000E+01	1.200E+01	4.000E-03
Cadmium	2.500E-02	5.000E-03	2.160E+01	3.860E+01	1.930E-01	1.880E-02	---	7.510E+00	3.000E+00	5.000E-03
Chromium (III) (Chromic Ion)	3.060E-02	1.000E-01	2.760E+01	4.940E+01	4.940E+00	5.630E+01	---	2.250E+04	9.000E+03	1.000E-01
Chromium (VI) (+6)	5.100E-03	1.460E-04	7.360E+01	1.310E+02	1.920E-02	1.460E-04	---	3.750E-02	7.500E-02	1.000E-01
Chrysene	2.500E-02	5.320E-03	9.610E+02	1.720E+03	9.140E+00	7.310E-02	1.600E+00	5.320E-03	1.220E-02	---
Cobalt	4.770E-02	1.130E-02	2.390E+01	4.280E+01	4.820E-01	1.130E-02	---	4.510E+00	1.800E+00	---
Copper	1.000E-02	3.750E-01	2.340E+01	4.180E+01	1.570E+01	3.750E-01	---	1.500E+02	6.000E+01	1.300E+00
Cresol m-	2.500E-02	1.880E+00	1.540E+01	2.750E+01	5.170E+01	1.880E+00	9.460E+02	2.150E+01	9.860E+00	---
Cresol o-	2.500E-02	1.880E+00	1.540E+01	2.750E+01	5.170E+01	1.880E+00	5.080E+02	1.950E+01	8.960E+00	---
Cresol p-	2.500E-02	3.750E+00	1.540E+01	2.750E+01	1.030E+02	3.750E+00	1.180E+03	4.300E+01	1.970E+01	---
DDD	5.000E-05	2.200E-05	---	---	3.940E+25	3.050E-04	6.040E-03	2.200E-05	2.910E-05	---
DDE	5.000E-05	5.180E-06	3.130E+21	5.590E+21	2.890E+16	2.150E-04	---	5.180E-06	1.190E-05	---
DDT p,p'-	5.000E-05	9.720E-06	---	---	1.740E+25	2.150E-04	4.220E-03	9.720E-06	2.230E-05	---
Dichlorophenoxyacetic acid 2,4-(2,4-D)	2.400E-04	7.000E-02	1.540E+01	2.750E+01	1.930E+00	3.750E-01	1.310E+01	2.710E+00	1.240E+00	7.000E-02
Endrin	5.000E-05	2.000E-03	3.060E+13	5.470E+13	1.090E+11	1.130E-02	---	5.490E-03	2.520E-03	2.000E-03
Ethyl methacrylate	5.000E-02	2.820E+00	7.180E+01	1.280E+02	3.610E+02	3.380E+00	2.820E+00	7.170E+01	3.290E+01	---
Ethylbenzene	5.000E-02	5.060E-03	1.550E+01	2.770E+01	1.400E-01	6.650E-03	5.060E-03	1.350E-02	3.110E-02	7.000E-01
Fluorene	2.500E-02	2.920E-01	1.680E+01	3.000E+01	8.770E+00	1.500E+00	1.040E+01	6.360E-01	2.920E-01	---
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	2.500E-05	6.650E-05	1.820E+21	3.250E+21	2.160E+17	6.650E-05	5.650E-03	1.930E-04	4.440E-04	2.000E-04
HCH, alpha-(Hexachlorocyclohexane alpha-BHC)	2.500E-05	1.160E-05	9.030E+23	1.610E+24	1.870E+19	1.160E-05	7.180E-04	2.950E-05	6.780E-05	---
HCH, beta-(Hexachlorocyclohexane beta-BHC)	2.500E-05	4.060E-05	1.560E+01	2.790E+01	1.130E-03	4.060E-05	2.410E-02	1.030E-04	2.370E-04	---
Lead	2.500E-02	1.500E-02	4.760E+01	8.500E+01	1.280E+00	1.500E-02	---	---	---	1.500E-02
Mercury (Fish Pathway Only)	1.000E-04	---	1.000E+00	1.000E+00	---	---	---	---	---	---
Mercury (Total)	2.000E-04	1.380E-03	4.690E+01	8.390E+01	1.160E-01	1.130E-02	1.380E-03	4.510E+00	1.800E+00	2.000E-03
Methylnapthalene 2-	2.500E-02	4.380E-02	1.660E+01	2.970E+01	1.300E+00	1.500E-01	---	9.540E-02	4.380E-02	---
Naphthalene	5.000E-03	6.090E-04	1.550E+01	2.770E+01	1.690E-02	6.090E-04	7.550E-04	1.010E-03	2.320E-03	---
Nickel	1.890E-01	7.510E-01	1.800E+01	3.220E+01	2.420E+01	7.510E-01	---	3.000E+02	1.200E+02	---
Phenanthrene	2.500E-02	---	1.000E+00	1.000E+00	---	---	---	---	---	---
Phenol	2.500E-02	1.130E+01	1.540E+01	2.750E+01	3.100E+02	1.130E+01	1.070E+03	2.490E+02	1.140E+02	---
Pyrene	2.500E-02	6.500E-02	6.840E+01	1.220E+02	7.940E+00	1.130E+00	1.010E+01	1.420E-01	6.500E-02	---
Selenium	2.070E-01	5.000E-02	1.760E+01	3.140E+01	1.570E+00	1.880E-01	---	7.510E+01	3.000E+01	5.000E-02
Silver	2.500E-02	1.880E-01	4.620E+01	8.260E+01	1.550E+01	1.880E-01	---	7.510E+01	3.000E+01	---
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	4.600E-07	1.310E-11	3.550E+11	6.340E+11	8.320E+00	5.620E-10	2.820E-09	1.310E-11	3.010E-11	3.000E-08
Thallium	9.600E-03	3.750E-04	1.830E+01	3.270E+01	1.230E-02	3.750E-04	---	1.500E-01	6.000E-02	2.000E-03
Tin	2.500E-02	2.250E+01	1.720E+06	3.070E+06	6.920E+07	2.250E+01	---	9.010E+03	3.600E+03	---
Toluene	5.000E-02	1.000E+00	1.510E+01	2.700E+01	2.700E+01	3.000E+00	2.930E+01	8.170E+00	3.750E+00	1.000E+00
Vanadium	1.770E-01	1.880E-01	2.210E+01	3.950E+01	7.420E+00	1.880E-01	---	7.510E+01	3.000E+01	---
Xylenes (total)	5.000E-02	5.540E-01	1.550E+01	2.770E+01	1.530E+01	7.510E+00	5.540E-01	1.140E+01	5.260E+00	1.000E+01
Zinc	6.260E+00	1.130E+01	1.750E+01	3.130E+01	3.520E+02	1.130E+01	---	4.510E+03	1.800E+03	---

Table 7 Aggregate Risk and Hazard Quotient Results

Chemical Name	Chemical CAS number	Aggregate Hazard Index Groundwater Pathways	Aggregate Hazard Index Surface Pathways	Total Aggregate Hazard Index	Aggregate Cancer Risk Groundwater Pathways	Aggregate Cancer Risk Surface Pathways	Total Aggregate Cancer Risk
Acenapthylene	208-96-8	---	---	---	---	---	---
Acetone (2-propanone)	67-64-1	1.100E-04	2.030E-09	1.100E-04	---	---	---
Acetophenone	98-86-2	2.670E-04	1.330E-08	2.670E-04	---	---	---
Aniline (benzeneamine)	62-53-3	4.500E-03	2.300E-07	4.500E-03	7.200E-08	6.290E-13	7.200E-08
Anthracene	120-12-7	6.240E-04	2.270E-06	6.260E-04	---	---	---
Antimony	7440-36-0	1.430E-01	3.970E-05	1.430E-01	---	---	---
Arsenic	7440-38-2	7.470E-02	1.470E-04	7.480E-02	1.840E-05	2.280E-08	1.840E-05
Barium	7440-39-3	9.960E-03	3.810E-05	1.000E-02	---	---	---

Benz(a)anthracene	56-55-3	1.420E-05	2.750E-03	2.760E-03	7.610E-10	3.210E-07	3.220E-07
Benzo(a)pyrene	50-32-8	1.420E-05	2.750E-03	2.760E-03	7.610E-10	3.210E-07	3.220E-07
Benzo(b)fluoranthene	205-99-2	---	---	---	8.880E-11	1.570E-08	1.580E-08
Benzo(ghi)perylene	191-24-2	---	---	---	---	---	---
Benzo(k)fluoranthene	207-08-9	---	---	---	3.020E-26	1.320E-09	1.320E-09
Beryllium	7440-41-7	1.190E-03	9.730E-07	1.190E-03	---	1.500E-11	1.500E-11
Cadmium	7440-43-9	2.850E-02	7.680E-05	2.850E-02	---	4.010E-11	4.010E-11
Chromium (III) (Chromic Ion)	16065-83-1	3.390E-06	4.860E-09	3.390E-06	---	---	---
Chromium (VI) (+6)	18540-29-9	3.030E-04	5.570E-06	3.090E-04	2.330E-07	1.520E-08	2.480E-07
Chrysene	218-01-9	---	---	---	2.940E-09	7.470E-10	3.690E-09
Cobalt	7440-48-4	7.340E-02	6.420E-05	7.350E-02	---	1.680E-09	1.680E-09
Copper	7440-50-8	1.670E-04	1.350E-04	3.030E-04	---	---	---
Cresol m-	108-39-4	5.770E-04	6.420E-08	5.770E-04	---	---	---
Cresol o-	95-48-7	5.870E-04	6.340E-08	5.870E-04	---	---	---
Cresol p-	106-44-5	2.890E-04	3.130E-08	2.890E-04	---	---	---
DDD	72-54-8	9.870E-31	6.830E-02	6.830E-02	1.370E-36	1.970E-07	1.970E-07
DDE	72-55-9	9.180E-23	4.970E-03	4.970E-03	1.770E-27	2.030E-07	2.030E-07
DDT p,p'-	50-29-3	9.380E-32	4.250E-03	4.250E-03	3.020E-36	2.890E-07	2.890E-07
Dichlorophenoxyacetic acid 2,4-(2,4-D)	94-75-7	3.090E-05	1.370E-07	3.110E-05	---	---	---
Endrin	72-20-8	4.440E-16	3.580E-05	3.580E-05	---	---	---
Ethyl methacrylate	97-63-2	2.660E-04	1.000E-08	2.660E-04	---	---	---
Ethylbenzene	100-41-4	1.430E-03	6.560E-08	1.430E-03	7.620E-07	2.980E-11	7.620E-07
Fluorene	86-73-7	3.490E-03	9.600E-06	3.500E-03	---	---	---
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	58-89-9	1.350E-24	3.570E-06	3.570E-06	1.570E-28	4.690E-10	4.690E-10
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	319-84-6	1.090E-28	1.540E-07	1.540E-07	1.880E-30	3.100E-09	3.100E-09
HCH, beta- (Hexachlorocyclohexane beta-BHC)	319-85-7	8.360E-05	4.350E-07	8.400E-05	3.080E-08	1.870E-10	3.100E-08
Lead	7439-92-1	---	---	---	---	---	---
Mercury (Fish Pathway Only)	22967-92-6	---	5.750E-01	5.750E-01	---	---	---
Mercury (Total)	7439-97-6	1.930E-03	1.540E-06	1.940E-03	---	---	---
Methylnapthalene 2-	91-57-6	2.490E-02	1.220E-06	2.490E-02	---	---	---
Naphthalene	91-20-3	5.320E-03	5.970E-07	5.320E-03	7.140E-07	5.450E-10	7.150E-07
Nickel	7440-02-0	6.620E-03	2.130E-04	6.830E-03	---	3.490E-10	3.490E-10
Phenanthrene	85-01-8	---	---	---	---	---	---
Phenol	108-95-2	8.950E-05	2.590E-09	8.950E-05	---	---	---
Pyrene	129-00-0	3.350E-03	1.990E-04	3.550E-03	---	---	---
Selenium	7782-49-2	2.810E-02	6.370E-05	2.820E-02	---	---	---
Silver	7440-22-4	1.580E-03	3.650E-07	1.580E-03	---	---	---
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	1746-01-6	3.300E-09	4.600E-01	4.600E-01	5.690E-14	1.670E-05	1.670E-05
Thallium	7440-28-0	7.870E-01	1.740E-02	8.040E-01	---	---	---
Tin	7440-31-5	3.630E-10	1.560E-09	1.920E-09	---	---	---
Toluene	108-88-3	1.170E-03	1.540E-08	1.170E-03	---	---	---
Vanadium	7440-62-2	2.150E-02	6.520E-05	2.150E-02	---	---	---
Xylenes (total)	1330-20-7	3.850E-03	9.250E-08	3.850E-03	---	---	---
Zinc	7440-66-6	1.680E-02	1.180E-03	1.800E-02	---	---	---
Sum-Detected COCs Only		1.170E+00	1.040E+00	2.210E+00	1.930E-05	1.740E-05	3.670E-05
Sum-with Non-Detected COCs		1.250E+00	1.130E+00	2.380E+00	2.050E-05	1.790E-05	3.830E-05

Table 8 Limiting Pathways

Chemical Name	Chemical CAS number	GW Path Limiting TCLP Conc. (mg/L)	Limiting GW Pathway	Surface Path Limiting Conc. (mg/kg Total for LF, mg/L TCLP for SI)	Limiting Surface Pathway
Acenapthylene	208-96-8	---	GW Ingestion	---	SW Ingestion
Acetone (2-propanone)	67-64-1	9.300E+02	GW Ingestion	1.450E+09	Air Volatile Inhalation
Acetophenone	98-86-2	1.030E+02	GW Ingestion	2.980E+08	Fish Ingestion
Aniline (benzeneamine)	62-53-3	3.530E-01	GW Ingestion	4.300E+06	Fish Ingestion
Anthracene	120-12-7	4.630E+01	GW Dermal-Child	3.390E+06	Fish Ingestion
Antimony	7440-36-0	2.190E-01	MCL	2.790E+05	Fish Ingestion
Arsenic	7440-38-2	2.830E-03	GW Ingestion	4.070E+02	Fish Ingestion
Barium	7440-39-3	6.180E+01	MCL	8.810E+06	Fish Ingestion
Benz(a)anthracene	56-55-3	9.140E-02	GW Dermal-Adult	1.630E+02	Fish Ingestion
Benzo(a)pyrene	50-32-8	3.430E+01	GW Dermal-Adult	1.220E+01	Fish Ingestion
Benzo(b)fluoranthene	205-99-2	2.920E+02	GW Dermal-Adult	9.560E+01	Fish Ingestion

Benzo(ghi)perylene	191-24-2	---	GW Ingestion	---	SW Ingestion
Benzo(k)fluoranthene	207-08-9	8.710E+17	GW Dermal-Adult	1.130E+03	Fish Ingestion
Beryllium	7440-41-7	2.550E-01	MCL	2.080E+04	Air Particulate Inhalation
Cadmium	7440-43-9	1.930E-01	MCL	1.540E+04	Fish Ingestion
Chromium (III) (Chromic Ion)	16065-83-1	4.940E+00	MCL	2.070E+10	Soil Ingestion
Chromium (VI) (+6)	18540-29-9	1.920E-02	GW Ingestion	6.100E+02	Air Particulate Inhalation
Chrysene	218-01-9	9.140E+00	GW Dermal-Adult	1.610E+04	Fish Ingestion
Cobalt	7440-48-4	4.820E-01	GW Ingestion	5.540E+03	Air Particulate Inhalation
Copper	7440-50-8	1.570E+01	GW Ingestion	3.930E+05	Fish Ingestion
Cresol m-	108-39-4	5.170E+01	GW Ingestion	7.660E+07	Fish Ingestion
Cresol o-	95-48-7	5.170E+01	GW Ingestion	7.800E+07	Fish Ingestion
Cresol p-	106-44-5	1.030E+02	GW Ingestion	1.590E+08	Fish Ingestion
DDD	72-54-8	3.940E+25	GW Dermal-Adult	7.620E-01	Fish Ingestion
DDE	72-55-9	2.890E+16	GW Dermal-Adult	3.950E-01	Fish Ingestion
DDT p,p'-	50-29-3	1.740E+25	GW Dermal-Adult	1.120E-01	Fish Ingestion
Dichlorophenoxyacetic acid 2,4-(2,4-D)	94-75-7	1.930E+00	MCL	3.460E+06	Fish Ingestion
Endrin	72-20-8	1.090E+11	MCL	4.190E+03	Fish Ingestion
Ethyl methacrylate	97-63-2	3.610E+02	GW Inhalation	1.190E+08	Air Volatile Inhalation
Ethylbenzene	100-41-4	1.400E-01	GW Inhalation	4.340E+04	Fish Ingestion
Fluorene	86-73-7	8.770E+00	GW Dermal-Child	9.190E+05	Fish Ingestion
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	58-89-9	2.160E+17	GW Ingestion	1.610E+02	Fish Ingestion
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	319-84-6	1.870E+19	GW Ingestion	2.430E+01	Fish Ingestion
HCH, beta- (Hexachlorocyclohexane beta-BHC)	319-85-7	1.130E-03	GW Ingestion	8.850E+01	Fish Ingestion
Lead	7439-92-1	1.280E+00	MCL	4.890E+06	Air Particulate Inhalation
Mercury (Fish Pathway Only)	22967-92-6	---	GW Ingestion	5.500E+00	Fish Ingestion
Mercury (Total)	7439-97-6	1.160E-01	GW Inhalation	4.140E+06	Soil Ingestion
Methylnapthalene 2-	91-57-6	1.300E+00	GW Dermal-Child	7.460E+06	Fish Ingestion
Naphthalene	91-20-3	1.690E-02	GW Ingestion	3.060E+03	Fish Ingestion
Nickel	7440-02-0	2.420E+01	GW Ingestion	2.080E+05	Air Particulate Inhalation
Phenanthrene	85-01-8	---	GW Ingestion	---	SW Ingestion
Phenol	108-95-2	3.100E+02	GW Ingestion	1.100E+09	Fish Ingestion
Pyrene	129-00-0	7.940E+00	GW Dermal-Child	1.010E+05	Fish Ingestion
Selenium	7782-49-2	1.570E+00	MCL	1.080E+06	Fish Ingestion
Silver	7440-22-4	1.550E+01	GW Ingestion	1.590E+06	Fish Ingestion
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	1746-01-6	8.320E+00	GW Dermal-Adult	5.500E-07	Fish Ingestion
Thallium	7440-28-0	1.230E-02	GW Ingestion	2.790E+01	Fish Ingestion
Tin	7440-31-5	6.920E+07	GW Ingestion	8.290E+09	Soil Ingestion
Toluene	108-88-3	2.700E+01	MCL	3.190E+07	Fish Ingestion
Vanadium	7440-62-2	7.420E+00	GW Ingestion	2.550E+06	Air Particulate Inhalation
Xylenes (total)	1330-20-7	1.530E+01	GW Inhalation	1.010E+08	Air Volatile Inhalation
Zinc	7440-66-6	3.520E+02	GW Ingestion	4.060E+06	Fish Ingestion

Table 9 Pathways Exceeding the Delisting Limits

Chemical Name	Chemical CAS number	Waste Stream TCLP Conc. (mg/L)	GW Path Limiting TCLP Conc. (mg/L)	Limiting GW Pathway	Surface Path Waste Conc. (mg/kg Total for LF, mg/L TCLP for SI)	Surface Path Limiting Conc. (mg/kg Total for LF, mg/L TCLP for SI)	Limiting Surface Pathway
Acenapthylene	208-96-8	2.500E-02	---	--	6.500E+00	---	--
Acetone (2-propanone)	67-64-1	1.000E-01	---	--	2.450E+00	---	--
Acetophenone	98-86-2	2.500E-02	---	--	3.000E+00	---	--
Aniline (benzeneamine)	62-53-3	2.500E-02	---	--	1.650E+00	---	--
Anthracene	120-12-7	2.500E-02	---	--	7.700E+00	---	--
Antimony	7440-36-0	8.290E-02	---	--	1.030E+01	---	--
Arsenic	7440-38-2	3.800E-02	2.830E-03	GW Ingestion	8.840E+00	---	--
Barium	7440-39-3	2.400E+00	---	--	1.980E+02	---	--
Benz(a)anthracene	56-55-3	2.500E-02	---	--	8.500E+00	---	--
Benzo(a)pyrene	50-32-8	2.500E-02	---	--	3.900E+00	---	--

Benzo(b)fluoranthene	205-99-2	2.500E-02	---	--	1.500E+00	---	--
Benzo(ghi)perylene	191-24-2	2.500E-02	---	--	1.500E+00	---	--
Benzo(k)fluoranthene	207-08-9	2.500E-02	---	--	1.500E+00	---	--
Beryllium	7440-41-7	1.000E-02	---	--	3.120E-01	---	--
Cadmium	7440-43-9	2.500E-02	---	--	1.110E+00	---	--
Chromium (III) (Chromic Ion)	16065-83-1	3.060E-02	---	--	5.110E+01	---	--
Chromium (VI) (+6)	18540-29-9	5.100E-03	---	--	8.500E+00	---	--
Chrysene	218-01-9	2.500E-02	---	--	1.200E+01	---	--
Cobalt	7440-48-4	4.770E-02	---	--	9.320E+00	---	--
Copper	7440-50-8	1.000E-02	---	--	5.290E+01	---	--
Cresol m-	108-39-4	2.500E-02	---	--	4.200E+00	---	--
Cresol o-	95-48-7	2.500E-02	---	--	4.200E+00	---	--
Cresol p-	106-44-5	2.500E-02	---	--	4.200E+00	---	--
DDD	72-54-8	5.000E-05	---	--	1.500E-01	---	--
DDE	72-55-9	5.000E-05	---	--	8.000E-02	---	--
DDT p,p'-	50-29-3	5.000E-05	---	--	3.250E-02	---	--
Dichlorophenoxyacetic acid 2,4-(2,4-D)	94-75-7	2.400E-04	---	--	4.550E-01	---	--
Endrin	72-20-8	5.000E-05	---	--	1.500E-01	---	--
Ethyl methacrylate	97-63-2	5.000E-02	---	--	6.000E-01	---	--
Ethylbenzene	100-41-4	5.000E-02	---	--	1.200E+00	---	--
Fluorene	86-73-7	2.500E-02	---	--	8.800E+00	---	--
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	58-89-9	2.500E-05	---	--	7.500E-02	---	--
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	319-84-6	2.500E-05	---	--	7.500E-02	---	--
HCH, beta- (Hexachlorocyclohexane beta-BHC)	319-85-7	2.500E-05	---	--	1.650E-02	---	--
Lead	7439-92-1	2.500E-02	---	--	3.210E+01	---	--
Mercury (Fish Pathway Only)	22967-92-6	1.000E-04	---	--	3.160E+00	---	--
Mercury (Total)	7439-97-6	2.000E-04	---	--	3.160E+00	---	--
Methylnapthalene 2-	91-57-6	2.500E-02	---	--	7.600E+00	---	--
Naphthalene	91-20-3	5.000E-03	---	--	1.650E+00	---	--
Nickel	7440-02-0	1.890E-01	---	--	7.240E+01	---	--
Phenanthrene	85-01-8	2.500E-02	---	--	3.300E+01	---	--
Phenol	108-95-2	2.500E-02	---	--	1.500E+00	---	--
Pyrene	129-00-0	2.500E-02	---	--	2.000E+01	---	--
Selenium	7782-49-2	2.070E-01	---	--	6.710E+01	---	--
Silver	7440-22-4	2.500E-02	---	--	5.600E-01	---	--
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	1746-01-6	4.600E-07	---	--	9.200E-06	5.500E-07	Fish Ingestion
Thallium	7440-28-0	9.600E-03	---	--	4.850E-01	---	--
Tin	7440-31-5	2.500E-02	---	--	8.730E+00	---	--
Toluene	108-88-3	5.000E-02	---	--	4.600E-01	---	--
Vanadium	7440-62-2	1.770E-01	---	--	1.550E+02	---	--
Xylenes (total)	1330-20-7	5.000E-02	---	--	6.900E+00	---	--
Zinc	7440-66-6	6.260E+00	---	--	4.790E+03	---	--

Table 10 Toxicity Characteristic Soil Saturation and Ecological Values

Chemical Name	Chemical CAS number	Allowable Toxicity Characteristic Conc. (mg/L)	Waste Stream TCLP Conc. (mg/L)	Allowable Soil Saturation Conc. (mg/kg)	Surface Path Waste Conc. (mg/kg Total for LF, mg/L TCLP for SI)	Allowable Aquatic Conc. (mg/L)	Predicted Ambient Conc. (mg/L)
Acenapthylene	208-96-8	---	2.500E-02	---	6.500E+00	---	---
Acetone (2-propanone)	67-64-1	---	1.000E-01	1.000E+05	2.450E+00	1.500E+00	3.300E-07
Acetophenone	98-86-2	---	2.500E-02	1.700E+03	3.000E+00	---	4.040E-07
Aniline (benzeneamine)	62-53-3	---	2.500E-02	---	1.650E+00	---	2.220E-07
Anthracene	120-12-7	---	2.500E-02	6.100E+00	7.700E+00	7.300E-04	1.020E-06
Antimony	7440-36-0	---	8.290E-02	---	1.030E+01	1.600E-01	1.390E-06
Arsenic	7440-38-2	5.000E+00	3.800E-02	---	8.840E+00	1.500E-01	1.190E-06
Barium	7440-39-3	1.000E+02	2.400E+00	---	1.980E+02	3.900E-03	2.670E-05
Benz(a)anthracene	56-55-3	---	2.500E-02	---	8.500E+00	2.700E-05	9.570E-07
Benzo(a)pyrene	50-32-8	---	2.500E-02	---	3.900E+00	1.400E-05	3.030E-07
Benzo(b)fluoranthene	205-99-2	---	2.500E-02	---	1.500E+00	2.700E-02	1.480E-07
Benzo(ghi)perylene	191-24-2	---	2.500E-02	---	1.500E+00	---	---
Benzo(k)fluoranthene	207-08-9	---	2.500E-02	---	1.500E+00	2.700E-02	1.250E-07
Beryllium	7440-41-7	---	1.000E-02	---	3.120E-01	5.100E-03	4.170E-08
Cadmium	7440-43-9	1.000E+00	2.500E-02	---	1.110E+00	2.200E-03	1.490E-07
Chromium (III) (Chromic Ion)	16065-83-1	5.000E+00	3.060E-02	---	5.110E+01	1.100E-02	3.580E-07
Chromium (VI) (+6)	18540-29-9	5.000E+00	5.100E-03	---	8.500E+00	1.100E-02	1.150E-06
Chrysene	218-01-9	---	2.500E-02	3.800E+00	1.200E+01	---	1.160E-06

Cobalt	7440-48-4	---	2.700E-02	---	9.200E+02	---	1.260E-06
Copper	7440-50-8	---	1.000E-02	---	5.290E+01	9.000E-03	7.130E-06
Cresol m-	108-39-4	2.000E+02	2.500E-02	---	4.200E+00	---	5.660E-07
Cresol o-	95-48-7	2.000E+02	2.500E-02	---	4.200E+00	---	5.660E-07
Cresol p-	106-44-5	2.000E+02	2.500E-02	---	4.200E+00	---	5.660E-07
DDD	72-54-8	---	5.000E-05	---	1.500E-01	6.400E-06	1.950E-08
DDE	72-55-9	---	5.000E-05	---	8.000E-02	1.000E-02	1.010E-08
DDT p,p'-	50-29-3	---	5.000E-05	---	3.250E-02	1.000E-06	2.890E-09
Dichlorophenoxyacetic acid 2,4-(2,4-D)	94-75-7	1.000E+01	2.400E-04	---	4.550E-01	---	6.130E-08
Endrin	72-20-8	2.000E-02	5.000E-05	---	1.500E-01	3.600E-05	2.000E-08
Ethyl methacrylate	97-63-2	---	5.000E-02	1.400E+02	6.000E-01	---	8.080E-08
Ethylbenzene	100-41-4	---	5.000E-02	2.300E+02	1.200E+00	4.530E-01	1.620E-07
Fluorene	86-73-7	---	2.500E-02	9.000E+01	8.800E+00	4.000E-03	1.180E-06
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	58-89-9	4.000E-01	2.500E-05	---	7.500E-02	8.000E-05	1.010E-08
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	319-84-6	---	2.500E-05	---	7.500E-02	5.000E-01	1.010E-08
HCH, beta- (Hexachlorocyclohexane beta-BHC)	319-85-7	---	2.500E-05	---	1.650E-02	5.000E+00	2.220E-09
Lead	7439-92-1	5.000E+00	2.500E-02	---	3.210E+01	2.500E-03	---
Mercury (Fish Pathway Only)	22967-92-6	2.000E-01	1.000E-04	---	3.160E+00	---	2.110E-07
Mercury (Total)	7439-97-6	2.000E-01	2.000E-04	---	3.160E+00	7.700E-04	---
Methylnapthalene 2-	91-57-6	---	2.500E-02	---	7.600E+00	---	1.020E-06
Naphthalene	91-20-3	---	5.000E-03	3.800E+02	1.650E+00	6.200E-02	2.220E-07
Nickel	7440-02-0	---	1.890E-01	---	7.240E+01	5.200E-02	9.750E-06
Phenanthrene	85-01-8	---	2.500E-02	---	3.300E+01	---	---
Phenol	108-95-2	---	2.500E-02	2.300E+04	1.500E+00	2.560E-01	2.020E-07
Pyrene	129-00-0	---	2.500E-02	5.500E+01	2.000E+01	---	2.560E-06
Selenium	7782-49-2	1.000E+00	2.070E-01	---	6.710E+01	5.000E-03	9.040E-06
Silver	7440-22-4	5.000E+00	2.500E-02	---	5.600E-01	1.200E-01	7.540E-08
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	1746-01-6	---	4.600E-07	---	9.200E-06	3.000E-08	1.020E-12
Thallium	7440-28-0	---	9.600E-03	---	4.850E-01	4.000E-03	6.530E-08
Tin	7440-31-5	---	2.500E-02	---	8.730E+00	---	1.180E-06
Toluene	108-88-3	---	5.000E-02	5.200E+02	4.600E-01	1.300E-01	6.200E-08
Vanadium	7440-62-2	---	1.770E-01	---	1.550E+02	1.900E-02	2.090E-05
Xylenes (total)	1330-20-7	---	5.000E-02	4.300E+02	6.900E+00	2.700E+00	9.290E-07
Zinc	7440-66-6	---	6.260E+00	---	4.790E+03	1.200E-01	6.450E-04

Site COCs - Part I

Chemical name	TCLP Concentration (mg/L)	Is TCLP Conc. a Detection Limit (COC is ND)?	Total Concentration (mg/kg)	Is Total Conc. a Detection Limit (COC is ND)?	Property Details	Default COC Version ID	Version Description	Created Date	Creator
Acenapthylene	0.05	Yes	6.5	No	0	0			
Acetone (2-propanone)	0.2	Yes	4.9	Yes	0	0			
Acetophenone	0.05	Yes	6.0	Yes	0	0			
Aniline (benzeneamine)	0.05	Yes	3.3	Yes	0	0			
Anthracene	0.05	Yes	7.7	No	0	0			
Antimony	0.0829	No	10.3	No	0	0			
Barium	2.4	No	198.0	No	0	0			
Benz(a)anthracene	0.05	Yes	8.5	No	0	0			
Benzo(a)pyrene	0.05	Yes	3.9	No	0	0			
Benzo(b)fluoranthene	0.05	Yes	3.0	Yes	0	0			
Benzo(ghi)perylene	0.05	Yes	3.0	Yes	0	0			
Benzo(k)fluoranthene	0.05	Yes	3.0	Yes	0	0			
Beryllium	0.02	Yes	0.312	No	0	0			
Cadmium	0.05	Yes	1.11	No	0	0			
Chrysene	0.05	Yes	12.0	No	0	0			
Cobalt	0.0477	No	9.32	No	0	0			
Copper	0.02	Yes	52.9	No	0	0			
Cresol m-	0.05	Yes	4.2	No	0	0			
Cresol o-	0.05	Yes	4.2	No	0	0			
Cresol p-	0.05	Yes	4.2	No	0	0			
DDD	0.0001	Yes	0.3	Yes	0	0			
DDE	0.0001	Yes	0.08	No	0	0			
DDT p,p'-	0.0001	Yes	0.065	Yes	0	0			
Dichlorophenoxyacetic acid 2,4-(2,4-D)	0.00024	No	0.91	Yes	0	0			
Endrin	0.0001	Yes	0.3	Yes	0	0			
Ethyl methacrylate	0.1	Yes	1.2	Yes	0	0			
Ethylbenzene	0.1	Yes	1.2	No	0	0			

Fluorene	0.05	Yes	8.4	No	0	0			
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	5e-05	Yes	0.15	Yes	0	0			
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	5e-05	Yes	0.15	Yes	0	0			
HCH, beta- (Hexachlorocyclohexane beta-BHC)	5e-05	Yes	0.033	Yes	0	0			
Lead	0.05	Yes	32.1	No	0	0			
Mercury (Total)	0.0002	No	3.16	No	0	0			
Methylnapthalene 2-	0.05	Yes	7.6	No	0	0			
Nickel	0.189	No	72.4	No	0	0			
Phenanthrene	0.05	Yes	33.0	No	0	0			
Phenol	0.05	Yes	3.0	Yes	0	0			
Pyrene	0.05	Yes	20.0	No	0	0			
Selenium	0.207	No	67.1	No	0	0			
Silver	0.05	Yes	0.56	No	0	0			
Tin	0.05	Yes	8.73	No	0	0			
Toluene	0.1	Yes	0.46	No	0	0			
Vanadium	0.177	No	155.0	No	0	0			
Xylenes (total)	0.1	Yes	6.9	No	0	0			
Zinc	6.26	No	4790.0	No	0	0			
Thallium	0.0096	No	0.97	Yes	0	0			
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	4.6e-07	No	9.2e-06	No	0	0			
Arsenic	0.038	No	8.84	No	0	0			
Chromium (III) (Chromic Ion)	0.0306	No	51.1	No	0	0			
Naphthalene	0.005	No	3.3	Yes	0	0			
Chromium (VI) (+6)	0.0051	No	8.5	No	0	0			
Mercury (Fish Pathway Only)	0.0002	Yes	3.16	No	0	0			

Site COCs - Part II

Chemical name	Maximum Contaminant Level (MCL) (mg/L)	Oral cancer slope factor 1/(mg/kg day)	Inhalation cancer slope factor 1/(mg/kg day)	Oral reference dose (mg/kg day)	Inhalation reference dose (mg/kg day)	Bioconcentration factor (L/kg)	Soil saturation level (unitless)	Toxicity Characteristic Rule regulatory level (mg/L)
Acenapthylene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acetone (2-propanone)	0.0	0.0	0.0	0.9	31.0	0.4	100000.0	0.0
Acetophenone	0.0	0.0	0.0	0.1	0.0	9.35	1700.0	0.0
Aniline (benzeneamine)	0.0	0.0057	0.0	0.007	0.001	2.844	0.0	0.0
Anthracene	0.0	0.0	0.0	0.3	1.08	0.0	6.1	0.0
Antimony	0.006	0.0	0.0	0.0004	0.0	40.0	0.0	0.0
Barium	2.0	0.0	0.0	0.2	0.0005	633.0	0.0	100.0
Benz(a)anthracene	0.0	0.1	0.216	0.0	0.0	0.0	0.0	0.0
Benzo(a)pyrene	0.0002	1.0	2.16	0.0003	2e-06	0.0	0.0	0.0
Benzo(b)fluoranthene	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Benzo(ghi)perylene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benzo(k)fluoranthene	0.0	0.01	0.02	0.0	0.0	0.0	0.0	0.0
Beryllium	0.004	0.0	8.64	0.002	2e-05	62.0	0.0	0.0
Cadmium	0.005	0.0	6.48	0.0005	1e-05	907.0	0.0	1.0
Chrysene	0.0	0.001	0.002	0.0	0.0	0.0	3.8	0.0
Cobalt	0.0	0.0	32.4	0.0003	6e-06	0.0	0.0	0.0
Copper	1.3	0.0	0.0	0.01	0.0	710.0	0.0	0.0
Cresol m-	0.0	0.0	0.0	0.05	0.6	18.18	0.0	200.0
Cresol o-	0.0	0.0	0.0	0.05	0.6	17.865	0.0	200.0
Cresol p-	0.0	0.0	0.0	0.1	0.6	17.554	0.0	200.0
DDD	0.0	0.24	0.24	3e-05	0.000108	0.0	0.0	0.0
DDE	0.0	0.34	0.0	0.0003	0.0	0.0	0.0	0.0
DDT p,p'-	0.0	0.34	0.3492	0.0005	0.0018	0.0	0.0	0.0
Dichlorophenoxyacetic acid 2,4-(2,4-D)	0.07	0.0	0.0	0.01	0.036	80.46	0.0	10.0
Endrin	0.002	0.0	0.0	0.0003	0.0	0.0	0.0	0.02
Ethyl methacrylate	0.0	0.0	0.0	0.09	0.3	17.555	140.0	0.0
Ethylbenzene	0.7	0.011	0.0087	0.1	1.0	145.88	230.0	0.0
Fluorene	0.0	0.0	0.0	0.04	0.144	0.0	90.0	0.0
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	0.0002	1.1	1.116	0.0003	0.00108	395.55	0.0	0.4
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	0.0	6.3	6.48	0.008	0.0288	456.0	0.0	0.0
HCH, beta- (Hexachlorocyclohexane beta-BHC)	0.0	1.8	1.8	0.0006	0.00216	439.0	0.0	0.0

Lead	0.015	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Mercury (Total)	0.002	0.0	0.0	0.0003	0.0003	0.0	0.0	0.2
Methylnapthalene 2-	0.0	0.0	0.0	0.004	0.0	0.0	0.0	0.0
Nickel	0.0	0.0	0.864	0.02	1.4e-05	78.0	0.0	0.0
Phenanthrene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phenol	0.0	0.0	0.0	0.3	0.2	7.5788	23000.0	0.0
Pyrene	0.0	0.0	0.0	0.03	0.108	0.0	55.0	0.0
Selenium	0.05	0.0	0.0	0.005	0.02	129.0	0.0	1.0
Silver	0.0	0.0	0.0	0.005	0.0	87.71	0.0	5.0
Tin	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Toluene	1.0	0.0	0.0	0.08	5.0	69.952	520.0	0.0
Vanadium	0.0	0.0	0.0	0.005	0.0001	0.0	0.0	0.0
Xylenes (total)	10.0	0.0	0.0	0.2	0.1	14.6	430.0	0.0
Zinc	0.0	0.0	0.0	0.3	0.0	2059.0	0.0	0.0
Thallium	0.002	0.0	0.0	1e-05	0.0	10000.0	0.0	0.0
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	3e-08	130000.0	130000.0	7e-10	4e-08	0.0	0.0	0.0
Arsenic	0.01	1.5	15.48	0.0003	1.5e-05	114.0	0.0	5.0
Chromium (III) (Chromic Ion)	0.1	0.0	0.0	1.5	0.0	19.0	0.0	5.0
Naphthalene	0.0	0.12	0.12	0.02	0.003	189.67	380.0	0.0
Chromium (VI) (+6)	0.1	0.5	294.0	0.003	0.0001	19.0	0.0	5.0
Mercury (Fish Pathway Only)	0.0	0.0	0.0	0.0001	0.0	0.0	0.0	0.2

Site COCs - Part III

Chemical name	Henry's law constant (atm-m^3/mol)	Diffusion coefficient in water (cm^2/s)	Diffusion coefficient in air (cm^2/s)	Solubility in water (mg/L water)	Landfill dilution-attenuation factor (unitless)	Surface impoundment dilution-attenuation factor (unitless)	Time to skin permeability (hr/event)	Skin permeability constant (cm/hr)
Acenapthylene	0.000125	7.53e-06	0.0439	3.93	16.1	7.67	6.23	0.155
Acetone (2-propanone)	3.4e-05	1.15e-05	0.12	1000000.0	15.4	3.18	0.47	0.00057
Acetophenone	1.013e-05	8.73e-06	0.06	6130.0	15.4	3.18	1.1	0.0051
Aniline (benzeneamine)	1.9e-06	1.01e-05	0.072	36100.0	15.4	3.18	0.78	0.0026
Anthracene	6.23e-05	7.74e-06	0.0324	0.0434	18.7	19.5	5.5	0.261
Antimony	0.0	8.96e-06	0.0773	0.0	0.0	0.0	0.0	0.001
Barium	0.0	8.26e-06	0.0714	0.0	0.0	0.0	0.0	0.001
Benz(a)anthracene	5.9e-06	6.21e-06	0.0247	0.0094	961.0	267.0	10.0	0.86
Benzo(a)pyrene	1.58e-06	5.85e-06	0.0218	0.00162	5880000.0	2850.0	14.0	1.2
Benzo(b)fluoranthene	6.6e-07	5.49e-06	0.0228	0.0015	5840000.0	2910.0	14.0	1.4
Benzo(ghi)perylene	3.3e-07	5.26e-06	0.0201	0.00026	589.0	233.0	20.0	1.62
Benzo(k)fluoranthene	9.43e-07	5.49e-06	0.0228	0.0008	1.25e+21	299000000000.0	14.3	1.0
Beryllium	0.0	5.08e-05	0.439	0.0	0.0	0.0	0.0	0.001
Cadmium	0.0	9.45e-06	0.0816	0.0	0.0	0.0	0.0	0.001
Chrysene	4.7e-06	6.21e-06	0.0248	0.0016	961.0	267.0	10.0	0.86
Cobalt	0.0	8e-06	0.08	0.0	0.0	0.0	0.0	0.001
Copper	0.0	8e-06	0.08	0.0	0.0	0.0	0.0	0.001
Cresol m-	1.2e-06	9.3e-06	0.093	22700.0	15.4	3.18	0.96	0.01
Cresol o-	2.3e-06	9.41e-06	0.0688	26000.0	15.4	3.18	0.96	0.011
Cresol p-	9.9e-07	9.3e-06	0.0693	21500.0	15.4	3.18	0.96	0.01
DDD	1.1e-05	4.76e-06	0.0169	0.09	1e+30	1e+30	37.0	0.46
DDE	6.2e-05	4.78e-06	0.017	0.12	3.13e+21	260000000000.0	36.0	1.4
DDT p,p'-	1.1e-05	4.48e-06	0.0148	0.025	1e+30	1e+30	60.0	0.57
Dichlorophenoxyacetic acid 2,4-(2,4-D)	5.5e-06	6.49e-06	0.0588	677.0	15.4	3.18	4.7	0.0071
Endrin	5.5e-06	5.76e-06	0.0107	0.25	30600000000000.0	251000.0	89.0	0.035
Ethyl methacrylate	0.000573	9.35e-06	0.0807	3670.0	71.8	7.43	1.0	0.0052
Ethylbenzene	0.004855	7.8e-06	0.075	169.0	15.5	4.09	1.3	0.073
Fluorene	3.07e-05	7.88e-06	0.0363	1.98	16.8	11.1	5.4	0.18
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	2.5e-06	7.34e-06	0.0142	6.8	1.82e+21	2040000.0	35.0	0.014
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	3.3e-06	5.04e-06	0.0191	2.0	9.03e+23	3410000.0	37.0	0.016
HCH, beta- (Hexachlorocyclohexane beta-BHC)	3.5e-07	5.4e-06	0.019	0.24	15.6	5.56	38.0	0.016
Lead	0.0	6.28e-06	0.0543	0.0	0.0	0.0	0.0	0.001
Mercury (Total)	0.0076	3.01e-05	0.0109	0.0562	0.0	0.0	0.0	0.001
Methylnapthalene 2-	0.0002786	7.84e-06	0.048	26.0	16.6	10.4	4.87	0.142
Nickel	0.0	1.46e-05	0.126	0.0	0.0	0.0	0.0	0.001
Phenanthrene	5.52e-05	7.47e-06	0.0333	1.28	16.1	8.17	5.6	0.23
Phenol	3.55e-07	1.03e-05	0.0827	82800.0	15.4	3.18	0.79	0.0057
Pyrene	2.4e-05	7.14e-06	0.0272	0.135	68.4	85.8	7.2	0.47
Selenium	0.0	1.2e-05	0.103	0.0	11.59	4.6	0.0	0.001
Silver	0.0	9.71e-06	0.0838	0.0	0.0	0.0	0.0	0.001

Silver	0.0	8e-06	0.08	0.0	0.0	0.0	0.0	0.001
Tin	0.0	8e-06	0.08	0.0	0.0	0.0	0.0	0.001
Toluene	0.00665	8.23e-06	0.0972	526.0	15.1	3.43	0.77	0.047
Vanadium	0.0	8e-06	0.08	0.0	0.0	0.0	0.0	0.001
Xylenes (total)	0.0077	9.34e-06	0.0737	186.0	15.5	4.24	1.3	0.076
Zinc	0.0	1.36e-05	0.117	0.0	0.0	0.0	0.0	0.001
Thallium	0.0	6.34e-06	0.0548	0.0	0.0	0.0	0.0	0.001
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	5e-05	6.81e-06	0.0127	1.93e-05	355000000000.0	90500.0	38.0	1.4
Arsenic	0.0	1.24e-05	0.107	0.0	19.21	7.7	0.0	0.001
Chromium (III) (Chromic Ion)	0.0	1.58e-05	0.136	0.0	0.0	0.0	0.0	0.001
Naphthalene	0.0002972	8.92e-06	0.059	31.0	15.5	4.31	2.4	0.077
Chromium (VI) (+6)	0.0	1.58e-05	0.136	0.0	0.0	0.0	0.0	0.002
Mercury (Fish Pathway Only)	0.0	0.0	1.06	0.0	0.0	0.0	0.0	0.0

Site COCs - Part IV

Chemical name	Lag time (hr)	Bunge constant (unitless)	Flag 1= organic 0= metal/inorganic	Bioaccumuation factor (L/kg)	Chronic ecological value (mg/L)	Flag (Carcinogen/ Noncarcinogen)	Molecular weight (g/mol)	Vapor pressure (atm)	Suspended sediment-surface water partitioning coefficient (mL/g)	Logarithmic value of octanol/water partitioning coefficient (log(mL/g))	Chemical Class	Analytical Method
Acenapthylene	0.742	1.0	1	0.0	0.0	Noncarcinogen	152.0	0.0	0.0	3.94	SVOC	8270E, 8310, 8275A
Acetone (2-propanone)	0.2	5.8e-05	1	0.0	1.5	Noncarcinogen	50.1	0.299	0.0436	-0.24	VOC	8260D, 8015C
Acetophenone	0.47	0.0044	1	0.0	0.0	Noncarcinogen	121.0	0.00052	2.68	1.58	SVOC	8270E
Aniline (benzeneamine)	0.32	0.00095	1	0.0	0.0	Noncarcinogen	93.1	0.00088	0.575	0.9	SVOC	8270E
Anthracene	1.07	3.47	1	2510.0	0.00073	Noncarcinogen	178.0	3.35e-08	1760.0	4.45	SVOC	8270E, 8310, 8275A
Antimony	0.0	0.0	0	0.0	0.16	Noncarcinogen	122.0	0.0	45.0	0.0	METALS/INORGANICS	6010D, 6020B
Barium	0.0	0.0	0	1.0	0.0039	Noncarcinogen	137.0	0.0	41.0	0.0	METALS/INORGANICS	6010D, 6020B
Benz(a)anthracene	2.2	50.0	1	5100.0	2.7e-05	Carcinogen	228.0	2.03e-10	19400.0	5.76	SVOC	8270E, 8310, 8275A
Benzo(a)pyrene	3.0	130.0	1	9950.0	1.4e-05	Carcinogen	252.0	6.43e-12	72700.0	6.13	SVOC	8270E, 8310, 8275A
Benzo(b)fluoranthene	3.0	160.0	1	9950.0	0.027	Carcinogen	252.0	1.06e-10	36100.0	5.78	SVOC	8270E, 8310, 8275A
Benzo(ghi)perylene	4.24	316.0	1	1700000.0	0.0	Noncarcinogen	276.0	0.0	247000.0	6.63	SVOC	8270E, 8310, 8275A
Benzo(k)fluoranthene	3.03	100.0	1	9950.0	0.027	Carcinogen	252.0	1.32e-12	61200.0	6.11	SVOC	8270E, 8310, 8275A
Beryllium	0.0	0.0	0	0.0	0.0051	Noncarcinogen	9.01	0.0	790.0	0.0	METALS/INORGANICS	6010D, 6020B
Cadmium	0.0	0.0	0	0.0	0.0022	Noncarcinogen	112.0	0.0	75.0	0.0	METALS/INORGANICS	6010D, 6020B
Chrysene	2.2	50.0	1	6030.0	0.0	Carcinogen	527.0	1.21e-06	38600.0	5.81	SVOC	8270E, 8310, 8275A
Cobalt	0.0	0.0	0	0.0	0.0	Noncarcinogen	58.9	0.0	0.0	0.0	METALS/INORGANICS	6010D, 6020B
Copper	0.0	0.0	0	0.0	0.009	Noncarcinogen	63.6	0.0	22.0	0.0	METALS/INORGANICS	6010D, 6020B
Cresol m-	0.4	0.0093	1	0.0	0.0	Noncarcinogen	108.0	0.00019	6.34	1.96	SVOC	8270E
Cresol o-	0.4	0.0098	1	0.0	0.0	Noncarcinogen	108.0	0.000416	6.2	1.95	SVOC	8270E
Cresol p-	0.4	0.0089	1	0.0	0.0	Noncarcinogen	108.0	0.00017	6.2	1.94	SVOC	8270E
DDD	7.8	130.0	1	394000.0	6.4e-06	Carcinogen	320.0	1.14e-09	3440.0	6.02	PCB/TCDD/CL PEST	8081B
DDE	7.6	580.0	1	553000.0	0.01	Carcinogen	319.0	7.45e-09	6480.0	6.51	PCB/TCDD/CL PEST	8081B
DDT p,p'-	13.0	340.0	1	2760000.0	1e-06	Carcinogen	354.0	5.17e-10	50800.0	6.91	PCB/TCDD/CL PEST	8081B
Dichlorophenoxyacetic acid 2,4-(2,4-D)	2.0	0.05	1	0.0	0.0	Noncarcinogen	221.0	1.4e-05	33.7	2.81	CHLOR HERB	8151A
Endrin	18.0	11.0	1	2010.0	3.6e-05	Noncarcinogen	381.0	7.68e-10	810.0	5.2	PCB/TCDD/CL PEST	8081B
Ethyl methacrylate	0.43	0.0039	1	0.0	0.0	Noncarcinogen	114.0	0.023	3.09	1.94	VOC	8260D
Ethylbenzene	0.39	0.14	1	0.0	0.453	Noncarcinogen	106.0	0.0126	0.153	3.15	VOC	8260D, 8015C, 8021B
Fluorene	0.9	1.6	1	1220.0	0.004	Noncarcinogen	166.0	8.17e-07	578.0	4.18	SVOC	8270E, 8310,

												8275A
HCH, (Hexachlorocyclohexane) (Lindane) gamma-	5.2	0.54	1	0.0	8e-05	Carcinogen	291.0	9.4e-06	345.0	3.72	PCB/TCDD/CL PEST	8081B
HCH, alpha- (Hexachlorocyclohexane alpha-BHC)	5.2	0.63	1	0.0	0.5	Carcinogen	290.0	5.61e-08	345.0	3.8	PCB/TCDD/CL PEST	8081B
HCH, beta- (Hexachlorocyclohexane beta-BHC)	5.2	0.65	1	0.0	5.0	Carcinogen	291.0	6.45e-10	345.0	3.78	PCB/TCDD/CL PEST	8081B
Lead	0.0	0.0	0	8.0	0.0025	Noncarcinogen	207.0	0.0	900.0	0.0	METALS/INORGANICS	6010D, 6020B
Mercury (Total)	0.0	0.0	0	0.0	0.00077	Noncarcinogen	201.0	2.63e-06	1000.0	0.62	METALS/INORGANICS	7470A, 7471B
Methylnapthalene 2-	0.644	0.724	1	0.0	0.0	Noncarcinogen	142.0	0.0	0.0	3.86	SVOC	8270E
Nickel	0.0	0.0	0	0.0	0.052	Noncarcinogen	58.7	0.0	65.0	0.0	METALS/INORGANICS	6010D, 6020B
Phenanthrene	1.1	2.9	1	3300.0	0.0	Noncarcinogen	178.0	1.47e-07	1820.0	4.46	SVOC	8270E, 8310, 8275A
Phenol	0.33	0.003	1	0.0	0.256	Noncarcinogen	94.1	0.000574	1.65	1.46	SVOC	8270E
Pyrene	1.5	13.0	1	8730.0	0.0	Noncarcinogen	202.0	5.59e-09	5100.0	4.88	SVOC	8270E, 8310, 8275A
Selenium	0.0	0.0	0	0.0	0.005	Noncarcinogen	78.96	0.0	5.0	0.0	METALS/INORGANICS	6010D, 6020B
Silver	0.0	0.0	0	0.0	0.12	Noncarcinogen	108.0	0.0	8.3	0.0	METALS/INORGANICS	6010D, 6020B
Tin	0.0	0.0	0	0.0	0.0	Noncarcinogen	119.0	0.0	0.0	0.0	METALS/INORGANICS	6010D, 6020B
Toluene	0.32	0.056	1	0.0	0.13	Noncarcinogen	92.1	0.0371	10.5	2.73	VOC	8260D, 8015C, 8021B
Vanadium	0.0	0.0	0	1.0	0.019	Noncarcinogen	50.9	0.0	50.0	0.0	METALS/INORGANICS	6010D, 6020B
Xylenes (total)	0.39	0.15	1	1.0	2.7	Noncarcinogen	106.0	0.0106	28.5	3.16	VOC	8260D, 8015C, 8021B
Zinc	0.0	0.0	0	1.0	0.12	Noncarcinogen	65.4	0.0	62.0	0.0	METALS/INORGANICS	6010D, 6020B
Thallium	0.0	0.0	0	0.0	0.004	Noncarcinogen	204.0	0.0	71.0	0.0	METALS/INORGANICS	6010D, 6020B
Tetrachlorodibenzo-p-dioxin (TCDD) 2,3,7,8-	8.1	630.0	1	1190000.0	3e-08	Carcinogen	322.0	9.74e-13	21800.0	6.8	PCB/TCDD/CL PEST	8290A
Arsenic	0.0	0.0	0	0.0	0.15	Carcinogen	74.92	0.0	29.0	0.0	METALS/INORGANICS	6010D, 6020B
Chromium (III) (Chromic Ion)	0.0	0.0	0	0.0	0.011	Noncarcinogen	52.0	0.0	1800000.0	0.0	METALS/INORGANICS	6010D, 6020B
Naphthalene	0.53	0.23	1	0.0	0.062	Noncarcinogen	128.0	0.000117	89.2	3.3	SVOC	8260D, 8270E, 8310, 8275A, 8021B
Chromium (VI) (+6)	0.0	0.0	0	0.0	0.011	Noncarcinogen	52.0	0.0	19.0	0.0	METALS/INORGANICS	7195, 7196A, 7197, 7198
Mercury (Fish Pathway Only)	0.0	0.0	0	1020000.0	0.0	Noncarcinogen	216.0	0.0	100000.0	0.08	METALS/INORGANICS	7470A, 7471B

APPENDIX H SKINNER LIST OF REFINERY CONSTITUENTS

REGION 5 SKINNER LIST

A "Skinner List" of Appendix VIII Hazardous Constituents applicable to refinery wastes was developed by EPA's Office of Solid Waste. (Skinner refers to the name of the U.S. EPA official signing the guidance memorandum). Any Appendix VIII constituent believed applicable to refineries was included. In 1985, this list was shortened to a more practical list of constituents and published as "Constituents of Petroleum Refining Wastes" as part of EPA's guidance for "Petitions to Delist Hazardous Wastes". This 1985 list of Appendix VIII Hazardous Constituents applicable to refining processes became known as the "Skinner List", and has been used as the basis for many RCRA Facility Investigation measurements.

In 1993, EPA's Office of Solid Waste updated the Skinner List through additions to and deletions from the 1985 list as part of new EPA guidance for "Petitions to Delist Hazardous Wastes. The 1993 list is labeled "Constituents of Concern for Wastes from Petroleum Processes".

In 1997, Region 5's Waste Management Branch melded the 1985 and 1993 Skinner Lists to establish a broader list of refinery process waste constituents, which is identified as the "Region 5 Skinner List" (Attachment 1). The Region 5 Skinner List was developed on the basis of:

1. Combining the1985 and 1993 Skinner Lists.

2. Hazardous Constituents deleted in 1993 from the 1985 list were retained if they are identified in Superfund's CLP Target Compound List or Target Analyte List. Multiparameter test procedures such as Methods 8260, 8270, and 6010 are routinely calibrated for TCLs and TALs; therefore, there is no need to discard the data being captured for each sample's measurements.

3. The 1985 Skinner List constituents deleted in 1993 were also deleted from the Region 5 list (or deemed optional) if they are impossible or impractical analytical measurements (e.g-methyl chrysene, benzenethiol), if they are not part of Appendix IX or the CLP TCL/TALs.

4. A list of polynuclear aromatic hydrocarbon (PAH) constituents, with low concentration PRGs and common to the 1985 or 1993 lists, was established for low level HPLC/fluorescence measurements.

5. Special considerations for specific constituents are:

    a. The 1985 constituent *quinoline*, deleted in the 1993 list, was retained by Region 5 because of its relatively toxicity.

    b. Methyl tertiary butyl ether (MTBE) was added to the Region 5 list because of its wide usage as a gasoline additive. Environmental laboratories usually have this compound in their calibration standards for Method 8015 and 8260.

c. The 1985 list includes “methyl chrysene”. No distinction is made for its different structural isomers. GC/MS mass spectra for methyl chrysene can not be easily differentiated from closely eluting isomers of methyl dibenz(a, h)anthracene. This constituent was deleted from the optional Region 5 list because inappropriate analytical measurements would occur.

d. Benzenethiol, or thiophenol, can be found in refinery wastes of caustic pH values. Benzenethiol is unstable in water/soils of neutral or acid pH values. Benzenethiol rapidly degrades in organic solvents used to prepare instrument calibration standards. Benzenethiol is part of Appendix VIII and the 1985 Skinner List, but never made it to Appendix IX to 40 CFR 264, because of its instability in the environment or in analytical standards. It is listed as an optional Region 5 constituent.

e. Cobalt was deleted from the 1985 list. Silver and zinc were added to the 1993 Skinner List. All three are in the Region 5 Skinner List because their concentrations are captured by commonly used multiparameter ICP emission spectroscopy measurements (Method 6010).

ATTACHMENT 1

Region 5 Waste Management Branch "Skinner List"
Constituents of Concern for Wastes from Petroleum Processes

Inorganics

Antimony	Cadmium	Lead	Silver
Arsenic	Chromium	Mercury	Vanadium
Barium	Cobalt	Nickel	Zinc
Beryllium	Cyanide	Selenium	

Volatile Organics

Benzene	1,2-Dichloroethane	Ethylene dibromide (EDB)	1,1,1-Trichloroethane
Carbon disulfide	1,1-Dichloroethane	Methyl ethyl ketone (MEK)	Trichloroethene
Chlorobenzene	1,4-Dioxane	Styrene	Tetrachloroethylene
Chloroform	Ethylbenzene	Toluene	Xylenes (total)

Semivolatile Organics

Acenaphthene	o-Cresol	Diethyl phthalate	Naphthalene
Anthracene	m-Cresol	2,4 Dimethylphenol	4-Nitrophenol
Benzo(a)anthracene	p-Cresol	Dimethyl phthalate	Phenanthrene
Benzo(b)fluroranthene	Dibenz(a,h)anthracene	2,4 Dinitrophenol	Phenol
Benzo(k)fluoranthene	Di-n-butyl phthalate	Fluoranthene	Pyrene
Benzo(a)pyrene	1,2-Dichlorobenzene*	Fluorene	Pyridine
Bis(2-ethylhexyl) phthalate	1,3-Dichlorobenzene*	Indeno(1,2,3-cd)pyrene	Quinoline
Chrysene	1,4-Dichlorobenzene*	Methyl tertiary butyl ether (MTBE)	*- can be tested as a volatile

Low Concentration Polynuclear Aromatic Hydrocarbons (Optional)

Benzo(a)anthracene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene
Benzo(b)fluoranthene	Benzo(a)pyrene	Chrysene*	

* added to this group to assist the chromatographic resolution of chrysene from Dibenz(a,h)anthracene in sample extracts

Optional Semivolatile Organics

Indene	Benzenethiol**	Dibenz(a,h)acridine	1-Methylnaphthalene*

*Note that 2-Methylnaphthalene is part of Appendix IX and is a CLP TCL organic. 1-Methylnaphthalene is not on these lists.

**Benzenethiol can be detected in certain petroleum refinery wastes. Its measurement must compensate for its instability at neutral and acid pH values during sample preparation and its unstable instrument calibration standards

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