

February 18, 2015

Ms. Barbara Brown
Project Coordinator
Maryland Department of the Environment
1800 Washington Blvd.
Baltimore, MD 21230

Mr. Andrew Fan, PE
Project Coordinator
US EPA Region III, 3LC20
1650 Arch Street
Philadelphia, PA 19103-2029

**Re: SPARROWS POINT TERMINAL LLC
TIN MILL CANAL SEDIMENT SAMPLING AND ANALYSIS PLAN, FINAL
FEBRUARY 18, 2015**

Dear Ms. Brown and Mr. Fan:

On behalf of Sparrows Point Terminal, LLC and Sparrows Point LLC, enclosed please find the Tin Mill Canal Sediment Sampling and Analysis Plan, Final that is submitted for approval in conjunction with the Administrative Consent Order (ACO) between Sparrows Point Terminal, LLC and the Maryland Department of the Environment (effective September 12, 2014) and the Settlement Agreement and Covenant Not to Sue (PPA) between Sparrows Point Terminal, LLC and the United States Environmental Protection Agency (effective November 25, 2014).

The plan describes sampling and analysis procedures that will be conducted to provide characterization data for the settled materials in Tin Mill Canal and incorporates comments received from both EPA and MDE on the draft sampling and analysis plan that was submitted for review in November 2014. We appreciate the guidance and input you have provided in support of development of this plan. Please contact me at rbecker@enviroanalyticsgroup.com should you have any questions and we look forward to your review of this information.

Sincerely,



Russell Becker
Vice President, Remediation

cc: Michael Pedone, Sparrows Point Terminal, LLC
Randall Lutz, Saul Ewing LLP
Doug Dorgan, Weaver Boos Consultants

TIN MILL CANAL

SEDIMENT SAMPLING AND ANALYSIS PLAN

SPARROWS POINT TERMINAL

SPARROWS POINT, MARYLAND

Prepared for

**SPARROWS POINT TERMINAL, LLC
SPARROWS POINT, LLC**

February 17, 2015

FINAL



Environmental Engineers

EnviroAnalytics Group
1650 Des Peres Road, Suite 230
Saint Louis, MO 63131

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1.0 INTRODUCTION

The Tin Mill Canal (TMC) is a constructed swale that currently serves as a conveyance for stormwater runoff and groundwater baseflow from an approximately 800 acre drainage area of the Sparrows Point site. Back River Wastewater Treatment Plant effluent may also enter the canal from an overflow weir and discharge structure located near the head end of the canal. Waters collected in the TMC are routed to the Humphrey's Creek Waste Water Treatment Plant (HCWWTP) for treatment prior to discharge via the NPDES permitted Outfall 014. The average volume of water flowing through the canal to the HCWWTP during dry weather ranges from 3,000 to 4,000 gallons per minute (gpm), but can increase to over 50,000 gpm during storm events. The TMC is located in the central portion of the former Bethlehem Steel facility, south of Interstate 695 and Highway Route 158. An aerial photo that shows the location of the canal is provided as **Figure 1**.

The TMC is approximately 7,500 feet in length, 30 to 50 feet wide and 15 feet below grade. The canal was constructed from slag and includes numerous point discharges from the site storm sewer system. Since its construction in the 1960s, the TMC has historically also conveyed wastewater discharged from numerous manufacturing facilities associated with former steelmaking and steel finishing operations at the Sparrows Point site. Over the years, some of the heavier particles and oils in the wastewaters from the steel manufacturing facilities have settled to the bottom of TMC.

This document provides a Sampling and Analysis Plan for data collection efforts to evaluate the physical and chemical characteristics of materials deposited in the bottom of the canal. Characterization of these materials is required to support design planning for efforts to remediate the canal and remove collected materials for recycling or disposal. The remediation goal is to remove the settled materials that have built up over time; provide erosion and sediment control stabilization of the canal floor and sidewalls, and subsequently improve the quality of water discharges from the site.

2.0 FIELD PROGRAM

2.1 Objectives of Sampling Effort

There are three objectives for this data collection effort;

1. Provide data to approximate the volume of sediment that is present within the TMC.
2. Provide data to evaluate the physical and chemical characteristics of the settled material. Physical characteristics will be assessed to identify applicable technologies to be used to remove, handle and provide material adequate for transport and recycling or disposal.
3. Provide chemical characteristic and constituent data to be used to make hazardous waste determinations as required by 40 CFR 262.11 and COMAR 26.13.03.02. The sampling and analysis program includes testing of the settled materials for both individual Appendix IX analytes identified as constituents of potential interest (COPIs) for the site and hazardous waste characteristic testing procedures (TCLP) in accordance with methods outlined in EPA SW-846. Concentrations of constituents within the sediment will be fully characterized to guide decisions for the proper management of environmental media that would be generated in the context of a removal and disposal remediation alternative.

2.2 Sampling Locations

Data will be collected from 17 transects along the length of the TMC as shown in Figure 2. Transects are located approximately 500 feet apart along the length of the TMC. Data will be collected at each transect in accordance with the following schedule and as shown in approximate cross-sectional profile on Figure 3:

- Width of the sediment horizon will be measured at each transect location. Depth of sediment to the slag bottom of the canal will be measured at two locations that represent distances of one third and two thirds across the perpendicular width of the canal.
- Two depth discrete samples will be recovered from two locations at each transect that represent distances of one third and two thirds across the perpendicular width of the canal (66 total samples). Depth specific samples will be collected from the two locations at depths of 0 to 12 inches below the sediment surface and from the bottom 12 inches of sediment, if there is sufficient thickness.
- One composite sample will be recovered at each transect location (17 total samples). The composite samples will include homogenized sediment from the four discrete sampling intervals as identified above.

- Bulk sediment samples will be recovered from transect numbers 5, 10, and 15. Bulk samples will include materials recovered from depths of 1 to 3 feet below the sediment surface.

2.3 Sampling Procedures

2.3.1 Physical Profiling

The width at the surface grade of the canal and sediment width will be measured and collected using either a hand held GPS unit or tape measure. Depth of the sediment at the selected locations will be determined by installing a measuring rod by hand till hammer refusal. Hammer refusal will be assumed to be the base of the sediment and interface with the constructed slag base of the canal.

2.3.2 Sample Collection

A thin-walled auger, tube core sampler or equivalent system will be used to collect sediment material for discrete and composite samples. This system consists of an auger, tube core sampler, a series of extension rods, and a “T” handle. The auger will be driven into the sediment and the tube core sampler will be used to extract a core. A sample of the core will be taken from the appropriate depth.

The following procedure will be used to collect sediment samples directly from the auger:

- The auger will be inserted into the material to be sampled at a 0° to 45° angle from vertical. This orientation minimizes spillage of the sample from the sampler. Extraction of samples may require tilting of the sampler.
- The auger will be rotated once or twice to cut a core of material.
- The auger will be slowly withdrawn, making sure that the slot is facing upward.
- An acetate core may be inserted into the auger prior to sampling, if characteristics of the sediments warrant. By using this technique, an intact core can be extracted.
- The sample will be transferred into an appropriate sample or homogenization container.

For samples from deeper depths, the auger will be used to bore a hole to the desired sampling depth and then will be withdrawn. The auger tip will be replaced with a tube core sampler, lowered down the borehole, and driven into the sediment at the completion depth. The core will then be withdrawn and the sample collected. The following procedure will be used to collect sediment samples from a tube core sampler:

- Begin augering, periodically removing any accumulated sediment from the auger bucket.
- After reaching the desired depth, the auger will be slowly and carefully removed from the boring.
- The auger tip will be removed from drill rods and replaced with a pre-cleaned thin-wall

tube sampler.

- The tube sampler will be carefully lowered down the borehole. Gradual force will be used to insert the tube sampler into sediment.
- Care will be taken to avoid scraping the borehole sides. Hammering of the drill rods will be avoided to facilitate coring, since the vibrations may cause the boring walls to collapse.
- Tube sampler will be removed and unscrew drill rods.
- Remove cutting tip and remove core from device.
- Discard top of core (approximately 1 inch), as this represents material collected by the tube sampler before penetration of the layer of concern.
- Transfer sample into an appropriate sample or homogenization container.

Bulk samples will be collected with a hand shovel or spade and placed into 5 gallon buckets for storage and handling.

2.3.3 Sample Preservation, Containers, Handling and Storage

Samples will be preserved to 4 degrees Celsius immediately after recovery. Wide-mouth glass containers with Teflon-lined caps will be utilized for sediment samples with the recovered sample volume a function of the analytical requirements. Sediment will be transferred from the sample collection device to an appropriate sample container using a stainless steel or plastic lab spoon or equivalent. If composite samples are collected, sediment sample will be placed in a stainless steel, plastic or other appropriate composition (e.g.: Teflon) bucket, and mixed thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Then sediment samples will be placed into labeled containers. Samples for volatile organic analysis will be collected directly from the bucket, before mixing the sample, to minimize loss due to volatilization of contaminants.

All sampling devices and non-disposable equipment that comes into contact with sediment will be decontaminated prior to reuse. Decontamination procedures include:

- Wash with a laboratory grade detergent, such as Alconox
- Rinse with distilled water
- Second rinse with distilled water

2.4 Field Data Management

Field notes will be taken by field personnel to provide a detailed description of the characterization and profiling event. Information for each sediment sample and each profile measurement will be recorded on a field log form and will include the following:

- Date/Time
- Initials of field personnel
- Weather condition(s)
- GPS coordinates (if applicable)
- Sample/location identification numbers
- Depth of water (at sample locations)
- Thickness of sediment (at sample locations)
- Sediment description and composition such as color, texture, plasticity, etc (at sample locations)
- Depth of penetration into the sediment for each sample
- Width of canal at the sediment surface at each transect
- Width of canal at ground surface at each transect

3.0 ANALYTICAL PROGRAM

3.1 Chemical Parameters

The sediment samples collected to characterize the TMC will be analyzed for chemical parameters as follows:

- The discrete sediment samples (66 total) will be analyzed for specific Appendix IX VOCs and Appendix IX RCRA metals, including hexavalent chromium as shown in Table 1. This analytical subset includes VOC and metal analyses consistent with previous COPI lists established for the Sparrows Point site.
- Discrete sediment samples from the lower horizon (bottom 12 inches of sediment surface, 33 total) will be analyzed for the VOC analytes of the TCLP test procedure.
- The composite samples (17 total) will be analyzed for the specific Appendix IX semi-volatile organic compounds (SVOCs), cyanide and PCBs aroclors as identified in Table 1. These samples will also be analyzed for the inorganic and semi-volatile analytes of the TCLP test procedure.

3.2 Geotechnical Parameters

The bulk sediment samples collected to characterize the TMC will be analyzed for geotechnical parameters as follows:

- Moisture content (ASTM D2216)
- Bulk density (ASTM D7263)
- Grain size analysis
 - USCS classification
 - grain size distribution (sieve and hydrometer, as appropriate – ASTM D422 and D1140)
- Modified proctor tests in accordance with ASTM D 1557

Results of these tests will be useful in determined methods and potential requirements to add conditioning agents for handling and recycling/disposal of removed materials.

3.3 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) will be assessed for all aspects of the project, including field, laboratory, and data management activities. QA/QC procedures will include the following:

- Field audits by project managers will be conducted periodically to observe and critique the sample collection processes, the field notes being made, the accuracy of the GPS measurements, and the ability of the selected equipment to obtain adequate samples. Any deficiencies found will be immediately addressed and corrected.
- Standard procedures will be followed by the analytical laboratory to ensure accuracy of the analytical results. Chain-of-custody procedures will be followed, unique sample identification numbers will be assigned for each sample and proper sample preservation, containers, handling and storage will be followed and documented.
- Additional sampling and laboratory analyses will be performed to provide data to allow the assessment of the quality of field and laboratory procedures. These additional samples (QA/QC samples) will include sample duplicates. One field duplicate sample will be collected for each set of ten sediment samples. Duplicate samples will be collected using identical sampling methods. Sample duplicates will be prepared in the field and submitted to the analytical laboratory “blind” without any indication of the actual sample location.
- Final analytical data will be reviewed for validation and verification purposes. Any discrepancies or laboratory flags will be investigated, and corrective action measures will be taken by the laboratory to address identified analytical discrepancies.

4.0 DATA EVALUATION AND REPORTING

4.1 Data Evaluation

Field and laboratory data will be tabulated and evaluated to determine if the regulatory and scientific objectives of the sampling and analysis program have been achieved. Evaluation will include techniques and guidance outlined in the EPA document Test Methods for Evaluating Solid Waste (SW-846). Data gap analysis tools will be applied to confirm sufficient data has been collected to support decision making regarding the removal and recycling/disposal of settled materials within the canal.

4.2 Data Validation

The laboratory will provide full deliverable or CLP-equivalent data packages. Each data package from the laboratory will undergo an U.S. EPA level 2B verification/validation review as outlined in “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use”, U.S. EPA-540-R-08-005, January 2009. The verification/validation review will be conducted in accordance with “U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review”, U.S. EPA-540-R-08-01, June 2008, and “U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review”, U.S. EPA-540-R-10-011, January 2010.

The quality control requirements specified in the methods and associated acceptance criteria will also be used to evaluate the data.

Upon completion of the data validation, Data Validation Reports (DVRs) will be prepared to present the data validation findings. A DVR will be prepared for each SDG data package reviewed. Analysis results forms, annotated by hand to reflect qualifier codes resulting from the data validation review, will be included with both of the reports. These qualifier codes will be presented in the far right margins of the analysis results forms, and will be clearly identifiable. A glossary defining each data validation qualifier code will also be included in the report.

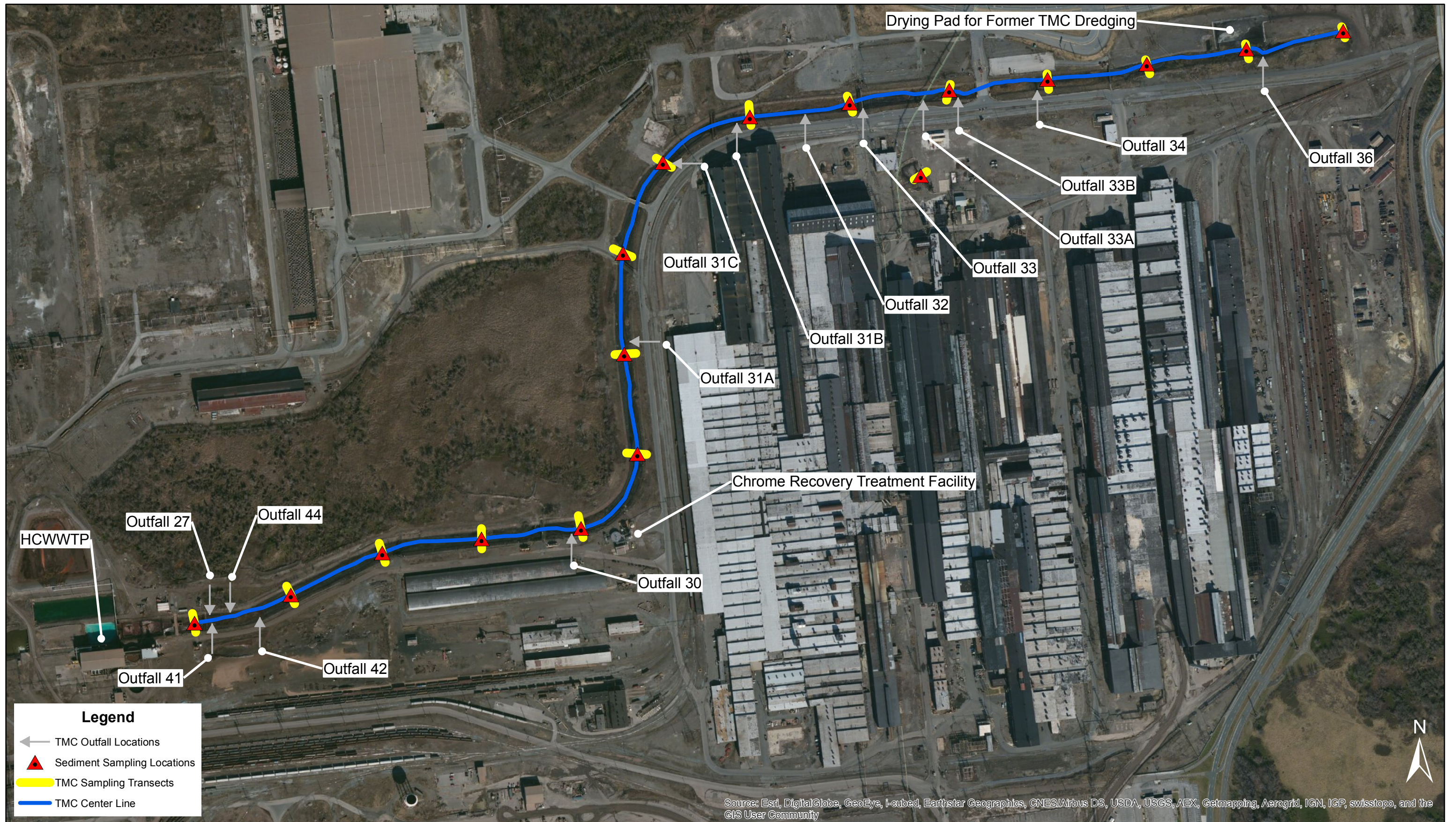
4.3 Reporting

A Summary Report will be prepared that will include a narrative explaining all field activities, including dates, work completed; tabulation of results; and conclusions and recommendations for removal and disposal of the settled material within the Tin Mill Canal. The Summary Report will include the following:

- Photo Documentation
 - Photos will have a brief descriptions and will be dated
- Field Documentation
 - Copies of all laboratory chains of custody
 - Daily Field Report Summaries, including rough field sketches as applicable
 - Any other pertinent documentation deemed appropriate by the Project Manager (especially if any deviation from this plan occurs)
- Tables
 - All geotechnical/engineering data collected
 - All chemical analytical data collected
 - All GPS coordinates collected
- Figures
 - GIS site maps showing the location of sampling points and extent of sediment area
 - Profile cross-sections



Site Map - Location of Tin Mill Canal
Sparrows Point Terminal, LLC
Sparrows Point, MD



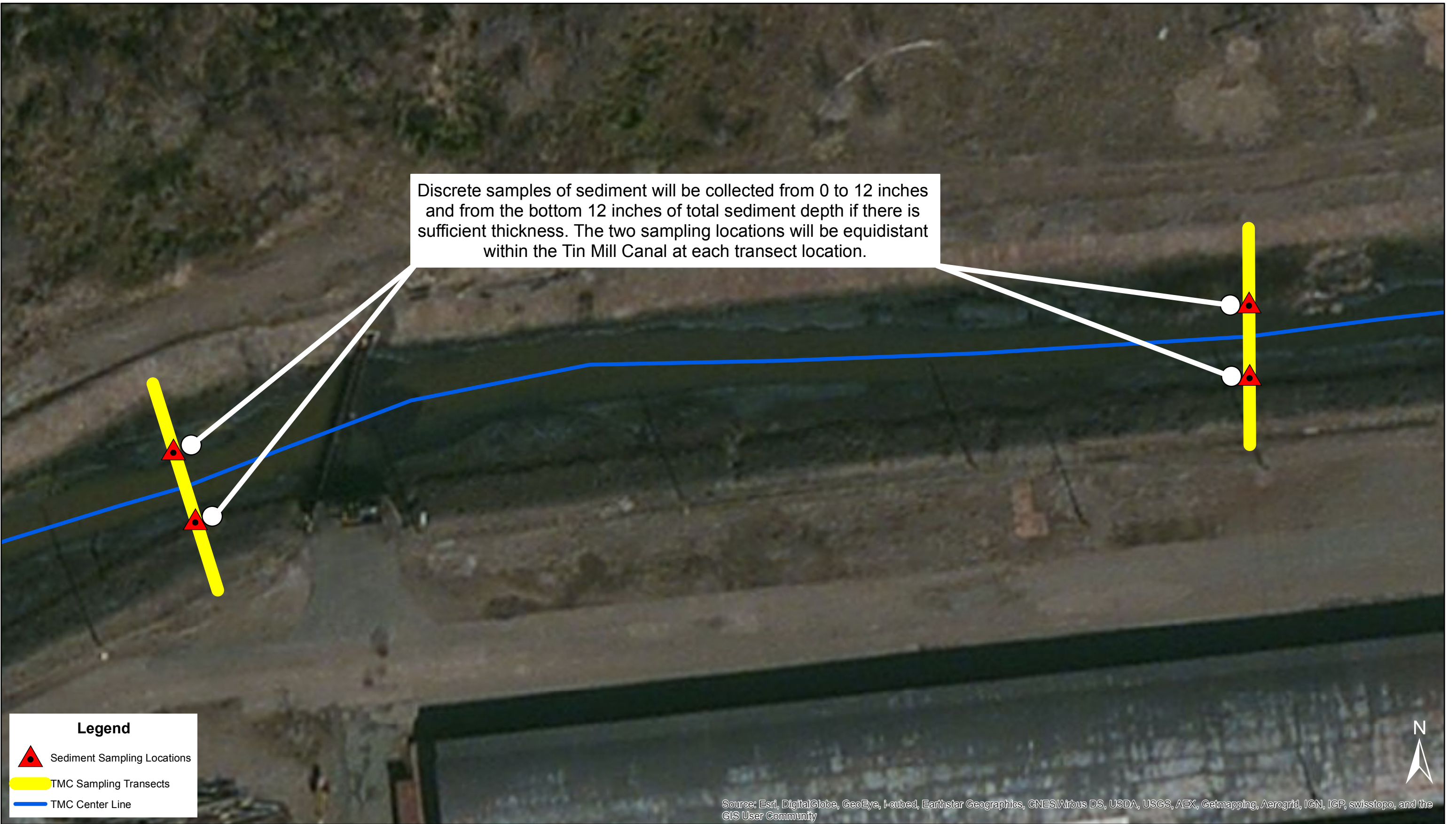


Table 1

Analytical Parameter Lists for Tin Mill Canal Sediment Sampling and Analysis Program

Modified Appendix IX Parameters COPI List

Volatiles (SW846-8260B)	Semivolatiles (SW846-8270)	PCBs (SW846-8082)
1,1,1,2-Tetrachloroethane	1,2,4-Trichlorobenzene	Aroclor 1016
1,1,1-Trichloroethane	1,2-Dichlorobenzene	Aroclor 1221
1,1,2,2-Tetrachloroethane	1,3-Dichlorobenzene	Aroclor 1232
1,1,2-Trichloroethane	1,4-Dichlorobenzene	Aroclor 1242
1,1-Dichloroethane	2,4,5-Trichlorophenol	Aroclor 1248
1,1-Dichloroethene	2,4,6-Trichlorophenol	Aroclor 1254
1,2-Dichloroethane	2,4-Dichlorophenol	RCRA metals (SW846-6010B) [except as noted]
1,2-Dichloropropane	2,4-Dimethylphenol	Antimony (Sb)
2-Butanone (Methyl ethyl ketone)	2,4-Dinitrophenol	Arsenic (As)
2-Hexanone	2,4-Dinitrotoluene	Barium (Ba)
4-Methyl-2-pentanone (MIBK)	2,6-Dinitrotoluene	Beryllium (Be)
Acetone	2-Chloronaphthalene	Cadmium (Cd)
Benzene	2-Chlorophenol	Chromium (Cr)
Bromoform	2-Methylnaphthalene	Hexavalent Chromium (3060A)
Carbon disulfide	2-Methylphenol (o-cresol)	Cobalt (Co)
Carbon tetrachloride	2-Nitrophenol	Copper (Cu)
Chlorobenzene	3,3'-Dichlorobenzidine	Lead (Pb)
Chloroethane	3,3-Dimethylbenzidine	Mercury (Hg) (7470A/7471A)
Chloroform	3-Methylphenol	Nickel (Ni)
cis-1,3-Dichloropropene	4 Methylphenol (p cresol)	Selenium (Se)
Ethylbenzene	4,6-Dinitro-2-methylphenol	Silver (Ag)
Methylene chloride	4-Bromophenyl phenyl ether	Thallium (Tl)
Tetrachloroethene	4-Chloro-3-methylphenol	Tin (Sn)
Toluene	4-Chlorophenyl phenyl ether	Vanadium (V)
trans-1,2-Dichloroethene	4-Nitrophenol	Zinc (Zn)
trans-1,3-Dichloropropene	Acenaphthene	Other
Trichloroethene	Acenaphthylene	Cyanide (SW846-9014)
Vinyl chloride	Anthracene	
Xylenes (total)	Benzo(a)anthracene	
	Benzo(a)pyrene	
	Benzo(b)fluoranthene	
	Benzo(ghi)perylene	
	Benzo(k)fluoranthene	
	Bis(2-chloroethoxy)methane	
	Bis(2-chloroethyl)ether	
	Bis(2-chloroisopropyl)ether	
	Bis(2-ethylhexyl)phthalate	
	Butyl benzyl phthalate	
	Dibenz(a,h)anthracene	
	Diethyl phthalate	
	Dimethyl phthalate	
	Di-n-butyl phthalate	
	Di-n-octyl phthalate	
	Fluoranthene	
	Fluorene	
	Hexachlorobenzene	
	Hexachlorobutadiene	
	Hexachlorocyclopentadiene	
	Hexachloroethane	
	Indeno(1,2,3-cd)pyrene	
	Isophorone	
	Naphthalene	
	Nitrobenzene	
	Pentachloroethane	
	Pentachlorophenol	
	Phenanthrene	
	Phenol	
	Pyrene	
	Pyridine	