HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Bear Creek Sediments

EPA ID No.: MDN000305762

Date Prepared: September 2021

Contact Person(s):
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Pathways, Components, or Threats Not Scored

The ground water migration pathway, the soil exposure and subsurface intrusion pathway, and the air migration pathway, were not scored as part of this Hazard Ranking System (HRS) evaluation as they are not expected to contribute significantly to the overall site score as noted below. The NPL listing focuses solely on the releases to the Surface Water Migration Pathway into Bear Creek via Tin Mill Canal. Waste material and associated contaminated sludge and sediments within Tin Mill Canal are being addressed by the current owner of Sparrows Point Peninsula in accordance with EPA and MDE approval under a Consent Decree.*

Ground Water Migration Pathway: Groundwater is not a source of drinking water within 4-miles of the source. This migration pathway is not a pathway of concern.

Soil Exposure Component, Soil Exposure and Subsurface Intrusion Pathway: The source consists of waste material in Tin Mill Canal, a man-made canal constructed of slag. There is no contaminated soil associated with the source being scored.

Subsurface Intrusion Component, Soil Exposure and Subsurface Intrusion Pathway: The primary contaminants at the source are polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals. The subsurface intrusion component is not anticipated to be a pathway of concern.

Air Migration Pathway: The source consists of waste material in Tin Mill Canal, a man-made canal constructed of slag. Air samples have not been collected to characterize the air migration pathway. This pathway is not anticipated to be a pathway of concern.

*Documented contamination on the Sparrows Point peninsula as a result of past operations of the Bethlehem Steel Corporation are being addressed by the property owner, Trade Point Atlantic (TPA) under a Consent Decree between the former property owner, Bethlehem Steel Corporation (BSC) and the U.S Environmental Protection Agency (EPA) and the Maryland Department of the Environment (MDE); an Administrative Consent Decree between SPT and MDE; a Settlement Agreement between SPT and the EPA; and MDE's Voluntary Cleanup Program (Refs. 6, pp. 1-188; 7, pp. 1-120; 8, pp. 1-269; 9, pp. 1-3).

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HRS DOCUMENTATION RECORD

Name of Site:	Bear Creek Sediments		
Date Prepared:	September 2021		
EPA ID No.:	MDN000305762		
EPA Region:	3		
Street Address of Site*:	Northwest off-shore sediments at Sparrows Point, originating at Tin Mill Canal outfall		
City, State, and Zip Code:	Sparrows Point, Baltimore County, Maryland 21219		
General Location in the State:	Northeast		
Topographic Map:	Sparrows Point, Maryland		
Latitude*:	39.227598° North	Longitude*:	-76.491127° West
Site Reference Point:	Outfall 014 (Ref. 14, p. 27).		

(**Figure 1**; Refs. 3, p. 1; 4)

*The street address, coordinates, and contaminant locations presented in this Hazard Ranking System (HRS) documentation record identify the general area in which the Site is located. They represent one or more locations the U.S. Environmental Protection Agency (EPA) considers to be part of the Site based on the screening information EPA used to evaluate the Site for inclusion on the National Priorities List (NPL). EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely-delineated boundaries. A site is defined as an area where a hazardous substance has been "deposited, stored, disposed, or placed, or has otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed regarding where the contamination has come to be located.

Scores

Ground Water[1] Pathway	Not Scored
Surface Water Pathway	96.06
Soil Exposure Pathway	Not Scored
Air Pathway	Not Scored
HRS SITE SCORE	48.02

[1] "Ground water" and "groundwater" are synonymous; the spelling is different due to "ground water" being codified as part of the HRS, while "groundwater" is the modern spelling.

WORKSHEET FOR COMPUTING HRS SITE SCORE

Bear Creek Sediments

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	Not Scored	
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	96.06	9,227.52
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	Not Scored	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	96.06	9,227.52
3a.	Soil Exposure Pathway Score (S_{se}) (from Table 5-1, line 22)	Not Scored	
3b.	Subsurface Intrusion Component (S_{ssi}) (from Table 5-11, line 12)	Not Scored	
3c.	Soil Exposure and Subsurface Intrusion Pathway Score (S_{sessi}) (from Table 5-11, line 13)	Not Scored	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	Not Scored	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	9,227.52	
6.	**HRS Site Score:** Divide the value on line 5 by 4 and take the square root	48.02	

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
Bear Creek Sediments

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories and Factors **DRINKING WATER THREAT**	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	Not scored
2b. Runoff	25	Not scored
2c. Distance to Surface Water	25	Not scored
2d. Potential to Release by Overland Flow (lines 2a [2b + 2c])	500	Not scored
3. Potential to Release by Flood		
3a. Containment (Flood)	10	Not scored
3b. Flood Frequency	50	Not scored
3c. Potential to Release by Flood (lines 3a x 3b)	500	Not scored
4. Potential to Release (lines 2d + 3c)	500	Not scored
5. Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics		
6. Toxicity/Persistence	*	Not scored
7. Hazardous Waste Quantity	*	Not scored
8. Waste Characteristics	100	Not scored
Targets		
9. Nearest Intake	50	Not scored
10. Population		
10a. Level I Concentrations	**	Not scored
10b. Level II Concentrations	**	Not scored
10c. Potential Contamination	**	Not scored
10d. Population (lines 10a + 10b + 10c)	**	Not scored
11. Resources	5	Not scored
12. Targets (lines 9 + 10d + 11)	**	Not scored
13. **DRINKING WATER THREAT SCORE** ([lines 5 x 8 x 12]/82,500)	100	Not scored

* Maximum value applies to waste characteristics category.
** Maximum value is not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
Bear Creek Sediments

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories and Factors **HUMAN FOOD CHAIN THREAT**	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+08
16. Hazardous Waste Quantity	*	100
17. Waste Characteristics	1,000	320
Targets		
18. Food Chain Individual	50	45
19. Population		
19a. Level I Concentrations	**	0
19b. Level II Concentrations	**	0.03
19c. Potential Human Food Chain Contamination	**	0.0000006
19d. Population (lines 19a + 19b + 19c)	**	0.0300006
20. Targets (lines 18 + 19d)	**	45.0300006
21. **HUMAN FOOD CHAIN THREAT SCORE** ([lines 14 x 17 x 20]/82,500)	100	96.06

* Maximum value applies to waste characteristics category.
** Maximum value is not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
Bear Creek Sediments

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories and Factors **ENVIRONMENTAL THREAT**	MAXIMUM VALUE	VALUE ASSIGNED
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	*	5.00E+08
24. Hazardous Waste Quantity	*	100
25. Waste Characteristics	1,000	320
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	**	0
26b. Level II Concentrations	**	0
26c. Potential Contamination	**	0.00175
26d. Sensitive Environments (lines 26a + 26b + 26c)	**	0.00175
27. Targets (line 26d)	**	0.00175
28. ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500)	60	0.0037
29. WATERSHED SCORE (lines 13 + 21 + 28)	100	96.06
30. SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE (S_{of})	100	96.06
SURFACE WATER MIGRATION PATHWAY SCORE (S_{sw})	100	96.06

* Maximum value applies to waste characteristics category.
** Maximum value is not applicable.

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85. MDE. Final TMDLs Approved by EPA: Baltimore Harbor. Available at: https://mde.maryland.gov/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/TMDL_Final_BaltHarbor_PCBs.aspx. Accessed July 16, 2021. 3 Pages.

86. Baltimore City. Baltimore City Department of Public Works, Surface Water In Detail. Available at: https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/surface/detail. Accessed July 16, 2021. 3 Pages.

87. MDE. Total Maximum Daily Loads of Trash and Debris for the Middle Branch and Northwest Branch Portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Baltimore City and County, Maryland. December 2014. 88 Pages.

88. Freshwater Inflows. Salinity. Available at: https://www.freshwaterinflow.org/salinity/. Accessed July 16, 2021. 4 Pages.

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SITE SUMMARY

The Bear Creek Sediments site is located off the northwest shore of the Sparrows Point peninsula in Baltimore, Maryland and as scored consists of sediments in Bear Creek contaminated with polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), cyanide, and heavy metals such as cadmium, chromium, lead, nickel, silver, and zinc as a result of historical releases from Tin Mill Canal (Source 1) (**Figures 1 and 2**). Hazardous substances such as PAHs, PCBs, cyanide, and metals detected in waste samples collected from Tin Mill Canal (TMC) have been detected in sediment samples collected from Bear Creek at concentrations that meet the criteria for an Observed Release (see **Sections 2.2 and 4.1.2.1.1**; **Figures 2 and Figure 4**). Within the zone of actual contamination, Bear Creek is fished, including crabbing, commercially and recreationally for human consumption (see **Section 4.1.3.3**). Bear Creek flows into the Patapsco River, which in turn flows into the Chesapeake Bay, all of which are within the target distance limit of the site. The Chesapeake Bay is also a habitat for two endangered species, the Atlantic sturgeon and the Shortnose sturgeon.

TMC is an approximate 7,500-foot-long, 30 to 50 foot wide, and up to 15 feet deep man-made channel progressing east to west through the former Bethlehem Steel Corporation (BSC) property bisecting the northern portion of the Sparrows Point peninsula in Baltimore, Maryland discharging to Bear Creek (Figures 1 and 2; Refs. 10, pp. 7 and 31). The Sparrows Point peninsula is surrounded by Chesapeake Bay tributaries including Bear Creek on the west, Patapsco River on the south, and Old Road Bay on the east (Figure 1; Ref. 4). The Chesapeake Bay and the rivers and streams that feed the bay comprise the largest estuary in United States and the third largest in the world (Ref. 23, p. 3). The Patapsco River historically has supported spawning runs of anadromous fish such as American and hickory shad, yellow and white perch, alewife and blueback herring although there are upstream barriers to spawning such as dams (Refs. 24, pp. 3, 4; 25, pp. 9, 10, 15, 17, 22). Recreational fisheries for various species, including crabs, exist in the surface water bodies (i.e. Bear Creek, Patapsco River, and Chesapeake Bay) adjacent to Sparrows Point peninsula (Refs. 30, pp. 26, 27, 44; 52, p. 1; 53, pp. 1, 2; 54, p. 1; 55, p. 1; 56, pp. 1, 2). Chesapeake Bay is also a habitat for the Atlantic sturgeon and Shortnose sturgeon. The hazardous substances including PAHs, PCBs, cyanide, and metals documented in the observed release from TMC to Bear Creek pose a threat to the fisheries and anadromous fish species (see **Section 4.1.2.1.1)**.

From the early 1900s through the 1970s, untreated wastewater from BSC was discharged to Humphreys Creek and subsequently to Bear Creek, or directly to Bear Creek (Ref. 11, p. 64). TMC was constructed between 1950 and 1970 by placing slag into Humphreys Creek and then digging out TMC from the slag. The slag was generated as part of steel making operations (Refs. 10, p. 7; 11, pp. 13, 103, 104). The original portion of the TMC (the eastern 3,800 feet) was constructed to convey industrial wastewater from a number of steel manufacturing processes westward into Humphreys Creek (Ref. 11, pp. 103, 107-113, 152, 153). Prior to the completion of Tin Mill Canal and Humphreys Impoundment, Humphreys Creek was an open body of water that connected directly to Bear Creek and later via an outfall that permitted discharges to Bear Creek during low tide and allowed inflow of brackish water during high tide (Ref. 11, pp. 152; 12, pp. 35, 37, 46, 99, 100; 13, pp. 150-156, 180-185). Between 1969 and 1970, the remainder of the canal, western portion, was constructed, at which point, all industrial wastewater discharge pipes into Humphreys Creek were routed to TMC and conveyed to the newly constructed Humphreys Creek Wastewater Treatment Plant (HCWWTP) (Refs. 11, p. 103; 12, p. 100; 13, pp. 19, 20). By 1971, all of Humphrey Creek was filled. Effluent from TMC and HCWWTP is discharged to Bear Creek via NPDES permitted Outfall 014 (Ref. 10, p. 7; 11, pp. 13, 33, 67, 76; 14, p. 14; Figures 2 and 3). The flow rate of the process wastewaters into TMC was reported to be between 40,000 gallons per minute (gpm) to over 200,000 gpm and included numerous waste streams from steel manufacturing operations (Ref. 11, p. 105, 108-112). Over the time, the heavier particles and oils in the wastewaters discharged to TMC from the steel manufacturing processes settled and accumulated on the bottom of the canal (Ref. 10, p. 7; 12, pp. 73, 141; 19, p.7).

In 2015 and 2016, a total of 100 discrete and 40 composite samples were collected of the sludge/sediment material throughout the length of TMC (Ref. 10, pp. 12, 13, 16, 76). Discrete samples were analyzed for volatile organic compounds (VOCs), Resource Conservation and Recovery Act (RCRA) metals including hexavalent chromium, and for Toxicity Characteristic Leaching Procedure (TCLP) VOCs and composite samples were analyzed for semivolatile organic compounds (SVOCs), cyanide, polychlorinated biphenyl (PCB), TCLP SVOCs, and TCLP inorganics (Ref. 10, pp. 12, 13, 16). Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, and total PCBs were identified in sediment samples collected from the TMC (Ref. 19, p. 7). Analytical results of samples indicated that concentrations of PCBs exceeded their respective Project Action Limit (PAL) in multiple locations collected from the TMC. Several samples exceeded the PCB level of 50 milligrams per kilogram (mg/kg) that would warrant excavation and disposal at a permitted off-site commercial landfill approved to accept TSCA-regulated PCB waste. Benzene was detected in one composite sample at a concentration of 18 mg/kg, exceeding its PAL of 5.1 mg/kg. The remaining PAL exceedances in soil consisted of three inorganics (arsenic, cobalt, and lead) and three SVOCs (benzo[a]pyrene, naphthalene, and 2,4-dinitrotoluene). Arsenic was the most common inorganic exceedance, and was detected above the PAL of 3.0 mg/kg in 62 of the total samples analyzed. The maximum detection of arsenic was 132 mg/kg. Lead and cobalt were each limited to a single PAL exceedance in one sample each. Benzo[a]pyrene exceeded the PAL of 2.1 mg/kg in the largest number of samples (three) of any SVOC. The maximum detection of benzo[a]pyrene was 10.3 mg/kg. Naphthalene and 2,4-dinitrotoluene were each limited to a single PAL exceedance (Refs. 10, p. 26; 18, p. 11). The PALs were generally based on the EPA's Regional Screening Levels (RSLs) for the Composite Worker exposure to soil (Ref. 18, p. 10).

Based on the analysis of the samples collected from TMC and in accordance with EPA’s July 26, 2017, Statement of Basis and Final Remedy for TMC, impacted sediments in the canal were to be removed and an engineered cap was to be installed above the sediments left in place to prevent direct contact exposures and support future stormwater conveyance through the TMC (Refs. 18, pp. 1, 7; 19, pp. 4, 6). Approximately 72,000 cubic yards of soil impacted sediments in TMC were planned to be excavated, dewatered, and disposed in Grays Landfill; a landfill located on Sparrows Point peninsula, or transported off-site to a TSCA-permitted landfill (Ref. 19, pp. 7, 8). Approximately 9,000 cubic yards of PCB-impacted sediment in TMC were planned to be excavated and disposed at an off-site Toxic Substances Control Act (TSCA) regulated facility (Ref. 19, pp. 7, 8). Following excavation of impacted sediments, the residual sediments and fill materials were to be covered with a 2-foot thick (minimum) cap of consisting of geotextile filter fabric overlain by finely graded aggregate and rip-rap to the final canal grade (Ref. 19, pp. 21, 22). Remediation of the canal was initiated in January 2018 and was anticipated to be completed early 2019 (Refs. 19, p. 26; 20, pp. 1, 8). A final report of the restoration of the canal has not been completed to date. Based on the documents cited above, the removal actions do not include a complete removal of the release of hazardous substances from TMC to Bear Creek. The release to Bear Creek is documented in **Section 4.0** of this HRS documentation record.

Sparrows Point Operational History:

Pennsylvania Steel began steel manufacturing operations on Sparrows Point peninsula in 1887, which was purchased by Bethlehem Steel Corporation (BSC) in 1916 (Ref. 13, pp. 2, 3). Bethlehem Steel Corporation operated an integrated steelmaking facility on Sparrows Point peninsula from approximately 1916 through 2003. Bethlehem Steel declared bankruptcy in 2001 and the facility was subsequently operated by a succession of owners, the last of which (RG Steel Sparrows Point, LLC) filed for bankruptcy in 2012. The facility was subsequently purchased by Sparrows Point, LLC (SPLLC) at a bankruptcy sale on August 7, 2012. Sparrows Point Terminal, LLC (SPT) purchased the real property on September 18, 2014 subject to the provisions of a Purchase and Sale Agreement wherein SPLLC and SPT have allocated various environmental responsibilities, liabilities, and obligations among themselves. SPT has subsequently undergone a name change and is now doing business as Tradepoint Atlantic (Ref. 10, p. 6). Tradepoint has organized the property into parcels for redevelopment as commercial, light industrial and logistics facilities (Ref. 18, p. 8).

BSC purchased the Sparrows Point facility and enlarged it with the addition of mills to produce hot rolled sheet, cold rolled sheet, galvanized sheet, tin mill products, and steel plate. During the peak production in 1959, the facility operated thirteen (13) coke oven batteries, ten (10) blast furnaces, and four open hearth furnaces. In general, various steel manufacturing operations and associated recovery systems, wastewater treatment systems, and solid waste disposal activities were conducted at the facility from 1887 to 2012 as discussed in further detail below (Ref. 13, p. 17).

Coke oven batteries were used to produce coke, which was a source of fuel in the iron-to-steel making process. A total of thirteen (13) coke oven batteries were operated from the 1930s until operation of the ovens ceased in December 1991. At least eleven blast furnaces were used at the facility for the production of iron. In addition, BSC formerly operated seven sinter strands as a means to charge the blast furnaces. Sinter is an agglomerated and fused mixture of fine-sized material such as iron ore, coke breeze, fluxstone, mill scale, and flue dust (Ref. 13, pp. 17, 18). By 1998, steel was being produced in two basic oxygen furnaces (Ref. 13, p. 18). Historically, steel had been produced in four open-hearth shops (Refs.11, p. 42; 13, p. 17). Finished steel was produced at the Plate Mill, the Cold Sheet Mill, Hot Strip Mill, and the Tin Mill. In addition, the Rod and Wire Mill and the Pipe Mill produced rods, wire products, and pipes during the 1940s through the early 1980s (Ref. 13, pp. 17, 18).

In addition to the iron and steel manufacturing operations, BSC operated a coal chemical recovery system consisting of several plants. These plants included: A and B Coal Chemicals Plants (CCPs), Benzene and Litol Plants, Hydrogen Cyanide Strippers, as well as a Desulfurization Plant and Sulfur Recovery Plant. These plants were formerly used for treatment of raw coke oven gas. The Benzene and Litol Plants were distillation and cracking plants for the purification of light oil. These plants operated from the late 1940s through 1986. The Hydrogen Cyanide strippers were used for removal of hydrogen cyanide from gas generated at the CCPs. The Desulfurization Plant and Sulfur Recovery Plant was used to remove sulfur from the coke oven gas and operated from the late 1960s through the late 1980s (Ref. 13, p. 18).

Other recovery systems that formerly operated at the facility included an Ammonia Recovery Plant, Green Pellet Plant, Ball Mill, Palm Oil Recovery, and Slag Reprocessing. Excess weak ammonia liquor from the CCPs was treated at the Ammonia Recovery Plant, which operated until the Coke Oven was shut down in 1991. Green iron ore pellets were manufactured from open hearth and BOF fume dust at the Green Pellet Plant. The pellets were then charged back into the furnaces. The Ball Mill, which operated until the 1980s, was used for processing coal tar and material from the tar decanter into a liquid for use as a fuel. The Palm Oil Recovery operation was historically operated by U.S. Filter and processed waste oils generated by BSC. The waste oil operations began around 1950 (Ref. 13, pp. 18, 19).

Several wastewater treatment systems formerly operated at the facility and discharged treated wastewater to water bodies surrounding the peninsula via numerous permitted outfalls (Refs. 11, pp. 13, 33-35; 12, pp. 66, 148; 13, p. 19; 14, pp. 1-27). The HCWWTP is still in operation, primarily treating stormwater from the TMC as well as water collected from the groundwater pump and treat system currently in operation at the Rod and Wire Mill (Refs. 13, p. 20; 70, pp. 6, 14, 22). The HCWWTP utilizes an ACTIFLO® microsand ballasted clarification process (Ref. 8, p. 93). Stormwater is treated to reduce metals, oil and grease, and total suspended solids (TSS) in accordance with the current individual NPDES permit requirements at Outfall 014 (Refs. 14, pp. 14-16). Solid wastes generated were disposed primarily in the following three areas: Greys Landfill, Coke Point Landfill, and Humphrey Impoundment (Ref. 13, pp. 19, 135). Greys Landfill is a solid waste disposal area occupying approximately forty (40) acres in the northwest corner of the peninsula. Greys Landfill is surrounded by a slag berm and is divided into cells designated for specific wastes including sludges, centrifuge cakes, dusts, cleanup materials, and asbestos containing materials. Greys Landfill is still currently in operation, primarily accepting wastes resulting from ongoing demolition activities. Coke Point Landfill occupies approximately forty (40) acres in the southwest corner of the peninsula and has been used as a landfill since 1971. Coke Point Landfill received non-hazardous waste including foundry dust, waste sand, slag, refractories, and various other dusts. The northern portion of the landfill received sweepings from the Coke Oven Area, which included coke ash. Coke Point Landfill is not currently in operation although it does have available permitted capacity. The Humphrey Impoundment occupies approximately forty-three (43) acres in the northwest portion of the peninsula. As stated previously, between 1950 and 1970, Humphrey Creek received wastewater discharges from various steel processing areas including the Cold Sheet Mill, the Hot Strip Mill, the Tin Mill, and the Rod and Wire Mill. When the Tin Mill Canal was completed in 1969, these discharges were routed through the canal to the HCWWTP. Between 1970 and 1985, Humphrey Impoundment was used as a dewatering area for sludges generated at various on-site wastewater treatment plants (Ref. 13, pp. 19, 20). The locations of waste disposal areas are shown on page 135 of Reference 13.

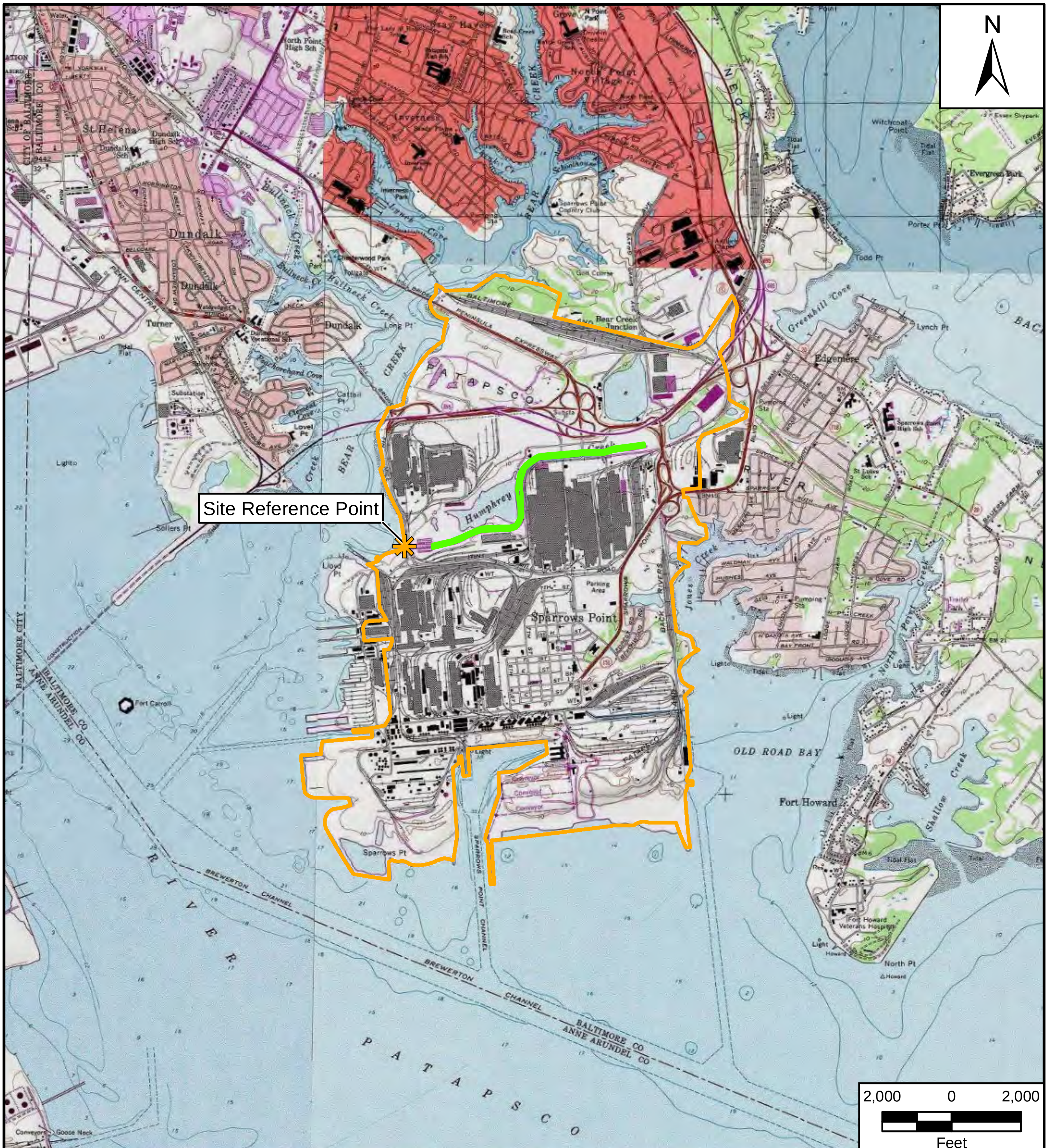
Regulatory History:

In February 1997, in response to complaints filed by the EPA and MDE pursuant to the Resource Conservation and Recovery Act (RCRA) and numerous state code violations against BSC claiming that BSC operated a hazardous waste treatment, storage, or disposal facility and that a release of hazardous substances to the environment had occurred, BSC, EPA, and MDE entered into a Consent Decree to address releases from historical and on-going operations at the facility (Ref. 6, pp. 5-7, 92-95). As required by the Consent Decree, BSC submitted a Description of Current Conditions (DCC) Report on January 20, 1998 describing prior investigations and identifying potential sources of contaminants. According to the DCC Report, a total of 203 Solid Waste Management Units (SWMUs) and twenty-eight (28) Areas of Concern (AOCs) were initially identified at the facility as part of the RCRA Facility Assessment (RFA) (Ref. 12, pp. 15, 152-159). The Consent Decree identified the following five Special Study Areas (SSAs) on the facility as priority areas for investigation: Tin Mill Canal/Finishing Mills; Greys Landfill; Coke Point Landfill; Coke Oven Area; and Humphrey Impoundment (Ref. 6, p. 121; 9, p. 1). EPA and MDE have overseen and approved the ongoing and continued implementation of remedial measures at the SSAs under the BSC Consent Decree (Refs. 7, p. 4, 5; 8. p. 3; 15, pp. 1-10).

On May 19, 2014, pursuant to Section XXXIII of the BSC Consent Decree, approximately 2,400 acres of the facility, not included in the five Special Study Areas, were removed from the jurisdiction of the BSC Consent Decree and placed into the Maryland VCP (Refs. 7, pp. 7-10; 8, p. 14). On July 28, 2014, an amendment to the BSC Consent Decree, added SPLLC as a Respondent, acknowledged that certain work required under the BSC Consent Decree had been completed (Ref. 8, p. 4). On September 12, 2014, SPT entered into an Administrative Consent Order with MDE (Ref. 7, pp. 1, 39) and into a Settlement Agreement with the EPA (Ref. 8, pp. 1, 2, 47-49). MDE continues to oversee the ongoing investigations and remediation of the parcels within the VCP (Refs. 16, pp. 1-11; 17).

Off-shore Sediment Investigation

In 2014, the property owner of Sparrows Point peninsula conducted an offshore sediment investigation of sediments in Bear Creek within 1,000 feet of the northwestern portion of the Sparrows Point peninsula, spanning from the former Bethlehem Steel Corporation property boundary in the north to Tin Mill Canal to the south (Ref. 21, pp. 1, 9 and **Figure 1**). Sediment samples were analyzed for VOCs, SVOCs, PCBs, metals, mercury, cyanide, oil and grease (Ref. 21, p. 3). Analytical results, indicated the most elevated concentrations of metals, PAHs, and PCBs were associated with sediments toward the southern end of the study area, adjacent to the outlet of TMC with maximum concentrations of arsenic (28 milligrams per kilogram [mg/kg], cadmium (45 mg/kg), copper (470 mg/kg), nickel (170 mg/kg), selenium (3.1 mg/kg), silver (4.8 mg/kg), zinc 10,000 mg/kg), cyanide (21 mg/kg), total PAHs (14,330 micrograms per kilogram [µg/kg]), and total PCBs (1,910 µg/kg) (Ref. 21, pp. 18, 23, 24, 26). Oil and grease were detected in excess of 80,000 mg/kg (Ref. 22, p. 82). A second round of sediment samples were collected in March and April 2015, focusing on delineating impacts identified during the previous investigation that are likely associated with the outlet of the Tin Mill Canal (Ref. 22, pp. 95-100, 105-111). An Ecological Risk Assessment (ERA and Human Health Risk Assessment (HHRA) was preformed based on the sediment data as well as fish and crab tissue samples that had been collected in 2010 off the southwestern portion of the peninsula (Ref. 22, pp. 213, 297, and 298). The ERA concluded that wildlife that consume aquatic and benthic organisms are potentially at risk from selenium and total PCBs in sediment as well as the potential for risk from oil and grease, which may cause physical impacts associated with coating gills, increasing biological oxygen demand, and fouling organisms. The results of the HHRA indicated potential human health concerns primarily for ingestion of crabs containing PCBs and/or PAHs (Ref. 22, pp. 429, 430).



Legend

Former Bethlehem Steel Corporation property boundary

Tin Mill Canal

Source: USGS 7.5 Minute Quadrangles: Baltimore East, MD 1974; Curtis Bay, MD 1957; Middle River, MD 1998; Sparrows Point, MD 1974; References 10, p. 31; 14, p. 27

Bear Creek Sediments
Baltimore, Baltimore County, Maryland

Figure 1

Site Location Map

TETRA TECH

Prepared For: EPA | Prepared By: Clayton Hayes

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Date Saved: 05/27/21

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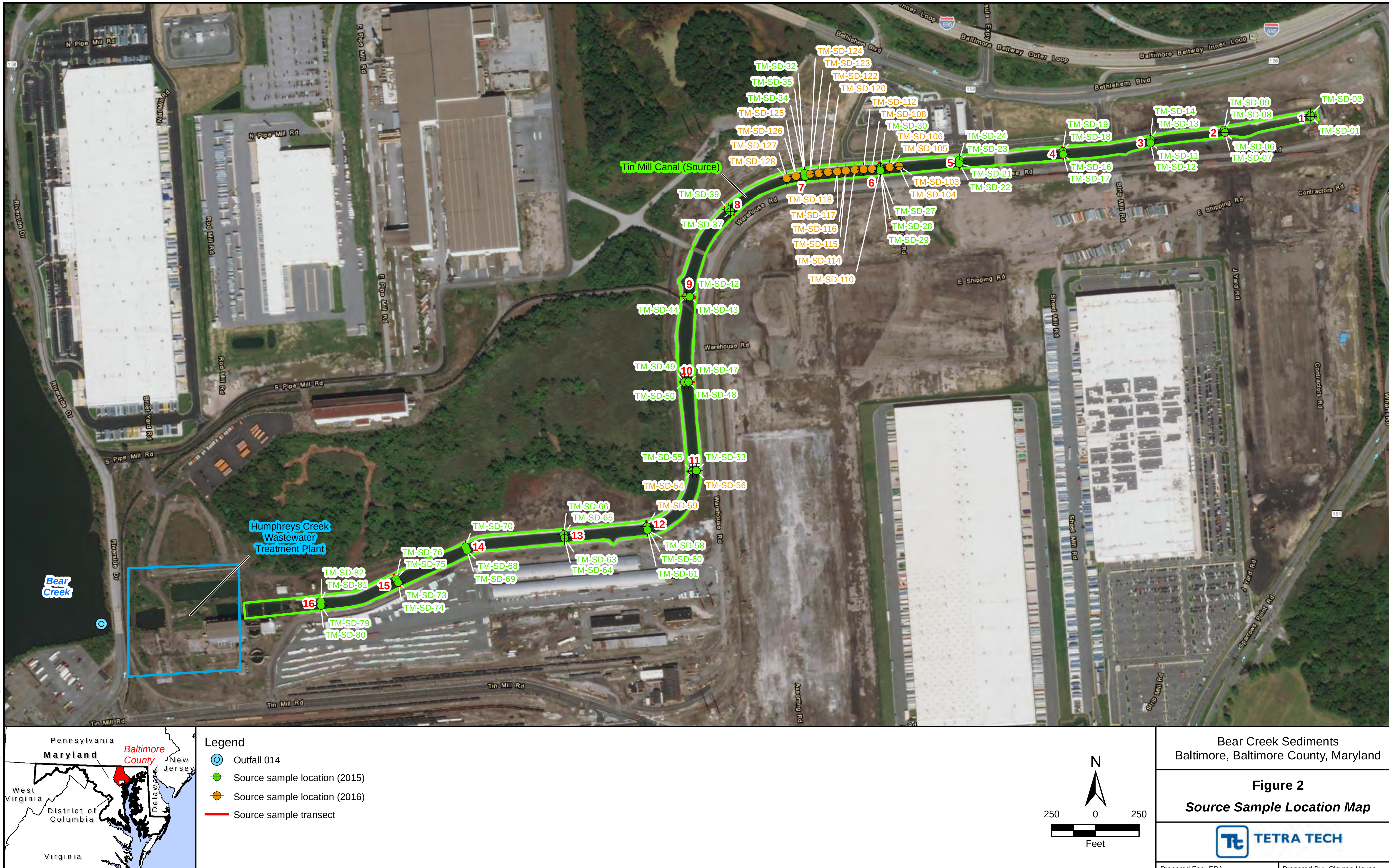

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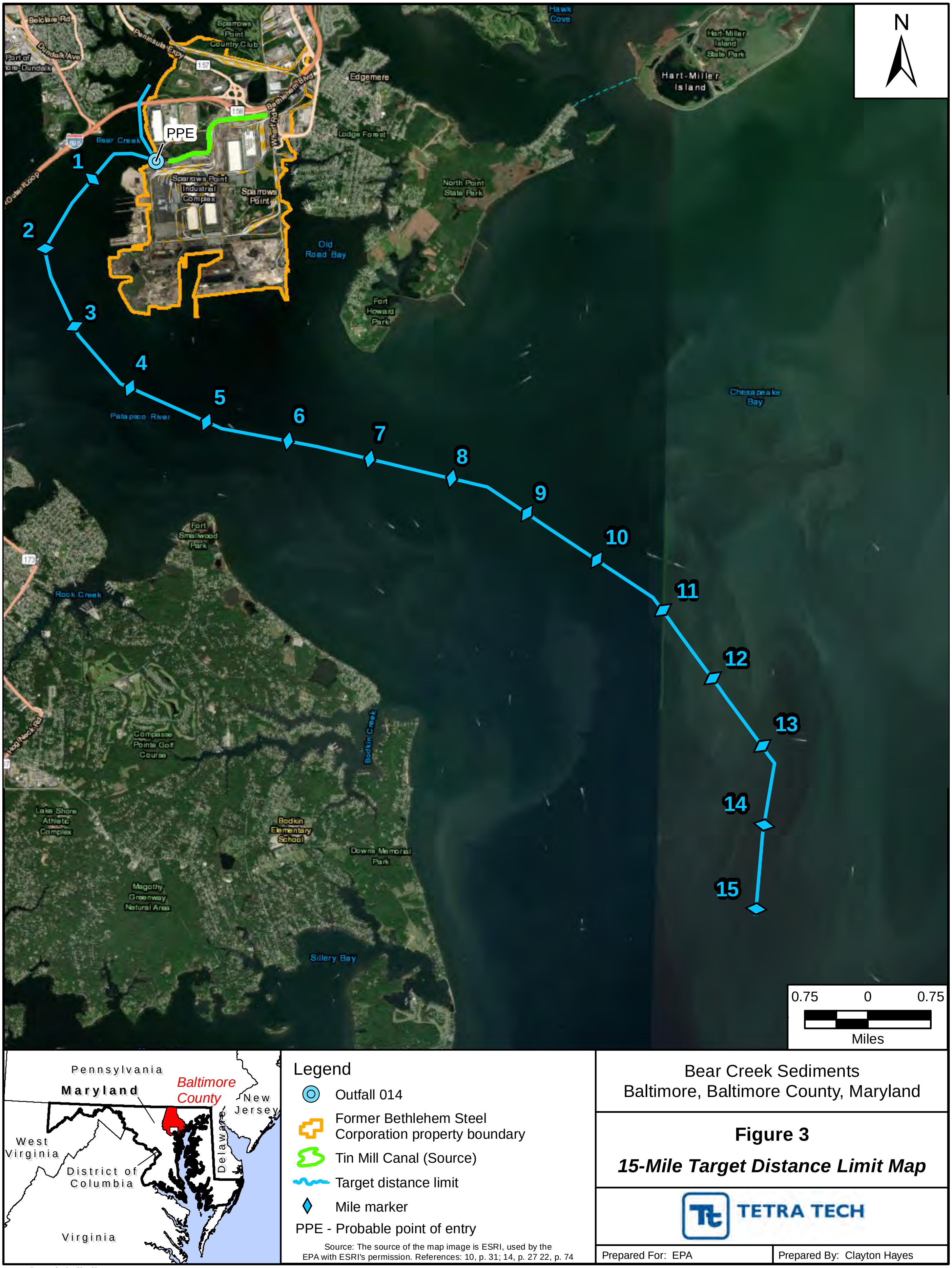

Figure 3

15-Mile Target Distance Limit Map

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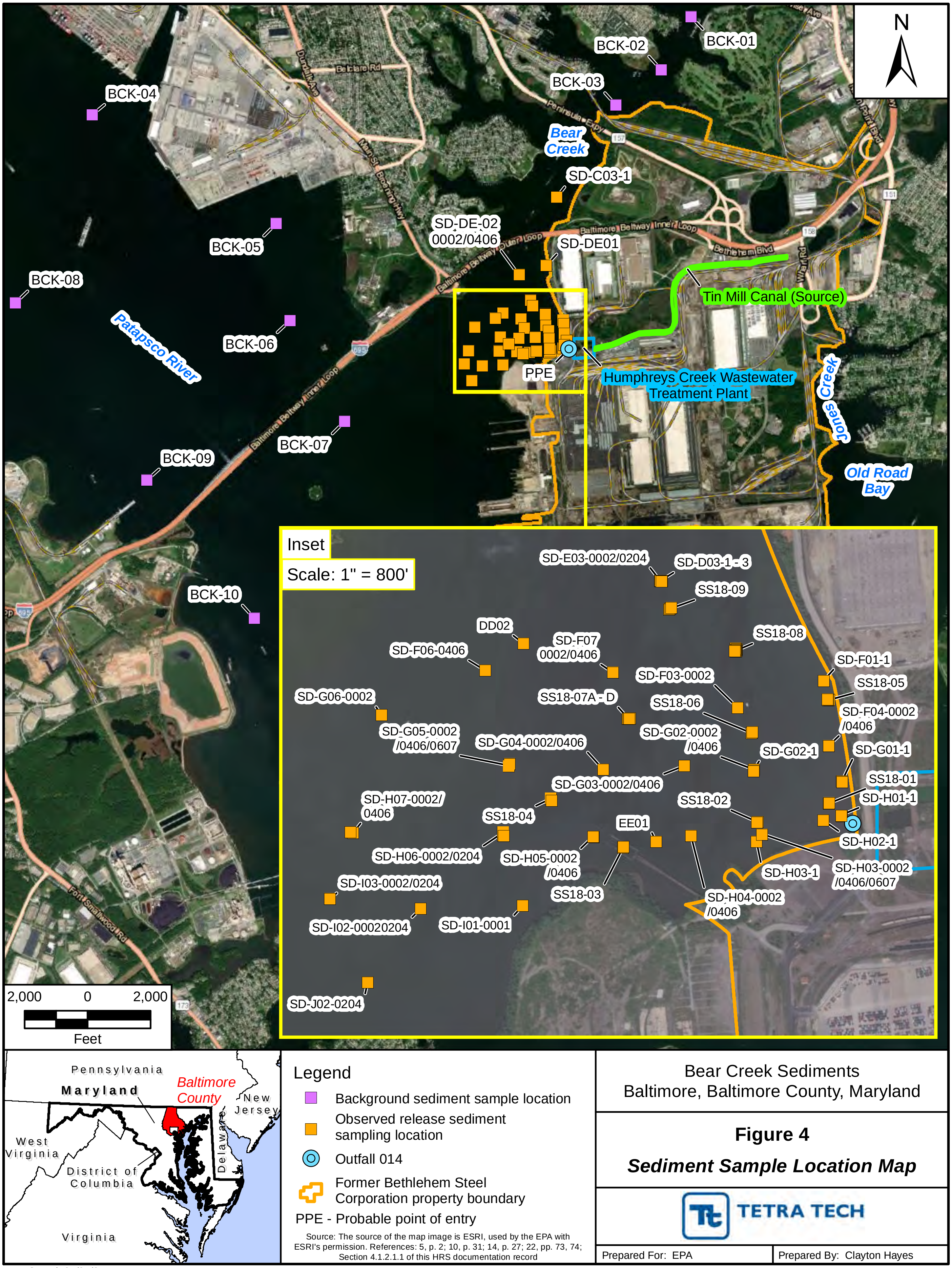

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Coordinate System: NAD 1983 UTM Zone 18N Projection: Transverse Mercator Datum:North American 1983 Units: Meter

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: Source No. 1

Name and description of the source: Tin Mill Canal

Source Type: Other - waste

Description and Location of Source (with reference to a map of the site):

Source 1 is an undefined volume of accumulated waste material in Tin Mill Canal (TMC) that resulted from historical discharges to the canal from numerous steel manufacturing process wastewaters as characterized by samples collected in 2015 and 2016, by EnviroAnalytics, on behalf of Trade Point Atlantic, current property owner of the accumulated waste material in the TMC (Ref. 10, pp. 5, 7, 10; **Figure 2** of this HRS documentation record). Analytical results of the samples showed the presence of PCBs, semivolatile organic compounds (SVOC), particularly PAHs, inorganics, and cyanide (Ref. 10, pp. 42-74 and 85-91).

TMC is approximately 7,700 feet in length, 30 to 50 feet wide and up to 15 feet below grade and bisects the northern portion of the Sparrows Point peninsula from east to west (Ref. 12, p. 34). TMC was constructed between 1950 and 1970 by placing slag that had been generated as part of steel making operations on the peninsula into Humphreys Creek and then digging out TMC from the slag (Ref. 11, pp. 13, 103, 104). TMC was constructed to convey steel manufacturing process wastewater (Ref. 11, p. 103). Prior to 1969, TMC discharged directly into Humphreys Creek (Ref. 11, p. 113; 13, pp. 57, 58, 60). Historically, Humphreys Creek was an open water body that flowed into Bear Creek (Refs. 8, p. 99; 12, pp. 35, 46, 61; 13, pp. 152-156, 181-185). By 1969, Humphreys Creek was completely filled with slag and enclosed to create Humphreys Impoundment and the construction of TMC was complete (Refs. 11, pp. 13; 16, 152; 12, p. 35; 13, pp. 21, 52). Industrial wastewater discharge pipes into Humphreys Creek were routed to TMC and conveyed to the newly constructed Humphreys Creek Wastewater Treatment Plant (HCWWTP) (Ref. 11, pp. 103, 105, 152; 12 p. 35). TMC accepted process wastewaters from all finishing mills at the facility. These wastewaters typically contained waste oil (e.g., rolling oil, lubricating oils and hydraulic oils), pickling rinsewaters, alkaline wastewaters and mill scale. The treatment of the wastewaters at HCWWTP consisted of pH adjustment with spent pickle liquor and lime, mixing, aeration, flocculation (polymer addition), and sedimentation prior to discharge at Outfall 014 (Ref. 11, pp. 64, 65). The HCWWTP utilizes an ACTIFLO® microsand ballasted clarification process (Ref. 8, p. 93). Stormwater is treated to reduce metals, oil and grease, and total suspended solids (TSS) in accordance with the current individual NPDES permit requirements at Outfall 014 (Refs. 14, pp. 14-16).

Steel manufacturing process wastewaters containing Resource Conservation and Recovery Act (RCRA) Hazardous Waste were conveyed to TMC through up to twenty-three internal discharge/outfall pipes from the various process areas throughout the steel manufacturing facility and included spent pickle liquor (K062); cyanide electroplating slurry, wastewater, and sludge (F007 and F008); chromium wastewater and waste chromic acid (D007); corrosive rinsewater (D002); ammonia lime sludge (K060); and ignitable spent caustic solution (D001); as well as oily waste (Refs. 11, pp. 1, 7, 103, 108-110; 12, pp. 72). These waste streams included oil, grease, suspended solids and metals such as iron, lead, zinc, tin, and chromium (Ref. 11, p. 107). The flow rate of the process wastewaters into TMC was reported as 40,000 gallons per minute (gpm) (Ref. 11, p. 105). In 1988, approximately 1,021 pounds of cyanide were released into Bear Creek from TMC through Outfall 014 (Ref. 11, p. 76). A 1998 report prepared under the Consent Decree identified metals, such as cadmium, chromium, lead, nickel, and zinc, cyanide, and PAHs such as acenaphthene, acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene as well as numerous volatile organic compounds (SVOCs) as chemicals of potential interest associated with TMC based on analytical data of accumulated material in the canal and process knowledge (Refs. 11, pp. 114 and 115; 12, pp. 74 and 75).

In accordance with requirements set forth in Multi-Media Consent Decree (Decree) between Bethlehem Steel Corporation, the United States Environmental Protection Agency, and the Maryland Department of the Environment, modified in accordance with a stipulated order entered into by Sparrows Point LLC and the respective agencies effective July 28, 2014; Administrative Consent Order (ACO) between Sparrows Point Terminal, LLC and the Maryland Department of the Environment; and Settlement Agreement and Covenant Not to Sue (SA) between Sparrows Point Terminal LLC and the United States Environmental Protection Agency, EnviroAnalytics, on behalf of Trade Point Atlantic (property owner), collected samples from TMC to characterize material present in the canal (Ref. 10, pp. 7, 8).

Based on the analysis of the samples (see **Section 2.2.2** of this HRS documentation record) collected from TMC and in accordance with EPA's Statement of Basis and Final Remedy for TMC, impacted sediments in the canal were removed and an engineered cap installed above the sediments left in place to prevent direct contact exposures and support future stormwater conveyance through the TMC (Refs. 18, p. 7; 70, p. 4). Approximately 343 tons of PCB-impacted sediments (PCB concentrations greater than 50 milligrams per kilogram) in TMC were excavated and disposed at an off-site Toxic Substances Control Act (TSCA) regulated facility (Ref. 70, p. 16). Approximately 72,000 cubic yards of oil impacted sediments in TMC were planned to be excavated and disposed off-site or in Greys Landfill; a landfill located on Sparrows Point peninsula (Ref. 19, pp. 7, 8). The Maintenance Cleanup Completion Report for the Tin Mill Canal did not provide a total quantity of non-TSCA regulated sediments removed from TMC and disposed in Greys Landfill. The non-TSCA regulated material was removed to restore the flow capacity of the canal and was excavated to the canal floor elevation based on the historical canal floor elevation, on Drawing 119358 prepared by Bethlehem Steel (dated December 1, 1970) (Ref. 70, p. 7). Following sediment excavation, residual sediment and fill materials were covered with a 2-foot thick (minimum) cap to prevent future direct contact exposure risks and protect water quality in the canal discharging to Bear Creek in compliance with stormwater permit conditions, and to provide a non-erosive canal lining that will facilitate future stormwater conveyance. Additional aggregate fill was placed in the PCB-contaminated sediment removal area, as necessary, to achieve the desired subgrade elevations prior to cap placement. The cap consists of a geotextile filter fabric overlain by finely graded aggregate and rip-rap lining up to the final canal grade (Ref. 70, pp. 17-18). Even though a removal has occurred for the source, it is still eligible because the contamination at the source (waste material in the canal) and associated historic release to surface water have not been completely addressed (i.e., contaminated sediments in Bear Creek; see **Section 4.1.2.1.1**).

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2.2.2 Hazardous Substances Associated with Source

In 2015 and 2016, EnviroAnalytics, on behalf of Trade Point Atlantic, collected samples of the accumulated waste material throughout TMC to provide information to characterize the physical and chemical characteristics of the material contained within the canal and to support development and implementation of a remedial cleanup action for the TMC that is protective of both human health and the environment compliant with requirements of the Resource Conservation and Recovery Act (RCRA), the Maryland Voluntary Cleanup Program (VCP) and other regulatory requirements. The characterization was completed pursuant to a sampling and analysis work plan approved by the Maryland Department of the Environment and United States Environmental Protection Agency on March 24, 2015 and two separate work plan addenda approved by the Maryland Department of the Environment and United States Environmental Protection Agency on August 11, 2015 (Ref. 10, pp. 5, 10, 12).

In April and August 2015, a total of 58 discrete samples were collected from 16 transects along the length of the TMC. The width of the deposited material was measured at each transect location. The depth of the material to the slag bottom of the canal was measured at two locations that represent distances of one third and two thirds across the perpendicular width of the sediment horizon (locations D1 and D2 for each transect). At each of these two locations, a sample was collected from the top foot of the material (shallow discrete sample) and another sample was collected from the bottom foot of the material (deep discrete sample). At some locations, there was not sufficient recovery of material to be able to collect both a shallow and a deep discrete sample (Ref. 10, pp. 12, 13, 32, 76). Collected samples were analyzed for volatile organic compounds (VOCs) and RCRA metals including hexavalent chromium in accordance with EPA SW-846 methods 8260B for VOCs and methods 6010B, 7471A, and 7196A for metals, mercury and hexavalent chromium, respectively (Ref. 10, pp. 12, 13, 894, 906, 962, 1083, 1143, 1199). Additionally, a total of 29 composite samples were collected from each transect (a shallow composite and a deep composite) and analyzed for semivolatile organic compounds (SVOCs) and polychlorinated biphenyl (PCB) aroclors in accordance with EPA SW-846 methods 8270C for SVOCs and 8082 for PCBs (Ref. 10, pp. 12, 13, 1097, 1213). Analytical results were validated at the Stage 2B level in accordance National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.1) and USEPA National Functional Guidelines for Inorganic Superfund Data Review (ISM02.1), USEPA October 2013, (Ref. 10, pp. 887, 898 955, 972, 1076, 1089, 1136, 1149, 1192, and 1205).

Samples were collected using a modified surge block sampling apparatus (suction sampler). The suction sampler consisted of a 2-inch diameter PVC pipe, the surge block (a piece of rubber between two 1 7/8-inch diameter washers), and a 1-inch diameter PVC pipe. The surge block was attached to the end of the 1-inch PVC pipe and secured in place with a nut. As the nut is tightened, the rubber is squeezed outward from between the washers. When the surge block is pushed into the 2-inch PVC pipe, the rubber between the washers creates a seal around the inside of the pipe (Ref. 10, p. 13).

To collect a sample, the suction sampler was driven downward into the material, with the surge block at the bottom of the 2-inch PVC pipe, until the required sampling depth was achieved. Once at the desired sampling depth, the apparatus was withdrawn for one foot, then lowered back down one foot while pulling the surge block up through the interior of the 2-inch pipe. This process pulled the soft sediment into the sampler. The suction sampler was then extracted from the material, tilting it as the bottom reached surface grade. Sample material was then recovered out of the sampler into a plastic bag and distributed as required to sample containers. For composite samples, recovered material was placed into a stainless steel, plastic or other appropriate composition (e.g.: Teflon) bucket and mixed thoroughly to obtain a homogeneous sample. Samples were preserved to 4 degrees Celsius immediately after recovery (Ref. 10, p. 13).

In July 2016, 42 discrete samples were collected and analyzed for PCBs in order to delineate the extent of elevated PCB concentrations surrounding the TM-SD-31 sampling location. These samples were collected between Transect 5 and Transect 7 from the top 12 inches and bottom 12 inches of the material at 21 locations spaced approximately 50 feet apart. These samples are numbered TM-SD-89 through TM-SD-130. These samples were collected from the center of the canal**.** In addition, 11 composite samples were collected and analyzed for SVOCs. These samples were collected from Transect 6 through Transect 16, as these were the locations for which the previous analytical results had unacceptably high reporting limits. The composite sample for a given transect consisted of material collected from the bottom 12 inches of the material at locations approximately one-third and two-thirds across the width of the sediment horizon. Discrete and composite samples were collected using the same methods employed during the investigation that occurred in April and August 2015 (Ref. 10, pp. 16, 42). Collected samples were analyzed in accordance with EPA SW-846 methods 8260C for VOCs, 8270D for SVOCs, 8082A for PCBs, 6020A for metals and 7474A for mercury, respectively (Ref. 10, pp. 1221, 1233, 1288, 1345, 1356). Analytical results were validated at the Stage 2B level in accordance National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.1) and USEPA National Functional Guidelines for Inorganic Superfund Data Review (ISM02.1), USEPA October 2013, (Ref. 10, pp. 1224, 1282, 1340, and 1348).

The table below provides a summary of the description of the material in TMC at the sampling locations for the samples collected as part of the TMC sediment characterization sampling events. Though the samples are referred to as “sediment”, the composition of the samples (e.g. oily, greasy, sludge-like, etc.) are consistent with waste-type material and are being evaluated as waste samples for the purpose of this HRS documentation package (**Table 1** of this HRS documentation record (Ref. 10, pp. 32-40, 42-74, 85-91, 76).

Table 1. Source Sample Location Description
(Source: Reference 10, pages 32-40, 42-74, 76, 85-91)

Transects	Collected Samples	Thickness of Waste Material (feet)		Description of Sampled Material/Sample Location	
		D1	D2	D1	D2
TRANSECT 1	TM-SD-01 TM-SD-03 TM-SD-05[1]	0.17	0.17	Dark black fine silt; oily/greasy; sludge-like. Low sample recovery due to thin sediment before refusal.	Dark black fine silt; oily/greasy; sludge-like. Low sample recovery due to thin sediment before refusal.
TRANSECT 2	TM-SD-06 TM-SD-07 TM-SD-08 TM-SD-09 TM-SD-10[1]	>5.00	>5.00	Dark black fine silt. Oily/greasy. Sludge-like. Sample location is within reed mat; - sample contained minor organic material from root system.	Dark black fine silt; oily/greasy; sludge-like.
TRANSECT 3	TM-SD-11 TM-SD-12 TM-SD-13 TM-SD-14 TM-SD-15[1]	>5.00	>5.00	Dark black fine silt; oily/greasy; sludge-like.	Dark black fine silt; oily/greasy; sludge-like.
TRANSECT 4	TM-SD-16 TM-SD-17 TM-SD-18 TM-SD-19 TM-SD-20[1]	>5.00	>5.00	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 5	TM-SD-21 TM-SD-22 TM-SD-23 TM-SD-24 TM-SD-25[1] TM-SD-103 TM-SD-104 TM-SD-105 TM-SD-106	>5.00	>5.00	Top 5" black dry-ish silt. Sample is dark black fine silt; oily/greasy; sludge-like.	Top 5" black dry-ish silt. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 6	TM-SD-27 TM-SD-28 TM-SD-29 TM-SD-30 TM-SD-31[1] TM-SD-108 TM-SD-110 TM-SD-112 TM-SD-114 TM-SD-115 TM-SD-116 TM-SD-117 TM-SD-118 TM-SD-120 TM-SD-122 TM-SD-123 TM-SD-124	>5.00	>5.00	Top 5" black dry-ish silt. Sample is dark black fine silt; oily/greasy; sludge-like.	Top 5" black dry-ish silt. Sample is dark black fine silt; oily/greasy; sludge-like.

Table 1. Source Sample Location Description
(Source: Reference 10, pages 32-40, 42-74, 76, 85-91)

Transects	Collected Samples	Thickness of Waste Material (feet)		Description of Sampled Material/Sample Location	
		D1	D2	D1	D2
	TM-SD-125 TM-SD-126 TM-SD-127 TM-SD-128				
TRANSECT 7	TM-SD-32 TM-SD-34 TM-SD-35 TM-SD-36[1]	>5.00	>5.00	Dark black fine silt; oily/greasy; sludge-like.	Top 5" black dry-ish silt. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 8	TM-SD-37 TM-SD-39 TM-SD-41[1]	>5.00	>5.00	Dark black fine silt; oily/greasy; sludge-like. Shoreline is stained black (oil?). Just upstream from skimmer.	Dark black fine silt; oily/greasy; sludge-like. Shoreline is stained black (oil?)
TRANSECT 9	TM-SD-42 TM-SD-43 TM-SD-44 TM-SD-46[1]	>5.00	>5.00	Top 5" black dry-ish silt. Sample is dark black fine silt; oily/greasy; sludge-like. Sample contains minor organic matter - roots.	Dark black fine silt; oily/greasy; sludge-like.
TRANSECT 10	TM-SD-47 TM-SD-48 TM-SD-49 TM-SD-50 TM-SD-51[1]	>5.00	>5.00	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.	Dark black fine silt; oily/greasy; sludge-like.
TRANSECT 11	TM-SD-53 TM-SD-54 TM-SD-55 TM-SD-56 TM-SD-57[1]	>5.00	>5.00	Top 6" is brown silt below which is dark black fine silt; oily/greasy; sludge-like.	Top 3" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 12	TM-SD-58 TM-SD-59 TM-SD-60 TM-SD-61 TM-SD-62[1]	>5.00	>5.00	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 13	TM-SD-63 TM-SD-64 TM-SD-65 TM-SD-66 TM-SD-67[1]	>5.00	>5.00	Top 5" is black silt below which is dark black fine silt; oily/greasy; sludge-like.	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 14	TM-SD-68 TM-SD-69 TM-SD-70 TM-SD-72[1]	>5.00	>5.00	Top 5" is black silt below which is dark black fine silt; oily/greasy; sludge-like. Able to walk out onto "mud mat" for sample collection.	Top 5" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like. Sample collected by walking out onto reed mat.
TRANSECT 15	TM-SD-73 TM-SD-74 TM-SD-75 TM-SD-76 TM-SD-77[1]	>5.00	>5.00	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.	Top 3" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.
TRANSECT 16	TM-SD-79 TM-SD-80 TM-SD-81 TM-SD-82 TM-SD-83[1]	>5.00	>5.00	Top 4" is black silt with some organic material (roots) in sample. Sample is dark black fine silt; oily/greasy; sludge-like.	Dark black fine silt; oily/greasy; sludge-like.

[1] Indicates composite sample. For each transect, sediment from the two shallow samples were thoroughly mixed to produce a shallow composite sample, and sediment from the two deep discrete samples were thoroughly mixed to produce a deep composite sample (Ref. 10, p. 12).

Analytical results from samples collected of the waste material in TMC in 2015 and 2016 are summarized in **Tables 2 and 3** and are used to characterize Source 1.

Table 2. TMC Waste Samples – Organic Hazardous Substances

Sample ID	Transect	Depth (feet)	Date	Hazardous Substance	Concentration[1,2] (µg/kg)	Adjusted MDL (µg/kg)	References
TM-SD-05	1	0-0.5	4/14/15	Arolcor-1248	125J	96.3	10, pp. 42, 200, 912
TM-SD-15	3	0-1	4/16/15	Aroclor-1254	614J	321	10, pp. 46, 201, 932
TM-SD-20	4	2-6	8/12/15	Aroclor-1242	3300	187	10, pp. 48, 547, 1172
				Aroclor-1254	1480	138	10, pp. 48, 547, 1172
TM-SD-25	5	3-4.5	8/12/15	Aroclor-1242	1760	126	10, pp. 50, 547, 1179
				Aroclor-1254	762	92.8	10, pp. 50, 547, 1179
TM-SD-103	5	0-1	10/27/16	Aroclor-1248	8020J[3]	542	10, p. 89, 821, 1324
				Aroclor-1260	1180J[3]	542	10, p. 89, 821, 1324
				Arolcor-1268	3660J[3]	542	10, p. 89, 821, 1324
TM-SD-104	5	4-5	10/27/16	Aroclor-1248	1630J[3]	533	10, p. 89, 822, 1325
TM-SD-105	5	0-1	10/27/16	Aroclor-1248	8670J[3]	765	10, p. 89, 821, 1322
				Arolcor-1260	3130J[4]	765	10, p. 89, 821, 1322
TM-SD-106	5	4-5	10/27/16	Arolor-1248	2380J[3]	490	10, p. 89, 821, 1323
TM-SD-108	6	7-8	10/27/16	Aroclor-1248	7500J[3]	516	10, p. 89, 821, 1319
				Arolcor-1260	1190	516	10, p. 89, 821, 1319
TM-SD-110	6	4-5	10/27/16	Aroclor-1248	6930J[3]	704	10, p. 89, 821, 1321
				Arolcor-1260	6000J[4]	704	10, p. 89, 821, 1321
TM-SD-112	6	4-5	10/27/16	Aroclor-1248	5140J[3]	753	10, p. 90, 821, 1317
				Arolcor-1260	2020	753	10, p. 90, 821, 1317
TM-SD-114	6	4-5	10/26/16	Aroclor-1248	2960J[3]	476	10, p. 90, 820, 1315
				Arolcor-1260	1170J[4]	476	10, p. 90, 820, 1315
TM-SD-115	6	0-1	10/26/16	Aroclor-1248	4260J[3]	486	10, p. 90, 820, 1312
				Arolcor-1260	1380	486	10, p. 90, 820, 1312
TM-SD-116	6	4-5	10/26/16	Aroclor-1248	7840J[3]	508	10, p. 90, 820, 1313
				Arolcor-1260	5060J[4]	508	10, p. 90, 820, 1313
TM-SD-117	6	0-1	10/26/16	Arolocr-1248	1440J[3]	727	10, p. 90, 820, 714, 715, 717, 1310
TM-SD-118	6	6-7	10/26/16	Aroclor-1248	343000J[4]	4790	10, p. 90, 820, 1311
				Arolcor-1260	9950J[3]	4790	10, p. 90, 820, 1311
TM-SD-120	6	7-8	10/26/16	Aroclor-1248	346000J[3]	5780	10, p. 90, 820, 1308
				Arolcor-1260	11300J[3]	5780	10, p. 90, 820, 1308
TM-SD-122	6	5.5-6.5	10/26/16	Aroclor-1248	34000J[3,4]	594	10, p. 91, 820, 1306
				Arolcor-1260	2380J[3]	594	10, p. 91, 820, 1306
TM-SD-123	6	0-1	10/26/16	Aroclor-1248	1490J[3]	719	10, p. 91, 819, 1303
TM-SD-124	6	7.5-8.5	10/26/16	Aroclor-1248	202000J[3]	3810	10, p. 91, 819, 1304
				Arolcor-1260	11500J[3]	3810	10, p. 91, 819, 1304
TM-SD-125	6	0-1	10/26/16	Aroclor-1248	1620J[3]	754	10, p. 91, 819, 1299
				Arolcor-1260	1170J[3]	754	10, p. 91, 819, 1299

Table 2. TMC Waste Samples – Organic Hazardous Substances

Sample ID	Transect	Depth (feet)	Date	Hazardous Substance	Concentration[1,2] (µg/kg)	Adjusted MDL (µg/kg)	References
TM-SD-126	6	5-6	10/26/16	Aroclor-1248	5210J[3]	592	10, p. 91, 819, 1300
				Arolcor-1260	1530J[3]	592	10, p. 91, 819, 1300
TM-SD-127	6	0-1	10/2616	Aroclor-1248	959J[3]	586	10, p. 91, 819, 1297
TM-SD-128	6	4.5-5.5	10/26/16	Aroclor-1248	3750J[3]	528	10, p. 91, 819, 1298
				Arolcor-1260	1810J[3]	528	10, p. 91, 819, 1298
TM-SD-129	7	0-1	10/26/16	Aroclor-1248	880J[3]	532	10, p. 91, 819, 1301
TM-SD-130	7	4.5-5.5	10/26/16	Aroclor-1248	2190J[3]	571	10, p. 91, 819, 1302
				Arolcor-1260	1390J[3]	571	10, p. 91, 819, 1302
TM-SD-31	6	2-4	8/12/15	Aroclor-1242	233000	200	10, pp. 52, 548, 1189
TM-SD-31	6	1-5	10/27/16	Anthracene	230J	84.4	10, p. 85, 711, 1267
				Benzo(b)fluoranthene	286J	70.8	10, p. 85, 711, 1267
				Benzo(k)fluoranthene	138J	70.1	10, p. 85, 711, 1267
				Benzo(a)pyrene	251J	79.6	10, p. 85, 711, 1267
				Fluoranthene	584J	124	10, p. 85, 711, 1267
				Fluorene	483J	45.4	10, p. 85, 711, 1267
				Naphthalene	1160	60.9	10, p. 85, 711, 1267
TM-SD-36	7	5.5-6.5	8/13/15	Aroclor-1242	3300J	836	10, p. 54, 464, 1102
				Aroclor-1254	4800	618	10. p. 54, 464, 1102
TM-SD-36	7	1-5	10/26/16	Anthracene	2080	79.5	10, p. 85, 710, 1266
				Acenaphthene	3500	71.8	10, p. 85, 710, 1266
				Benzo(b)fluoranthene	1570	66.7	10, p. 85, 710, 1266
				Benzo(k)fluoranthene	2120	66.1	10, p. 85, 710, 1266
				Benzo(a)pyrene	2560	75	10, p. 85, 710, 1266
				Dibenzo(a,h)anthracene	275J	66.1	10, p. 85, 710, 1266
				Fluoranthene	9370	117	10, p. 85, 710, 1266
				Fluorene	3540	42.8	10, p. 85, 710, 1266
				Indeno(1,2,3-cd)pyrene	1500	183	10, p. 85, 710, 1266
				Naphthalene	3090	57.4	10, p. 85, 710, 1266
TM-SD-41	8	1-4	10/26/16	Anthracene	1240	82	10, p. 85, 710, 1265
				Acenaphthene	1130	74.1	10, p. 85, 710, 1265
				Benzo(b)fluoranthene	586J	68.8	10, p. 85, 710, 1265
				Benzo(k)fluoranthene	501J	68.1	10, p. 85, 710, 1265
				Benzo(a)pyrene	870	77.4	10, p. 85, 710, 1265
				Fluoranthene	3680	121	10, p. 85, 710, 1265
				Fluorene	1290	44.2	10, p. 85, 710, 1265
				Indeno(1,2,3-cd)pyrene	600J	188	10, p. 85, 710, 1265
				Naphthalene	7230	59.2	10, p. 85, 710, 1265
TM-SD-46	9	2.5-6.5	11/20/16	Anthracene	1700	43.6	10, p. 85, 886, 1370
				Acenaphthene	763	39.4	10, p. 85, 886, 1370
				Benzo(b)fluoranthene	2240	36.6	10, p. 85, 886, 1370
				Benzo(k)fluoranthene	1610	36.2	10, p. 85, 886, 1370

Table 2. TMC Waste Samples – Organic Hazardous Substances

Sample ID	Transect	Depth (feet)	Date	Hazardous Substance	Concentration[1,2] (µg/kg)	Adjusted MDL (µg/kg)	References
TM-SD-46	9	2.5-6.5	11/20/16	Benzo(a)pyrene	3200	41.2	10, p. 85, 886, 1370
				Dibenzo(a,h)anthracene	351J	36.2	10, p. 85, 886, 1370
				Fluoranthene	6190	64.4	10, p. 85, 886, 1370
				Fluorene	2740	23.5	10, p. 85, 886, 1370
				Indeno(1,2,3-cd)pyrene	1420	100	10, p. 85, 886, 1370
				Naphthalene	12600	31.5	10, p. 85, 886, 1370
TM-SD-51	10	0-1	8/13/15	Arolcor-1254	3820J	606	10, p. 60, 464, 1114
TM-SD-51	10	7-8	11/20/16	Anthracene	9900	51.3	10, p. 85, 886, 1369
				Acenaphthene	10700	46.3	10, p. 85, 886, 1369
				Benzo(b)fluoranthene	6170	43	10, p. 85, 886, 1369
				Benzo(k)fluoranthene	5020	42.6	10, p. 85, 886, 1369
				Benzo(a)pyrene	10300	48.4	10, p. 85, 886, 1369
				Dibenzo(a,h)anthracene	1040	42.6	10, p. 85, 886, 1369
				Fluoranthene	28600	75.7	10, p. 85, 886, 1369
				Fluorene	4660	27.6	10, p. 85, 886, 1369
				Indeno(1,2,3-cd)pyrene	4080	118	10, p. 85, 886, 1369
				Naphthalene	1190	37	10, p. 85, 886, 1369
TM-SD-57	11	4-6	11/20/16	Anthracene	1040	93.2	10, p. 87, 886, 1368
				Acenaphthene	1920	84.2	10, p. 87, 886, 1368
				Benzo(b)fluoranthene	1050	78.2	10, p. 87, 886, 1368
				Benzo(k)fluoranthene	477J	77.4	10, p. 87, 886, 1368
				Benzo(a)pyrene	1370	88	10, p. 87, 886, 1368
				Fluoranthene	5160	138	10, p. 87, 886, 1368
				Fluorene	1770	50.2	10, p. 87, 886, 1368
				Indeno(1,2,3-cd)pyrene	262J	214	10, p. 87, 886, 1368
TM-SD-62	12	3.5-4.5	8/13/15	Aroclor-1254	3700J	652	10, p. 64, 464, 1119
TM-SD-62	12	3-4	10/26/16	Anthracene	691	81.3	10, p. 87, 712, 1264
				Benzo(b)fluoranthene	1000	68.2	10, p. 87, 712, 1264
				Benzo(k)fluoranthene	621J	67.6	10, p. 87, 712, 1264
				Benzo(a)pyrene	919	76.7	10, p. 87, 712, 1264
				Fluoranthene	3780	120	10, p. 87, 712, 1264
				Fluorene	1210	43.8	10, p. 87, 712, 1264
				Indeno(1,2,3-cd)pyrene	712	187	10, p. 87, 712, 1264
				Naphthalene	553J	58.7	10, p. 87, 712, 1264
TM-SD-67	13	5-7	8/13/15	Aroclor-1254	2960J	644	10, p. 66, 465, 1128
TM-SD-67	13	0-6.5	10/26/16	Anthracene	1420	104	10, p. 87, 712, 1263
				Acenaphthene	1060	93.8	10, p. 87, 712, 1263
				Benzo(b)fluoranthene	1020	87.1	10, p. 87, 712, 1263
				Benzo(k)fluoranthene	902	86.3	10, p. 87, 712, 1263
				Benzo(a)pyrene	1070	98	10, p. 87, 712, 1263
				Dibenzo(a,h)anthracene	172J	86.3	10, p. 87, 712, 1263

Table 2. TMC Waste Samples – Organic Hazardous Substances

Sample ID	Transect	Depth (feet)	Date	Hazardous Substance	Concentration[1,2] (µg/kg)	Adjusted MDL (µg/kg)	References
TM-SD-67	13	0-6.5	10/26/16	Fluoranthene	4160	153	10, p. 87, 712, 1263
				Fluorene	2750	56	10, p. 87, 712, 1263
				Indeno(1,2,3-cd)pyrene	912	239	10, p. 87, 712, 1263
				Naphthalene	3450	75	10, p. 87, 712, 1263
TM-SD-72	14	0.5-4.5	10/26/16	Anthracene	2530J[5]	190	10, p. 87, 712, 1262
				Acenaphthene	4140J[5]	172	10, p. 87, 712, 1262
				Benzo(b)fluoranthene	935J[2,5]	160	10, p. 87, 712, 1262
				Benzo(k)fluoranthene	760J[2,5]	158	10, p. 87, 712, 1262
				Benzo(a)pyrene	1280J[2,5]	180	10, p. 87 712, 1262
				Fluoranthene	6080J[5]	281	10, p. 87, 712, 1262
				Fluorene	5740J[5]	103	10, p. 87, 712, 1262
				Indeno(1,2,3-cd)pyrene	1090J[2,5]	438	10, p. 87, 712, 1262
				Naphthalene	137000J[5]	138	10, p. 87, 712, 1262
TM-SD-77	15	3-6	8/14/15	Aroclor-1242	3290J[7]	416	10, p. 70, 609; 80, p. 8
				Aroclor-1254	2790J[6]	307	10, p. 70, 609; 80, p. 8
TM-SD-77	15	3-4	10/26/16	Anthracene	1470	106	10, p. 87, 712, 1261
				Acenaphthene	1040	95.7	10, p. 87, 712, 1261
				Benzo(b)fluoranthene	1290	88.8	10, p. 87, 712, 1261
				Benzo(k)fluoranthene	917	88	10, p. 87, 712, 1261
				Benzo(a)pyrene	1310	100	10, p. 87, 712, 1261
				Fluoranthene	4730	156	10, p. 87, 712, 1261
				Fluorene	3050	57.1	10, p. 87, 712, 1261
				Indeno(1,2,3-cd)pyrene	1030	243	10, p. 87, 712, 1261
				Naphthalene	4130	76.5	10, p. 87, 712, 1261
TM-SD-83	16	5-6.5	8/14/15	Aroclor-1242	2800J[7]	281	10, p. 72, 609; 80, p. 15
				Aroclor-1254	1200J	207	10, p. 72, 609; 80, p. 15
TM-SD-83	16	0.5-3	10/26/16	Anthracene	206J	81.4	10, p. 87, 712, 1260
				Benzo(b)fluoranthene	169J	68.2	10, p. 87, 712, 1260
				Benzo(k)fluoranthene	239J	67.6	10, p. 87, 712, 1260
				Benzo(a)pyrene	312J	76.8	10, p. 87, 712, 1260
				Fluoranthene	1020	120	10, p. 87, 712, 1260
				Indeno(1,2,3-cd)pyrene	436J	187	10, p. 87, 712, 1260
				Naphthalene	1200	58.7	10, p. 87, 712, 1260

Notes:

- [1]Although the results are qualified as estimated, the presence of the analytes is not in question.
- [2] J Qualified data, unless otherwise indicated, indicates the compound was qualitatively identified at concentrations below their respective RLs. No bias is associated with this data (Ref. 10, pp. 905, 1096, 1212, 1232, 1286, 1287, 1355).
- [3] The continuing calibration precision criterion (the percent difference between initial and continuing CFs ≤15 percent) was exceeded for the polychlorinated biphenyls continuing calibration standards presented in Table 2 above. Positive results for these analytes have been marked with "J" qualifiers to indicate that they are quantitative estimates (Ref. 10, pp. 714, 715, 717, 1284, 1291-1294).
- [4] Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. The laboratory for reporting purposes used the higher concentration for these analytes. The results for the polychlorinated biphenyls have been marked with "J" qualifiers to indicate that they are quantitative estimates (Ref. 10, p. 1286).
- [5] The moisture content for this sample was greater than 70 percent (74.0%). Positive results have been marked with "J" qualifiers to indicate that they are estimates. Positive results may be higher than reported (Ref. 10, p. 1232).

- [6] A lack of precision (greater than 40 % difference between results) was observed for this analyte on the dual chromatographic columns used for sample analysis. The laboratory for reporting purposes used the lower concentration for these analytes. The results have been marked with "J" qualifiers to indicate that they are quantitative estimates (Ref. 10, p. 1211).
- [7] The PCB initial calibration verification criterion (the percent recovery ± 20 percent) was exceeded for the initial calibration verification standards. The positive results for this analytes are considered biased high quantitative estimates, and may be lower than reported. This has been indicated by placing "J" qualifiers next to the quantitative results (Ref. 10, p. 1209).
- MDL = Method Detection Limit - It is the minimum result which can be reliably discriminated from a blank with a predetermined confidence level (Ref. 75, p. 1), a statistical calculation below the point of calibration (Ref. 76, p. 2). The adjusted MDL represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable (Ref. 10, p. 195, 459, 543, 606, 706, 815, and 882) and is specific to each sample, adjusted for its weight/volume, %Solids and dilution factor (Ref. 75, p. 1). The samples were analyzed by non-CLP laboratories. The adjusted MDLs presented above are equivalent to the HRS-defined method detection limit as defined by HRS Section 1.1 (Ref. 1, Sections 1.1 and 2.3).
- µg/kg = micrograms per kilogram
- RL = Reporting Limit - A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix. It must be at or above the concentration of lowest calibration standard (Refs. 75, p. 1), limit of detection for a specific target analyte for a specific sample after any adjustments have been made for dilutions or percent moisture at the lowest point on the calibration curve (Ref. 76, p. 2).

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-01	1	0-0.5	4/14/15	Cadmium	3J[3]	0.065	10, pp. 42, 200, 909
				Chromium	809	0.075	10, pp. 42, 200, 909
				Lead	138J-[4]	0.41	10, pp. 42, 200, 909
				Selenium	7.9	0.51	10, pp. 42, 200, 909
				Silver	1.3	0.054	10, pp. 42, 200, 909
				Zinc	773J[3]	0.37	10, pp. 42, 200, 909
				Mercury	0.12J-[4]	0.0027	10, pp. 42, 200, 909
TM-SD-03	1	0-0.5	4/14/15	Cadmium	14.9J[3]	0.071	10, pp. 42, 200, 911
				Chromium	379	0.082	10, pp. 42, 200, 911
				Lead	198J-[4]	0.45	10, pp. 42, 200, 911
				Selenium	18.2	0.56	10, pp. 42, 200, 911
				Silver	20.2	0.059	10, pp. 42, 200, 911
				Zinc	4280J[3]	0.41	10, pp. 42, 200, 911
				Mercury	0.21J-[4]	0.0033	10, pp. 42, 200, 911
TM-SD-06	2	0-1	4/14/15	Cadmium	0.36J[3]	0.068	10, pp. 44, 200, 915
				Chromium	467	0.079	10, pp. 44, 200, 915
				Lead	64J-[4]	0.43	10, pp. 44, 200, 915
				Selenium	1	0.54	10, pp. 42, 200, 916
				Silver	2.2	0.057	10, pp. 42, 200, 916
				Zinc	1070J[3]	0.39	10, pp. 42, 200, 916
				Mercury	0.38J-[4]	0.0034	10, pp. 42, 200, 916
TM-SD-07	2	4-5	4/14/14	Cadmium	0.69J[3]	0.061	10, pp. 44, 200, 917
				Chromium	263	0.070	10, pp. 44, 200, 917
				Lead	80.8J-[4]	0.39	10, pp. 44, 200, 917
				Selenium	1.3	0.48	10, pp. 44, 200, 917
				Silver	2.9	0.051	10, pp. 44, 200, 917
				Zinc	1240J[3]	0.35	10, pp. 44, 200, 918
				Mercury	0.28J-[4]	0.003	10, pp. 44, 200, 918
TM-SD-08	2	0-1	4/14/15	Cadmium	4.4J[3]	0.078	10. pp. 44, 200, 919
				Chromium	347	0.090	10. pp. 44, 200, 919
				Lead	291J-[4]	0.49	10. pp. 44, 200, 919
				Selenium	1.5	0.61	10. pp. 44, 200, 919
				Silver	4.5	0.065	10. pp. 44, 200, 919
				Zinc	7400J[3]	4.5	10. pp. 44, 200, 919
				Mercury	0.36J-[4]	0.0029	10. pp. 44, 200, 920
TM-SD-09	2	4-5	4/14/15	Chromium	368	0.061	10, p. 44, 200, 921
				Lead	27.3J-[4]	0.31	10, p. 44, 200, 921
				Selenium	1.4	0.42	10, p. 44, 200, 921
				Silver	2.4	0.044	10, p. 44, 200, 921
				Zinc	242J[3]	0.31	10, p. 44, 200, 921
				Mercury	0.026J-[4]	0.0028	10, p. 44, 200, 921

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-10	2	4-5	4/14/15	Cyanide	1J	0.24	10, pp. 44, 200, 926
TM-SD-11	3	0-1	4/15/15	Cadmium	0.78J[3]	0.076	10, pp. 46, 200, 926
				Chromium	538	0.088	10, pp. 46, 200, 926
				Lead	135J-[4]	0.49	10, pp. 46, 200, 926
				Selenium	0.71J	0.6	10, pp. 46, 200, 926
				Silver	4.9	0.063	10, pp. 46, 200, 926
				Zinc	553J[3]	0.44	10, pp. 46, 200, 926
				Mercury	0.39J-[4]	0.0035	10, pp. 46, 200, 926
TM-SD-12	3	3-4	8/12/15	Cadmium	2.4J[3]	0.062	10, p. 46, 547, 1161
				Chromium	1040	0.071	10, p. 46, 547, 1161
				Lead	60.6J[6]	0.39	10, p. 46, 547, 1161
				Selenium	2.2J[3]	0.49	10, p. 46, 547, 1161
				Silver	7.4	0.051	10, p. 46, 547, 1161
				Zinc	1060	0.36	10, p. 46, 547, 1161
				Mercury	0.09J	0.0033	10, p. 46, 547, 1161
TM-SD-13	3	0-1	4/16/15	Chromium	232	0.077	10, pp. 46, 201, 928
				Lead	51.4J-[4]	0.43	10, pp. 46, 201, 928
				Selenium	0.74	0.52	10, pp. 46, 201, 928
				Silver	2.6	0.056	10, pp. 46, 201, 928
				Zinc	293J[3]	0.38	10, pp. 46, 201, 928
				Mercury	0.1J-[4]	0.0031	10, pp. 46, 201, 928
TM-SD-14	3	4-5	4/16/15	Cadmium	0.58J[3]	0.081	10, pp. 46, 201, 930
				Chromium	203	0.094	10, pp. 46, 201, 930
				Lead	163J-[4]	0.52	10, pp. 46, 201, 930
				Selenium	1.2	0.64	10, pp. 46, 201, 930
				Silver	1.6	0.068	10, pp. 46, 201, 930
				Zinc	370J[3]	0.47	10, pp. 46, 201, 930
				Mercury	0.13J-[4]	0.004	10, pp. 46, 201, 930
TM-SD-14	3	3-4	8/12/15	Cadmium	0.97J[3]	0.087	10, p. 46, 547, 1163
				Chromium	261	0.1	10, p. 46, 547, 1163
				Lead	107J[6]	0.55	10, p. 46, 547, 1163
				Selenium	1.5J[3]	0.68	10, p. 46, 547, 1163
				Silver	4.9	0.072	10, p. 46, 547, 1163
				Zinc	516	0.5	10, p. 46, 547, 1163
				Mercury	0.2	0.0034	10, p. 46, 547, 1163
TM-SD-15	3	0-1	4/16/15	Cyanide	4.8J-[5]	0.24	10, pp. 46, 201, 934
TM-SD-15	3	3-4	8/12/15	Cyanide	1.9	0.2	10, p. 46, 547, 1167
TM-SD-16	4	0-1	4/16/15	Cadmium	0.37J[3]	0.079	10, pp. 48, 201, 934
				Chromium	179	0.092	10, pp. 48, 201, 934
				Lead	38.3J-[4]	0.51	10, pp. 48, 201, 934
				Selenium	1.2	0.62	10, pp. 48, 201, 935

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-16	4	0-1	4/16/15	Silver	2.1	0.066	10, pp. 48, 201, 935
				Zinc	272J[3]	0.46	10, pp. 48, 201, 935
				Mercury	0.14J-[4]	0.0033	10, pp. 48, 201, 935
TM-SD-17	4	5-6	8/12/15	Cadmium	1.2J[3]	0.084	10, p. 48, 547, 1168
				Chromium	251	0.097	10, p. 48, 547, 1168
				Lead	81.9J[6]	0.53	10, p. 48, 547, 1168
				Selenium	1.4J[3]	0.66	10, p. 48, 547, 1168
				Silver	9.2	0.07	10, p. 48, 547, 1168
				Zinc	326	0.48	10, p. 48, 547, 1168
				Mercury	0.41	0.0036	10, p. 48, 547, 1168
TM-SD-18	4	0-1	4/16/15	Chromium	317	0.094	10, pp. 48, 201, 936
				Lead	51.3J-[4]	0.52	10, pp. 48, 201, 936
				Selenium	0.98	0.64	10, pp. 48, 201, 936
				Silver	2.7	0.068	10, pp. 48, 201, 937
				Zinc	546J[3]	0.47	10, pp. 48, 201, 937
				Mercury	0.041J-[4]	0.0036	10, pp. 48, 201, 937
TM-SD-19	4	2-3	8/12/15	Cadmium	1.2J[3]	0.097	10, pp. 48, 547, 1170
				Chromium	207	0.11	10, pp. 48, 547, 1170
				Lead	121J[6]	0.62	10, pp. 48, 547, 1170
				Selenium	1.7J[3]	0.76	10, pp. 48, 547, 1170
				Silver	8.3	0.081	10, pp. 48, 547, 1170
				Zinc	212	0.56	10, pp. 48, 547, 1170
				Mercury	0.28	0.0048	10, pp. 48, 547, 1170
TM-SD-20	4	0-1	4/16/15	Cyanide	2.3J-[5]	0.24	10, p. 48, 201, 941
TM-SD-20	4	2-6	8/12/15	Cyanide	4.9	0.4	10, p. 48, 547, 1174
TM-SD-21	5	0-1	4/16/15	Chromium	685	0.1	10, pp. 50, 201, 941
				Lead	78.7J-[4]	0.56	10, pp. 50, 201, 941
				Selenium	1.6	0.69	10, pp. 50, 201, 941
				Silver	5.1	0.073	10, pp. 50, 201, 941
				Zinc	331J[3]	0.5	10, pp. 50, 201, 941
				Mercury	0.42J-[4]	0.0032	10, pp. 50, 201, 942
TM-SD-22	5	4-5	4/16/15	Chromium	399	0.077	10, pp. 50, 201, 943
				Lead	48.6J-[4]	0.42	10, pp. 50, 201, 943
				Selenium	1.4	0.52	10, pp. 50, 201, 943
				Silver	2.9	0.055	10, pp. 50, 201, 943
				Zinc	379J[3]	0.38	10, pp. 50, 201, 943
				Mercury	0.56J-[4]	0.0059	10, pp. 50, 201, 943
TM-SD-22	5	3-4	8/12/15	Cadmium	0.59J[3]	0.069	10, p. 50, 547, 1175
				Chromium	411	0.08	10, p. 50, 547, 1175
				Lead	57.7J[6]	0.44	10, p. 50, 547, 1175

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-22	5	3-4	8/12/15	Selenium	1.6J[3]	0.54	10, p. 50, 547, 1175
				Silver	7.6	0.058	10, p. 50, 547, 1175
				Zinc	157	0.4	10, p. 50, 547, 1175
				Mercury	0.33	0.0029	10, p. 50, 547, 1175
TM-SD-23	5	0-1	4/16/15	Chromium	236	0.084	10, pp. 50, 201, 945
				Lead	68.5J-[4]	0.46	10, pp. 50, 201, 945
				Selenium	0.99	0.57	10, pp. 50, 201, 945
				Silver	5.3	0.061	10, pp. 50, 201, 945
				Zinc	50.8J[3]	0.42	10, pp. 50, 201, 945
				Mercury	0.23J-[4]	0.0032	10, pp. 50, 201, 945
TM-SD-24	5	3.5-4.5	8/12/15	Cadmium	0.8J[3]	0.1	10, p. 50, 547, 1177
				Chromium	173	0.12	10, p. 50, 547, 1177
				Lead	53.7J[6]	0.65	10, p. 50, 547, 1177
				Selenium	2.1J[3]	0.8	10, p. 50, 547, 1177
				Silver	8.4	0.085	10, p. 50, 547, 1177
				Zinc	67.2	0.59	10, p. 50, 547, 1177
				Mercury	0.48	0.0034	10, p. 50, 547, 1177
TM-SD-25	5	0-1	4/16/15	Cyanide	1.4J-[5]	0.26	10, pp. 50, 202, 950
TM-SD-25	5	3-4.5	8/12/15	Cyanide	1.9	0.22	10, p. 50, 547, 1181
TM-SD-27	6	0-1	4/17/15	Cadmium	1.2	0.072	10, p. 52, 375, 1052
				Chromium	713	0.083	10, p. 52, 375, 1052
				Lead	160J+[6]	0.46	10, p. 52, 375, 1052
				Selenium	1.5	0.56	10, p. 52, 375, 1052
				Silver	13.7	0.059	10, p. 52, 375, 1052
				Zinc	454	0.41	10, p. 52, 375, 1052
				Mercury	1.1	0.0072	10, p. 52, 375, 1052
TM-SD-28	6	3-4	8/12/15	Cadmium	1.5J[3]	0.14	10, p. 52, 548, 1185
				Chromium	569	0.16	10, p. 52, 548, 1185
				Lead	166J[6]	0.86	10, p. 52, 548, 1185
				Selenium	2.3J[3]	1.1	10, p. 52, 548, 1185
				Silver	15.4	0.11	10, p. 52, 548, 1185
				Zinc	345	0.78	10, p. 52, 548, 1185
				Mercury	0.83	0.0085	10, p. 52, 548, 1185
TM-SD-29	6	0-1	4/20/15	Cadmium	0.74	0.11	10, p. 52, 372, 1002
				Chromium	524	0.13	10, p. 52, 372, 1002
				Lead	90.1J+[6]	0.72	10, p. 52, 372, 1002
				Selenium	6.8	0.89	10, p. 52, 372, 1002
				Silver	9.2	0.094	10, p. 52, 372, 1002
				Zinc	1030	0.65	10, p. 52, 372, 1002
				Mercury	0.56	0.0058	10, p. 52, 372, 1002

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-30	6	2-3	8/12/15	Cadmium	0.96J[3]	0.066	10, p. 52, 548, 1187
				Chromium	303	0.077	10, p. 52, 548, 1187
				Lead	75J[6]	0.42	10, p. 52, 548, 1187
				Selenium	1.8J[3]	0.52	10, p. 52, 548, 1187
				Silver	5.4	0.055	10, p. 52, 548, 1187
				Zinc	133	0.38	10, p. 52, 548, 1187
				Mercury	0.2	0.003	10, p. 52, 548, 1187
TM-SD-31	6	0-1	4/20/15	Cyanide	0.88J-[4]	0.38	10, p. 52, 373, 1036
TM-SD-31	6	2-4	8/12/15	Cyanide	4.5	0.26	10, p. 52, 548, 1191
TM-SD-32	7	0-1	4/17/15	Cadmium	1.2	0.1	10, p. 54, 375, 1054
				Chromium	347	0.12	10, p. 54, 375, 1054
				Lead	114J+[6]	0.66	10, p. 54, 375, 1054
				Selenium	1.1	0.81	10, p. 54, 375, 1054
				Silver	9.1	0.086	10, p. 54, 375, 1054
				Zinc	559	0.59	10, p. 54, 375, 1054
				Mercury	0.32	0.0046	10, p. 54, 375, 1054
TM-SD-34	7	0-1	4/20/15	Chromium	425	0.092	10, p. 54, 372, 1000
				Lead	40.3J+[6]	0.51	10, p. 54, 372, 1000
				Selenium	1.6	0.62	10, p. 54, 372, 1000
				Silver	9.2	0.066	10, p. 54, 372, 1000
				Zinc	315	0.46	10, p. 54, 372, 1000
				Mercury	0.16J	0.0044	10, p. 54, 372, 1000
TM-SD-35	7	5.5-6.5	8/13/15	Cadmium	3J[3]	0.1	10, p. 54, 464, 1100
				Chromium	333	0.12	10, p. 54, 464, 1100
				Lead	146J[6]	0.64	10, p. 54, 464, 1100
				Selenium	3.1J[3]	0.79	10, p. 54, 464, 1100
				Silver	9.2	0.084	10, p. 54, 464, 1100
				Zinc	281J[7]	0.58	10, p. 54, 464, 1100
				Mercury	0.63	0.0038	10, p. 54, 464, 1100
TM-SD-36	7	0-1	4/20/15	Cyanide	0.44J-[4]	0.24	10, p. 54, 373, 1033
TM-SD-36	7	5.5-6.5	8/13/15	Cyanide	4.3	0.32	10, p. 54, 464, 1104
TM-SD-37	8	0-1	4/20/15	Chromium	366	0.1	10, p. 56, 372, 998
				Lead	48.6J+[6]	0.57	10, p. 56, 372, 998
				Selenium	1.8	0.71	10, p. 56, 372, 998
				Silver	8.8	0.075	10, p. 56, 372, 998
				Zinc	364	0.52	10, p. 56, 372, 998
				Mercury	0.23	0.0041	10, p. 56, 372, 999
TM-SD-39	8	0-1	4/20/15	Cadmium	1	0.076	10, p. 56, 372, 996
				Chromium	389	0.088	10, p. 56, 372, 996
				Lead	200J+[6]	0.48	10, p. 56, 372, 996

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-39	8	0-1	4/20/15	Selenium	2	0.6	10, p. 56, 372, 996
				Silver	7.8	0.063	10, p. 56, 372, 997
				Zinc	321	0.44	10, p. 56, 372, 997
				Mercury	0.098J	0.0033	10, p. 56, 372, 998
TM-SD-41	8	0-1	4/20/15	Cyanide	0.45J-[4]	0.23	10, p. 56, 373, 1030
TM-SD-42	9	0-1	4/17/15	Chromium	591	0.098	10, pp. 58, 375, 1055
				Lead	44.8J+[6]	0.54	10, pp. 58, 375, 1056
				Selenium	1.7	0.67	10, pp. 58, 375, 1056
				Silver	9.3	0.071	10, pp. 58, 375, 1056
				Zinc	310	0.49	10, pp. 58, 375, 1056
				Mercury	0.2	0.004	10, pp. 58, 375, 1056
TM-SD-43	9	6-7	8/13/15	Cadmium	2.1J[3]	0.06	10, pp. 58, 464, 1105
				Chromium	1930	0.07	10, pp. 58, 464, 1105
				Lead	113J[6]	0.38	10, pp. 58, 464, 1105
				Selenium	1.8J[3]	0.47	10, pp. 58, 464, 1105
				Silver	9.9	0.05	10, pp. 58, 464, 1105
				Zinc	259J[7]	0.35	10, pp. 58, 464, 1105
				Mercury	0.28	0.0033	10, pp. 58, 464, 1105
TM-SD-44	9	0-1	4/20/15	Cadmium	0.3	0.076	10, pp. 58, 372, 994
				Chromium	330	0.088	10, pp. 58, 372, 994
				Lead	80.6	0.49	10, pp. 58, 372, 994
				Selenium	1.8	0.6	10, pp. 58, 372, 994
				Silver	6.2	0.063	10, pp. 58, 372, 995
				Zinc	809	0.44	10, pp. 58, 372, 995
				Mercury	0.19	0.003	10, pp. 58, 372, 995
TM-SD-46	9	0-1	4/20/15	Cyanide	3.6J-[4]	0.25	10, pp. 58, 373, 1027
TM-SD-46	9	6-7	8/13/15	Cyanide	12.5	0.26	10, pp. 58, 464, 1109
TM-SD-47	10	0-1	4/17/15	Chromium	1950	0.16	10, pp. 60, 375, 1057
				Lead	91.1J+[6]	0.88	10, pp. 60, 375, 1057
				Selenium	1.7	1.1	10, pp. 60, 375, 1058
				Silver	9.3	0.12	10, pp. 60, 375, 1058
				Zinc	601	0.8	10, pp. 60, 375, 1058
				Mercury	0.16J	0.0062	10, pp. 60, 375, 1058
TM-SD-48	10	5.5-6.5	8/13/15	Cadmium	4.7J[3]	0.16	10, pp. 60, 464, 1110
				Chromium	4130	0.19	10, pp. 60, 464, 1110
				Lead	222J[6]	1	10, pp. 60, 464, 1110
				Selenium	3.4J[3]	1.3	10, pp. 60, 464, 1110
				Silver	11.4	0.14	10, pp. 60, 464, 1110
				Zinc	709J[7]	0.95	10, pp. 60, 464, 1110
				Mercury	0.39	0.0054	10, pp. 60, 464, 1110

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-49	10	0-1	4/20/15	Cadmium	1.4	0.096	10, pp. 60, 372, 992
				Chromium	371	0.11	10, pp. 60, 372, 992
				Lead	30.2	0.61	10, pp. 60, 372, 992
				Selenium	2.2	0.75	10, pp. 60, 372, 993
				Silver	5.9	0.08	10, pp. 60, 372, 993
				Zinc	284	0.55	10, pp. 60, 372, 993
				Mercury	0.046J	0.0034	10, pp. 60, 372, 993
TM-SD-50	10	1.5-2.5	8/13/15	Cadmium	3.3J[3]	0.13	10, pp. 60, 464, 1112
				Chromium	3470	0.15	10, pp. 60, 464, 1112
				Lead	172J[6]	0.85	10, pp. 60, 464, 1112
				Selenium	2.7J[3]	1	10, pp. 60, 464, 1112
				Silver	12	0.11	10, pp. 60, 464, 1112
				Zinc	497J[7]	0.77	10, pp. 60, 464, 1112
				Mercury	0.43	0.0047	10, pp. 60, 464, 1112
TM-SD-51	10	0-1	4/20/15	Cyanide	3.4J-[4]	2.6	10, pp. 60, 373, 1021
TM-SD-51	10	1.5-6.5	8/13/15	Cyanide	3.2	0.28	10, pp. 60, 464, 1116
TM-SD-53	11	0-1	4/17/15	Cadmium	1.7	0.13	10, pp. 62, 375, 1059
				Chromium	2350	0.15	10, pp. 62, 375, 1059
				Lead	145J+[6]	0.81	10, pp. 62, 375, 1059
				Selenium	3.1	1	10, pp. 62, 375, 1059
				Silver	12.7	0.11	10, pp. 62, 375, 1060
				Zinc	403	0.73	10, pp. 62, 375, 1060
				Mercury	0.43	0.0046	10, pp. 62, 375, 1060
TM-SD-54	11	5-6	11/20/16	Cadmium	3.46	0.051	10, pp. 86, 886, 1371
				Chromium	2310	0.898	10, pp. 86, 886, 1371
				Lead	224	0.28	10, pp. 86, 886, 1371
				Silver	6.45J[6]	0.094	10, pp. 86, 886, 1371
				Zinc	568	4.99	10, pp. 86, 886, 1371
				Mercury	0.978	0.003	10, pp. 86, 886, 1377
TM-SD-55	11	0-1	4/20/15	Cadmium	0.84	0.064	10, pp. 62, 372, 990
				Chromium	286	0.074	10, pp. 62, 372, 990
				Lead	59	0.41	10, pp. 62, 372, 991
				Selenium	1.9	0.5	10, pp. 62, 372, 991
				Silver	3.6	0.053	10, pp. 62, 372, 991
				Zinc	790	0.37	10, pp. 62, 372, 991
				Mercury	0.02J	0.0031	10, pp. 62, 372, 991
TM-SD-56	11	4-5	11/20/16	Cadmium	4.35	0.051	10, pp. 86, 886, 1373
				Chromium	3010	0.898	10, pp. 86, 886, 1373
				Lead	220	0.280	10, pp. 86, 886, 1373
				Silver	7.11J[6]	0.094	10, pp. 86, 886, 1373

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-56	11	4-5	11/20/16	Zinc	526	4.99	10, pp. 86, 886, 1373
				Mercury	0.835	0.003	10, pp. 86, 886, 1378
TM-SD-57	11	0-1	4/20/15	Cyanide	1.1J-[4]	0.23	10, pp. 62, 373, 1018
TM-SD-58	12	0-1	4/17/15	Cadmium	5.3	0.075	10, pp. 64, 375, 1061
				Chromium	1690	0.086	10, pp. 64, 375, 1061
				Lead	224J+[6]	0.48	10, pp. 64, 375, 1061
				Selenium	2.3	0.59	10, pp. 64, 375, 1061
				Silver	7.4	0.062	10, pp. 64, 375, 1061
				Zinc	1280	0.43	10, pp. 64, 375, 1062
				Mercury	0.24	0.004	10, pp. 64, 375, 1062
TM-SD-59	12	3-4	10/26/16	Cadmium	8.89	0.003	10, pp. 86, 712, 1276
				Chromium	3880	1.4	10, pp. 86, 712, 1275
				Lead	261	0.116	10, pp. 86, 712, 1277
				Selenium	5.36	0.03	10, pp. 86, 712, 1276
				Silver	5.78	0.001	10, pp. 86, 712, 1270
				Zinc	1740	1.56	10, pp. 86, 712, 1277
				Mercury	0.927	0.003	10, pp. 86, 712, 1279
TM-SD-60	12	0-1	4/20/15	Cadmium	4.3	0.084	10, pp. 64, 372, 989
				Chromium	590	0.097	10, pp. 64, 372, 989
TM-SD-60	12	0-1	4/20/15	Lead	55.2	0.53	10, pp. 64, 372, 989
				Selenium	1.5	0.66	10, pp. 64, 372, 989
				Silver	6	0.07	10, pp. 64, 372, 989
				Zinc	332	0.48	10, pp. 64, 372, 989
				Mercury	0.34	0.0039	10, pp. 64, 372, 989
TM-SD-61	12	3.5-4.5	8/13/15	Cadmium	8.7J[3]	0.16	10, pp. 64, 464, 1117
				Chromium	3620	0.18	10, pp. 64, 464, 1117
				Lead	240J[6]	1	10, pp. 64, 464, 1117
				Selenium	3.2J[3]	1.2	10, pp. 64, 464, 1117
				Silver	12	0.13	10, pp. 64, 464, 1117
				Zinc	1110J[7]	0.9	10, pp. 64, 464, 1117
				Mercury	0.41	0.0056	10, pp. 64, 464, 1117
TM-SD-62	12	0-1	4/20/15	Cyanide	6.9J-[4]	0.26	10, pp. 64, 373, 1015
TM-SD-62	12	3.5-4.5	8/13/15	Cyanide	18.7J	3.6	10, pp. 64, 464, 1121
TM-SD-63	13	0-1	4/17/15	Chromium	3190	0.076	10, pp. 66, 375, 1063
				Lead	59.1J+[6]	0.42	10, pp. 66, 375, 1063
				Selenium	1.9	0.51	10, pp. 66, 375, 1063
				Silver	8.9	0.055	10, pp. 66, 375, 1063
				Zinc	284	0.38	10, pp. 66, 375, 1063
				Mercury	0.3J-[4]	0.0039	10, pp. 66, 375, 1064

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-64	12	6-7	8/13/15	Cadmium	3.4J[3,8]	0.3	10, pp. 66, 464, 1122
				Chromium	15000J[8]	0.35	10, pp. 66, 464, 1122
				Lead	364J[8]	1.9	10, pp. 66, 464, 1122
				Selenium	5J[3,8]	2.4	10, pp. 66, 464, 1122
				Silver	20.9J[8]	0.25	10, pp. 66, 464, 1122
				Zinc	709J [7,8]	1.7	10, pp. 66, 464, 1122
				Mercury	0.97J[8]	0.011	10, pp. 66, 464, 1122
TM-SD-65	13	0-1	4/20/15	Cadmium	0.58J	0.18	10, pp. 66, 372, 987
				Chromium	1240	0.2	10, pp. 66, 372, 987
				Lead	53.9	1.1	10, pp. 66, 372, 987
				Silver	7.6	0.15	10, pp. 66, 372, 987
				Zinc	635	1	10, pp. 66, 372, 987
				Mercury	0.29J	0.0075	10, pp. 66, 372, 987
TM-SD-66	13	6-7	8/13/15	Cadmium	3.3J[3]	0.15	10, pp. 66, 464, 1124
				Chromium	3720	0.17	10, pp. 66, 464, 1124
				Lead	108J[6]	0.96	10, pp. 66, 464, 1124
				Selenium	3.4J[3]	1.2	10, pp. 66, 464, 1124
				Silver	8.8	0.12	10, pp. 66, 464, 1124
				Zinc	915J[7]	0.86	10, pp. 66, 464, 1124
				Mercury	0.37	0.0051	10, pp. 66, 464, 1124
TM-SD-67	13	0-1	4/20/15	Cyanide	4.9J-[4]	0.38	10, pp. 66, 373, 1013
TM-SD-67	13	5-7	8/13/15	Cyanide	9.1	0.31	10, pp. 66, 465, 1130
TM-SD-68	14	0-1	4/17/15	Cadmium	0.93	0.18	10, pp. 68, 375, 1065
				Chromium	1940	0.21	10, pp. 68, 375, 1065
				Lead	99.1J+[6]	1.1	10, pp. 68, 375, 1065
				Silver	7	0.15	10, pp. 68, 375, 1065
				Zinc	1270	1	10, pp. 68, 375, 1065
				Mercury	0.51J-[4]	0.0068	10, pp. 68, 375, 1065
TM-SD-69	14	5-6	8/13/15	Cadmium	1.1J[3]	0.13	10, pp. 68, 465, 1131
				Chromium	2460	0.15	10, pp. 68, 465, 1131
				Lead	90.7J[6]	0.84	10, pp. 68, 465, 1131
				Selenium	2.5J[3]	1	10, pp. 68, 465, 1131
				Silver	5.9	0.11	10, pp. 68, 465, 1131
				Zinc	342J[7]	0.76	10, pp. 68, 465, 1131
				Mercury	0.041J	0.004	10, pp. 68, 465, 1131
TM-SD-70	14	0-1	4/17/15	Cadmium	0.64	0.1	10, pp. 68, 375, 1071
				Chromium	617	0.12	10, pp. 68, 375, 1071
				Lead	66.3J+[6]	0.64	10, pp. 68, 375, 1071
				Selenium	1.3	0.78	10, pp. 68, 375, 1071
				Silver	6	0.083	10, pp. 68, 375, 1071
				Zinc	1030	0.58	10, pp. 68, 375, 1071

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
				Mercury	0.25J-[4]	0.0045	10, pp. 68, 375, 1071
TM-SD-72	14	0.5-4.5	10/26/16	Chromium	9180J[8]	2.41	10, pp. 86, 712, 1273
				Lead	444J[8]	0.04	10, pp. 86, 712, 1272
				Selenium	2.18J[8]	0.051	10, pp. 86, 712, 1272
				Silver	10.4J[8]	0.011	10, pp. 86, 712, 1268
				Zinc	1710J[8]	2.67	10, pp. 86, 712, 1274
				Mercury	1.63J[8]	0.006	10, pp. 86, 712, 1278
TM-SD-72	14	0-1	4/17/15	Cyanide	1.8J-[4]	0.42	10, pp. 68, 374, 1046
TM-SD-72	14	5-6	8/13/15	Cyanide	4.1	0.32	10, pp. 68, 465, 1135
TM-SD-73	15	0-1	4/17/15	Cadmium	0.69	0.084	10, pp. 70, 375, 1067
				Chromium	898	0.098	10, pp. 70, 375, 1067
				Lead	88.8J+[6]	0.54	10, pp. 70, 375, 1067
				Selenium	1.7	0.66	10, pp. 70, 375, 1067
				Silver	8	0.07	10, pp. 70, 375, 1067
				Zinc	1060	0.49	10, pp. 70, 375, 1067
				Mercury	0.18J-[4]	0.0039	10, pp. 70, 375, 1067
TM-SD-74	15	5-6	8/14/15	Cadmium	2.2	0.17	10, pp. 70, 609; 80, p. 4
				Chromium	7120	0.2	10, pp. 70, 609; 80, p. 4
				Lead	268J[6]	1.1	10, pp. 70, 609; 80, p. 4
				Selenium	4.6	1.3	10, pp. 70, 609; 80, p. 4
				Silver	12.7	0.14	10, pp. 70, 609; 80, p. 4
				Zinc	858	0.99	10, pp. 70, 609; 80, p. 4
				Mercury	0.72J-[6]	0.0062	10, pp. 70, 609; 80, p. 4
TM-SD-75	15	0-1	4/17/15	Cadmium	0.95	0.1	10, pp. 70, 375, 1073
				Chromium	901	0.12	10, pp. 70, 375, 1073
TM-SD-75	15	0-1	4/17/15	Lead	81.4J+[6]	0.65	10, pp. 70, 375, 1073
				Selenium	1.7	0.8	10, pp. 70, 375, 1073
				Silver	2.4	0.085	10, pp. 70, 375, 1073
				Zinc	1270	0.59	10, pp. 70, 375, 1073
				Mercury	0.25J-[4]	0.0042	10, pp. 70, 375, 1073
TM-SD-76	15	3-4	8/14/15	Cadmium	4.5	0.14	10, pp. 70, 609; 80, p. 6
				Chromium	1990	0.17	10, pp. 70, 609; 80, p. 6
				Lead	475J[6]	0.92	10, pp. 70, 609; 80, p. 6
				Selenium	3.4	1.1	10, pp. 70, 609; 80, p. 6
				Silver	7.1	0.12	10, pp. 70, 609; 80, p. 6
				Zinc	1480	0.83	10, pp. 70, 609; 80, p. 6
				Mercury	0.5J-[6]	0.005	10, pp. 70, 609; 80, p. 6
TM-SD-77	15	0-1	4/17/15	Cyanide	2.9J-[4]	0.24	10, pp. 70, 374, 1049
TM-SD-77	15	3-6	8/14/15	Cyanide	4.5J[9]	0.45	10, pp. 70, 609; 80, p. 10

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-79	16	0-1	4/17/15	Cadmium	5	0.082	10, pp. 72, 375, 1069
				Chromium	384	0.094	10, pp. 72, 375, 1069
				Lead	260J+[6]	0.52	10, pp. 72, 375, 1069
				Selenium	1.5	0.64	10, pp. 72, 375, 1069
				Silver	8	0.068	10, pp. 72, 375, 1069
				Zinc	5080	0.47	10, pp. 72, 375, 1069
				Mercury	0.21J-[4]	0.004	10, pp. 72, 375, 1069
TM-SD-80	16	5.5-6.5	8/14/15	Cadmium	2.4	0.1	10, pp. 72, 609; 80, p. 11
				Chromium	5980	0.12	10, pp. 72, 609; 80, p. 11
				Lead	148J[6]	0.65	10, pp. 72, 609; 80, p. 11
				Selenium	2.5	0.8	10, pp. 72, 609; 80, p. 11
				Silver	11	0.085	10, pp. 72, 609; 80, p. 11
				Zinc	2530	0.59	10, pp. 72, 609; 80, p. 11
				Mercury	0.25J-[6]	0.0035	10, pp. 72, 609; 80, p. 11
TM-SD-81	16	0-1	4/17/15	Cadmium	2.4	0.072	10, pp. 72, 374, 1039
				Chromium	615	0.083	10, pp. 72, 374, 1039
				Lead	122J+[6]	0.46	10, pp. 72, 374, 1039
				Selenium	1.6	0.57	10, pp. 72, 374, 1039
				Silver	4.2	0.06	10, pp. 72, 374, 1039
				Zinc	2310	0.42	10, pp. 72, 374, 1039
				Mercury	0.15	0.0035	10, pp. 72, 374, 1039
TM-SD-82	16	5-6	8/14/15	Cadmium	2	0.064	10, pp. 72, 609; 80, p. 13
				Chromium	5280	0.074	10, pp. 72, 609; 80, p. 13
				Lead	113J[6]	0.41	10, pp. 72, 609; 80, p. 13
				Selenium	2.8	0.5	10, pp. 72, 609; 80, p. 13
				Silver	6.1	0.053	10, pp. 72, 609; 80, p. 13
				Zinc	1040	0.37	10, pp. 72, 609; 80, p. 13
				Mercury	0.068J-[6]	0.0033	10, pp. 72, 609; 80, p. 13
TM-SD-83	16	0-1	4/17/15	Cyanide	2.5J-[4]	0.27	10, pp. 72, 374, 1051
TM-SD-83	16	5-6.5	8/14/15	Cyanide	5J[9]	0.24	10, pp. 72, 609; 80, p. 17
TM-SD-84	17	0-1	4/20/15	Cadmium	4.3	0.074	10, pp. 74, 372, 1006
				Chromium	1000	0.086	10, pp. 74, 372, 1006
				Lead	311J+[6]	0.47	10, pp. 74, 372, 1006
				Selenium	3.1	0.58	10, pp. 74, 372, 1006
				Silver	3.2	0.062	10, pp. 74, 372, 1006
				Zinc	3500	0.43	10, pp. 74, 372, 1006
				Mercury	0.43	0.0036	10, pp. 74, 372, 1006

Table 3. TMC Waste Samples – Inorganic Hazardous Substances

Sample ID	Transect	Depth	Date	Hazardous Substance	Concentration[1,2] (mg/kg)	Adjusted MDL (mg/kg)	References
TM-SD-86	17	0-1	4/20/15	Cadmium	9.5	0.076	10, pp. 74, 372, 1008
				Chromium	588	0.087	10, pp. 74, 372, 1008
				Lead	964J+[6]	0.48	10, pp. 74, 372, 1008
				Selenium	2.1	0.59	10, pp. 74, 372, 1008
				Silver	2.8	0.063	10, pp. 74, 372, 1008
				Zinc	7870	4.4	10, pp. 74, 372, 1008
				Mercury	0.23	0.0033	10, pp. 74, 372, 1008
TM-SD-88	17	0-1	4/20/15	Cyanide	1.2J-[4]	0.27	10, pp. 74, 373, 1039

Notes:

- [1] Although the results are qualified as estimated, the presence of the analytes is not in question.
- [2] J Qualified data, unless otherwise indicated, indicates the compound was qualitatively identified at concentrations below their respective RLs. No bias is associated with this data (Ref. 10, pp. 893, 961, 1082, 1142, 1198, 1220, 1344).
- [3] Results did not meet the indicated QC limits for the **laboratory duplicate analysis**. The positive results for all samples not previously qualified have been marked with "J" qualifiers to indicate that they are quantitative estimates (Ref. 10, pp. 892, 893, 1081, 1141).
- [4] Results did not meet the indicated QC limits for the **matrix spike analysis**. The low matrix spike recoveries indicate the presence of interferences. The results are considered biased low quantitative estimates, and may be higher than reported. Positive results not previously qualified have been marked "J-" to indicate that they are biased low (Ref. 10, pp. 890, 891, 959).
- [5] Results did not meet the indicated QC limits for the **matrix spike/matrix spike duplicate analysis**. The low matrix spike recoveries indicate the presence of interferences. Positive results not previously qualified have been marked "J-" to indicate that they are biased low (Ref. 10, pp. 891).
- [6] Results did not meet the indicated QC limits for **the matrix spike analysis**, positive results were qualified. The presence of the analyte is not in question, only the concentration of the analyte. (Ref. 10, pp. 958, 1080, 1140, 1195, 1196, 1343).
- [7] The **ICP serial dilution criterion was exceeded**. The lack of precision may be due to interferences in samples of similar matrix. The positive results for these metals have been marked with "J" qualifiers to indicate that they are quantitative estimates (Ref. 10, pp. 1081, 1082)
- [8]The **moisture content** for this sample was greater than 70 percent (74.0%). Positive results have been marked with "J" qualifiers to indicate that they are estimates. Positive results may be higher than reported (Ref. 10, pp. 1082, 1220).
- [9]Results did not meet the indicated QC limits for the **matrix spike/matrix spike duplicate analysis**. Positive results for all samples are considered biased high quantitative estimates, and may be higher than reported. The results are marked "J" to indicate that they are estimates. (Ref. 10, p. 1196).
- MDL = Method Detection Limit - It is the minimum result which can be reliably discriminated from a blank with a predetermined confidence level (Ref. 75, p. 1), a statistical calculation below the point of calibration (Ref. 76, p. 2). The adjusted MDL represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable (Ref. 10, p. 195, 459, 543, 606, 706, 815, and 882) and is specific to each sample, adjusted for its weight/volume, %Solids and dilution factor (Ref. 75, p. 1). The samples were analyzed by non-CLP laboratories. The adjusted MDLs presented above are equivalent to the HRS-defined method detection limit as defined by HRS Section 1.1 (Ref. 1, Sections 1.1 and 2.3).
- mg/kg = milligrams per kilogram
- RL = Reporting Limit - A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix. It must be at or above the concentration of lowest calibration standard (Refs. 75, p. 1), limit of detection for a specific target analyte for a specific sample after any adjustments have been made for dilutions or percent moisture at the lowest point on the calibration curve (Ref. 76, p. 2).

2.2.3 Hazardous Substances Available to a Pathway

Samples collected of sludge material throughout the canal contained concentrations of hazardous substances such as PAHs, PCBs, cyanide, and metals (see **Section 2.2.2**). Sediment samples collected from Bear Creek contain the same hazardous substances as the source samples at concentrations significantly above background confirming that hazardous substances in Bear Creek are at least partially attributable to hazardous substances present in the source (see **Section 4.1.2.1.1** of this HRS documentation record). TMC was constructed between 1950 and 1970 by placing slag that had been generated as part of steel making operations on the peninsula into Humphreys Creek and then digging out TMC from the slag (Ref. 11, pp. 13, 103, 104). TMC was originally constructed to convey steel manufacturing process wastewater into Humphreys Creek, which was an open water body that flowed into Bear Creek (Refs. 11, pp. 13, 113; 12, pp. 35, 61; 13, pp. 152-156, 181-185). By 1969, Humphreys Creek was completely filled and enclosed to create Humphreys Impoundment and the construction of TMC was complete (Refs. 12, p. 35; 13, pp.152, 157). All industrial wastewater discharge pipes into Humphreys Creek were routed to TMC and conveyed to the newly constructed Humphreys Creek Wastewater Treatment Plant (HCWWTP) (Refs. 11, pp. 103, 113; 12 p. 35).

In 2018 and 2019, approximately 343 tons of PCB-impacted material (PCB concentrations greater than 50 milligrams per kilogram) and an unknown quantity of oil impacted material were excavated and removed from the canal (Ref. 70, pp. 6, 7, 14, 16, 23). Following excavation, residual sediment and fill materials were covered with a 2-foot thick (minimum) cap to prevent future direct contact exposure risks and protect water quality in the canal discharging to Bear Creek in compliance with stormwater permit conditions, and to provide a non-erosive canal lining that will facilitate future stormwater conveyance (Ref. 70, pp. 17-18). Even though a removal has occurred for the source, from the time of construction of the canal until listing, there was inadequate source containment resulting in the release to Bear Creek as documented by the discharge of process wastewater to Bear Creek either directly or via Humphreys Creek (Refs. 8, p. 98; 11, p. 113; 12, pp. 34, 35, 61; 13, pp. 57, 58, 60, 152-156, 181-185). Additionally, TMC and HCWWTP area are situated at an elevation of 5 feet above mean sea level and are located within the 100-year flood zone (Ref. 71). The area Sparrows Point is located has been impacted by numerous hurricanes over the past century, including Hurricane Isabel in 2003 (Ref. 72). Hurricane Isabel caused an approximate 6-foot storm surge in the area of Sparrows Point (Ref. 73). Since the ground elevation at TMC and HCWWTP is a maximum of 5 feet above sea level, as previously noted, and the storm surface in the area of Sparrows Point during Hurricane Isabel was 6 feet, as previously noted, it’s likely that TMC and HCWWTP were completely underwater during hurricane Isabel, which would have allowed for direct contact and discharge of contaminated material within TMC to Bear Creek.

Based on the historical documentation of direct releases from TMC to surface water (i.e., no maintained engineered cover, or functioning and maintained run-on control system and runoff management system) and the evidence of hazardous substance migration from the source, a surface water containment factor value of 10 is assigned for this source (Ref. 1, Table 4-2 and Table 4-8).

Table 4. Hazardous Substances Available to Pathway

Containment Description	Containment Factor	References
Release via overland flow migration and/or flood	10	1, Section 4.1.2.1.2.1.1, Tables 4-2 and 4-8

2.4.2.1 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The hazardous constituent quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source, as well as releases from the source, are not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.1). There are insufficient historical and current data (e.g., manifests, potentially-responsible party records, state records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, available information is insufficient to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, Hazardous Wastestream Quantity (Ref. 1, Section 2.4.2.1.1).

Hazardous Constituent Quantity (C) Value: Not Scored (NS)

2.4.2.1.2 Hazardous Wastestream Quantity

The hazardous wastestream quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the mass of the hazardous wastestreams plus the mass of any additional CERCLA pollutants and contaminants in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.2). There are insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, Volume of the Contaminated Soil (Ref. 1, Section 2.4.2.1.2).

Hazardous Wastestream Quantity (W) Value: Not scored

2.4.2.1.3 Volume (Tier C)

Samples collected of waste material within TMC document the presence of hazardous substances (**Section 2.2.2** of this HRS documentation record). The information available on the vertical extent of the waste is not sufficient to support an exact or reasonably accurate volume of the waste with reasonable confidence; therefore, it is not possible to calculate a volume (Tier C) for Source No. 1 (Ref. 1, Section 2.4.2.1.3). In 2018 and 2019, approximately 343 tons of PCB-impacted material (PCB concentrations greater than 50 milligrams per kilogram) and an unknown quantity of oil impacted material were excavated and removed from the canal (Ref. 70, pp. 6, 7, 14, 16, 23). Following excavation, residual sediment and fill materials were covered with a 2-foot thick (minimum) cap to prevent future direct contact exposure risks and protect water quality in the canal discharging to Bear Creek in compliance with stormwater permit conditions, and to provide a non-erosive canal lining that will facilitate future stormwater conveyance (Ref. 70, p. 17, 18). Even though a removal has occurred for the source, it is still eligible because the contamination at the source (waste material in the canal) and associated historic releases to surface water have not been completely addressed (i.e., contaminated sediments in Bear Creek; **see Section 4.1.2.1.1**). Therefore, for Source No. 1, a value of greater than 0 but exact amount unknown has been assigned for the source hazardous waste quantity value for volume (Ref. 1, Section 2.4.2.1.3). The source type is “other;” therefore, the volume value is divided by 2.5 to obtain the assigned value, as shown below (Ref. 1, Section 2.4.2.1.3, Table 2-5).

Dimension of source in cubic yards (yd^3): >0 yd^3
Volume (V) Assigned Value: (>0)/2.5 = >0

2.4.2.1.4 <u>Area</u>

The Tier D area measure is not evaluated for source type “other” (Ref. 1, Section 2.4.2.1.4, Table 2-5).

Area (A) Assigned Value: 0

2.4.2.1.5 <u>Source Hazardous Waste Quantity Value</u>

The source hazardous waste quantity value for Source No. 1 is greater than zero, but unknown (Ref. 1, Table 2-5).

Source Hazardous Waste Quantity Value: >0, but unknown

Table 5. Summary of Source Descriptions

Source No.	Source HWQ Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway			
			Ground Water (GW) (Ref. 1, Table 3-2)	Surface Water (SW) Overland/flood (Ref. 1, Table 4-2)	Air	
					Gas	Particulate
					Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	>0, but unknown	N	NS	10	NS	NS

Notes:
HWQ = Hazardous Waste Quantity
NS = Not Scored

Total Source Hazardous Waste Quantity Value: >0

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND AND FLOOD MIGRATION COMPONENT

4.1.1 GENERAL CONSIDERATION

The site is located within the Patapsco River Mesohaline Segment (a.k.a. Baltimore Harbor embayment/estuary) of the Baltimore Harbor Watershed (Refs. 85, p. 1; 86, p. 2; 87, p. 17; 88, pp. 1-3; 89, pp. 11, 13). Waters characterized as mesohaline contain between 5 to 18 parts per trillion (Ref. 88, p. 1). The Patapsco River and tributaries surrounding Sparrows Point peninsula, such as Bear Creek, are tidally influenced water bodies (Refs. 51, pp. 1, 2; 52, pp. 1, 2; 85, p. 1; 86, p. 2, 87, p. 17; 89, pp. 11, 13).

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

The hazardous substance migration path includes both the overland and in-water segments taken by hazardous substances as they migrate away from sources at the Site (Ref. 1, Section 4.1.1.1). The overland segment is defined as the portion of the hazardous substance migration pathway beginning at a source and proceeding downgradient to the probable point of entry (PPE) to surface water (Ref. 1, Section 4.1.1.1). The in-water segment begins at the PPE and continues in the direction of flow for the distance established by the target distance limit, to approximately 15 miles downstream of the PPE (Ref. 1, Section 4.1.1.2). Overland and in-water segments for Source 1 presented in this HRS documentation record are described below. The surface water pathway is shown on **Figures 3 and 4**.

<u>Description of the Overland Segments and PPEs</u>

As presented in Section 2.2 of this HRS documentation record, Source 1 is an undefined volume of accumulated waste material in Tin Mill Canal (TMC) that resulted from historical discharges to the canal from numerous steel manufacturing process wastewaters as characterized by samples collected in 2015 and 2016, by EnviroAnalytics, on behalf of Trade Point Atlantic, current property owner of the accumulated waste material in the TMC (**Tables 2 and 3** Ref. 10, p. 5) (**Figure 2** of this HRS documentation record). Analytical results of the samples showed the presence of PCBs, semivolatile organic compounds (SVOC), particularly PAHs, inorganics, and cyanide (Ref. 10, pp. 42-74 and 85-91).

TMC was constructed between 1950 and 1970 by placing slag that had been generated as part of steel making operations on the peninsula into Humphreys Creek and then digging out TMC from the slag (Ref. 11, pp. 13, 103, 104). TMC was constructed to convey steel manufacturing process wastewater (Ref. 11, p. 103). Prior to 1969, TMC discharged directly into Humphreys Creek (Ref. 11, p. 113; 13, pp. 57, 58, 60). Historically, Humphreys Creek was an open water body that flowed into Bear Creek (Refs. 8, p. 99; 12, pp. 35, 46, 61; 13, pp. 152-156, 181-185). By 1969, Humphreys Creek was completely filled with slag and enclosed to create Humphreys Impoundment and the construction of TMC was complete (Refs. 11, pp. 13; 16, 152; 12, p. 35; 13, pp. 21, 52). The PPE (PPE1) for Source 1 is in Bear Creek at Outfall 014 as shown on **Figure 2 and 4**. The distance from Outfall 014 (PPE1) to Bear Creek is 0 feet.

4.1.1.2 Target Distance Limit

The target distance limit (TDL) defines the maximum distance over which targets are considered in evaluating the surface water pathway (Ref. 1, Section 4.1.1.2). According to the HRS, the TDL for the watershed extends 15 miles from the PPE along the surface water or to the most distant sample point that meets the observed release criteria to the watershed, whichever is greater (Ref. 1, Section 4.1.1.2).

The PPE into surface water is in Bear Creek at the outfall of TMC (Outfall 014). From the PPE, Bear Creek flows south into the Patapsco River. The Patapsco River flows southeast for approximately 5.8 mile before joining the Chesapeake Bay at Bodkin Point and North Point. As shown on **Figure 3** of this HRS documentation record, the 15-mile TDL is completed in the Chesapeake Bay. Additionally, as documented in **Section 4.1.1**, surface waters along the 15-mile TDL are tidally-influenced; including Bear Creek at and north of the PPE. Therefore, in accordance with the HRS, the TDL extends north of the PPE to the farthest upstream sampling location that meets the criteria for an observed release (SD-C03) located approximately 0.99-mile north of the PPE (**Figure 4**; Ref. 74).

4.1.2.1 Likelihood of Release

Samples collected of the waste material in TMC (Source 1) contain PAHs, PCBs, cyanide, and heavy metals such as arsenic, cadmium, chromium, lead, silver and zinc (see **Tables 2 and 3 in Section 2.2.2**). Samples collected of the sediments in Bear Creek contain the same hazardous substances as present in the source at concentrations meeting the criteria for documenting an observed release (see **Section 4.1.2.1.1** of this HRS documentation record). Overland flow routes and drainage pathways from the source is discussed in Section 4.1 of this HRS documentation record and document the overland flow routes of contaminants to Bear Creek.

4.1.2.1.1 Observed Release

An observed release by direct observation was not scored.

Chemical Analysis

In 2014 and 2015, in accordance with the Sparrows Point Trust Agreement, which was signed in January 2014 by EPA and RG Steel, and stated that the purpose of the Environmental Trust included “managing and/or funding implementation of activities in the offshore environment at the Site consistent with the Consent Decree and Sale Order”, EA Engineering on behalf of the Trust collected sediment samples in Bear Creek to evaluate impacts that are likely associated with the outlet of the Tin Mill Canal, which historically discharged wastewater from onsite industrial facilities (Ref. 22, pp. 31, 38, and 61).

In October 2014, 20 surface sediment samples were collected to approximately 6 inches below the sediment surface using a Ponar grab sampler along the northwest shoreline of Sparrows Point peninsula (Ref. 22, pp. 61, 63, 71, 444-452). Following collection of the required sample volume, each sample was homogenized using a decontaminated stainless-steel spoon in a stainless steel pot and placed into appropriate laboratory-cleaned containers (Ref. 22, p. 63). Sediment samples were analyzed by TestAmerica for the following parameters dependent upon collection location (Ref. 22, pp. 63, 64; 48, pp. 1-3):

- PPL VOCs by USEPA Method 8260C
- Low-level (LL) PPL SVOCs by USEPA Method 8270D LL
- Low-level PCB Aroclors by USEPA Method 8082A LL
- PPL metals by USEPA Method 6020A
- Mercury by USEPA Method 7471B
- Cyanide by USEPA Method 9014
- Oil and Grease by USEPA Method 9071B
- SEM/AVS by USEPA Methods 6010B and 9034
- Total Solids by USEPA Method SM 2540G
- Total Organic Carbon (TOC) by Lloyd Kahn
- Grain Size by ASTM D422
- Moisture Content by D2216-90

Environmental Data Services, Inc. conducted data validation of the analytical data for sediment samples collected on October 13, 2014 by EA Engineering. The data were validated according to the protocols and quality control (QC) requirements of the analytical methods and the USEPA National Functional Guidelines for Organic and Inorganic Data Review (Ref. 22, pp. 545-561, 640-654).

On March 27th, 29th, and 30th, 2015 and April 23rd, 25th and 29th, 2015, subsurface sediment cores, up to 6 feet below sediment surface, were collected from 22 locations using an electric vibracore offshore from the effluent of TMC (Ref. 22, pp. 71, 77, 78, 79, 459-462, and 471-473). If less than 5.5 ft of sediment was recovered, due to shallow refusal or other factors, then up to three attempts were made to collect a core of at least 5.5 ft in length. These replicate cores were named “A,” “B,” and “C,” and the replicate with the best recovery was selected for sampling and laboratory analysis. Upon recovery, the selected core for sampling was transferred to a processing facility and held at 4 degrees Celsius (Ref. 22, p. 64). On April 30th and May 1st, 2015 the core samples were split open, described and logged, photographed and sampled (Ref. 22, p. 64, 77, 78, 474-479, 483-488, 494-516, 519-540). Observable impacts (sheen and/or odor) were noted and recorded (Ref. 22, pp. 77, 78, 482-540). Following collection of the required sample volume for VOCs, each interval for analysis was homogenized using a decontaminated stainless-steel spoon in a stainless steel pot and placed into appropriate laboratory-cleaned containers (Ref. 22, p. 65). Sediment samples were analyzed by TestAmerica for the following parameters dependent upon collection location (Refs. 22, pp. 65; 49, pp. 1-5):

- PPL VOCs by USEPA Method 8260C
- LL PPL SVOCs by USEPA Method 8270D LL
- Low-level PCB Aroclors by USEPA Method 8082A LL
- PPL metals by USEPA Method 6020A
- Mercury by USEPA Method 7471B
- Cyanide by USEPA Method 9014
- Oil and Grease by USEPA Method 9071B
- Total Solids by USEPA Method SM 2540G
- TOC by Lloyd Kahn

Environmental Data Services, Inc. conducted data validation of the analytical data for sediment samples collected in March and April 2015 by EA Engineering. The data were validated according to the protocols and quality control (QC) requirements of the analytical methods and the USEPA National Functional Guidelines for Organic and Inorganic Data Review (Ref. 22, pp. 847-858, 876-898).

In October 2018, EPA RCRA conducted additional sampling of the sediments offshore of TMC outlet to further delineate the horizontal and vertical extent of oil and grease and other contaminants in the upper 1 foot (ft) of sediment (Ref. 28, pp. 1, 2). A modified box corer was utilized to collect the sediment samples. The box corer had a 0.5-ft by 0.5-ft footprint, and was customized to obtain sediment samples from up to 1.3 ft below the sediment-water interface. At each of the nine sediment sample locations, the box corer sampler was deployed at a controlled rate and retrieved following sample collection. After recovering the box corer, sediments from the 0- to 0.5-ft and 0.5- to 1-ft intervals were recovered, placed into separate stainless-steel containers, and homogenized using decontaminated stainless-steel tools. Sediments for chemistry analysis were then placed in laboratory-provided containers and preserved as required by the specific analysis (Ref. 28, pp. 3, 13, 17). Sediment samples were analyzed by TestAmerica for the following parameters dependent (Refs. 28, p. 19; 29, pp. 1-3):

- SVOCs/PAHs SW846 8270D LL
- PCB Aroclors SW846 8082A LL
- Metals SW846 6020A/7471B
- Cyanide by SW46 Method 9014
- Oil and Grease by SW846 9071B
- TOC by Lloyd Kahn
- Grain Size ASTM International D422
- Moisture Content D2216-90

The analytical results were validated by EPA Region 3 Environmental Services Assistance Team (ESAT) according to National Functional Guidelines for Organic and Inorganic Superfund Methods Data Review and applicable EPA Region 3 modifications (Refs. 44, pp. 1-4; 45, pp. 1-4; 46, pp. 1-4; 47, pp. 1-4).

In October 2019, EPA Site Assessment collected sediment samples from surface water bodies surrounding Sparrows Point, including Bear Creek (Ref. 30, pp. 14, 26). Sediment samples were collected using a ponar dredge operated from a boat. Each sample consisted of one successful ponar grab. To achieve a successful grab, the dredge was lowered through the water to the sediment surface and recovered with a full receptacle of sediment. Sediment samples were targeted from the sediment surface to a maximum depth of 2 feet below sediment surface. Sediment from the ponar was placed into a disposable aluminum pan and homogenized with a disposable polyethylene scoop, and all extraneous material (i.e., pebbles, plant material, shells) was removed to the greatest extent practicable. Homogenized materials were then placed directly in the appropriate sample containers for analysis (Ref. 30, p. 14). Sediment and samples were analyzed for SVOCs (including PAHs by Selective Ion Monitoring [SIM]), PCBs, and TAL metals (including mercury) and cyanide by the assigned EPA Contract Laboratory Program (CLP) laboratory. Analysis was conducted in accordance with EPA CLP Statement of Work (SOW) Superfund Organic Method (SOM02.4) and Inorganic Superfund Method (ISM02.4) for organics and inorganics, respectively (Ref. 30, pp. 14, 15). Sediment samples were also analyzed for physical parameters including grain size and (TOC) by Lloyd Kahn Method and grain size in accordance with ASTM D422 (Ref. 30, p. 15). The analytical results were validated by EPA Region 3 Environmental Services Assistance Team (ESAT) according to National Functional Guidelines for Organic and Inorganic Superfund Methods Data Review and applicable EPA Region 3 modifications (Refs. 39, pp. 1-5; 40, pp. 1-4; 41, pp. 1-5; 42, pp. 1-6; 43, pp. 1-6).

Sparrows Point Peninsula is located in a heavily industrial and commercial area in southwestern Baltimore, Maryland along the Patapsco River (see **Figure 1**). To account for background concentrations of upstream sources, as part of the October 2019 sampling event, ten sediment samples were collected from Bear Creek (BCK-01, BCK-02, BCK-03) and the Patapsco River (BCK-4 through BCK-10) (Ref. 30, pp. 26, 44, 47; **Figure 4**). The background sediment samples were used to establish background conditions and chemical compositions of the sediment materials upstream of the discharge point of TMC. Analytical results of the background sediment samples are presented to establish representative background concentrations of site-attributable hazardous substances, which are used to demonstrate that significant concentrations of hazardous substances have been detected in the release sediment samples collected from Bear Creek.

To be conservative, the sediment background concentrations established for the site for scoring purposes are based on the highest concentrations identified in the collected samples background data set as indicate in bold in **Tables 6 and 7**. A summary of the calculated 3x background concentration for each hazardous substance, or the highest reporting detection limit (RDL) for hazardous substances that were not detected, are listed in **Table 8**. Background samples were not collected as part of the 2014, 2015, and 2018 sampling events. Sediment samples collected in 2019 confirm the contamination identified in previous sampling events is still present and that contaminants are unlikely to change significantly (e.g., volatilize, degrade into other substances, etc.) due to their physical or chemical characteristics and lack of direct exposure to air or sunlight; however, microorganisms can break down some PAHs in soil (Refs. 63, p. 1; 64, p. 1; 65, p. 1; 66, p. 1; 67, p. 1; 68, p. 1; and 69, p. 1). Analytical results for sediment samples collected as part of the sampling events conducted in 2014, 2015, 2018, as well as 2019 were compared to the background sediment set collected in 2019. Sediment samples meeting the criteria for an observed release are presented in **Tables 9 and 10**.

Table 6. Background Sediment Samples Organic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (µg/kg)	RDL (µg/kg)	References
SP-2019-SD-BCK01	C0AC9	10/23/19	Aroclor-1248	150U	150	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 24, 212
			Aroclor-1254	81J	150	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 4, 24, 212
			Aroclor-1260	150U	150	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 24, 212
			Naphthalene	120	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178
			Acenaphthene	16J	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 4, 27, 178
			Fluorene	28J	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 4, 27, 178
			Anthracene	56J	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 4, 27, 178
			Fluoranthene	**500**	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178

Table 6. Background Sediment Samples Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**RDL (µg/kg)**	**References**
SP-2019-SD-BCK01	C0AC9	10/23/19	Benzo(b)fluoranthene	**470**	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178
			Benzo(k)fluoranthene	**190**	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178
			Benzo(a)pyrene	200	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178
			Dibenzo(a,h)anthracene	78U	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178
			Indeno(1,2,3-c,d)pyrene	**130**	78	30, p. 47; 31, p. 7; 34, p. 24; 42, pp. 27, 178
SP-2019-SD-BCK002	C0AD3	10/23/19	Aroclor-1248	**160U**	160	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 38, 215
			Aroclor-1254	46J	160	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 4, 38, 215
			Aroclor-1260	**160U**	160	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 38, 215
			Naphthalene	140	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
			Acenaphthene	17J	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 4, 41, 184
			Fluorene	31J	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 4, 41, 184
			Anthracene	47J	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 4, 41, 184
			Fluoranthene	330	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
			Benzo(b)fluoranthene	250	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
			Benzo(k)fluoranthene	99	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
			Benzo(a)pyrene	150	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
			Dibenzo(a,h)anthracene	**79U**	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
			Indeno(1,2,3-c,d)pyrene	87	79	30, p. 47; 31, p. 7; 34, p. 25; 42, pp. 41, 184
SP-2019-SD-BCK03	C0AD2	10/23/19	Aroclor-1248	120U	120	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 34, 214
			Aroclor-1254	**82J**	120	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 4, 34, 214
			Aroclor-1260	120U	120	30, p. 47; 31, p. 7; 34, p. 57; 42, pp. 34, 214
			Naphthalene	130	62	30, p. 47; 31, p. 7; 34, p. 24; 42 pp. 37, 182
			Acenaphthene	12J	62	30, p. 47; 31, p. 7; 34, p. 24; 42 pp. 4, 37, 182
			Fluorene	21J	62	30, p. 47; 31, p. 7; 34, p. 24; 42 pp. 4, 37, 182

Table 6. Background Sediment Samples Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**RDL (µg/kg)**	**References**
SP-2019-SD-BCK03	C0AD2	10/23/19	Anthracene	44J	62	30, p. 47; 31, p. 7; 34, p. 24; 42 pp. 4, 37, 182
			Fluoranthene	310	62	30, p. 47; 31, p. 7; 34, p. 24; 42 pp. 37, 182
			Benzo(b)fluoranthene	260	62	30, p. 47; 31, p. 7; 34, p. 25; 42 pp. 37, 182
			Benzo(k)fluoranthene	100	62	30, p. 47; 31, p. 7; 34, p. 25; 42 pp. 37, 182
			Benzo(a)pyrene	160	62	30, p. 47; 31, p. 7; 34, p. 25; 42 pp. 37, 182
			Dibenzo(a,h)anthracene	62U	62	30, p. 47; 31, p. 7; 34, p. 25; 42 pp. 37, 182
			Indeno(1,2,3-c,d)pyrene	89	62	30, p. 47; 31, p. 7; 34, p. 25; 42 pp. 37, 182
SP-SD-BCK04	C0AE7	10/24/19	Aroclor-1248	120U	120	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 78, 226
			Aroclor-1254	19J	120	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 4, 78, 226
			Aroclor-1260	120U	120	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 78, 226
			Naphthalene	**170**	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
			Acenaphthene	**25**	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
			Fluorene	50	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
			Anthracene	73	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
			Fluoranthene	310	58	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202, 203
			Benzo(b)fluoranthene	210	58	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202, 203
			Benzo(k)fluoranthene	120	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
			Benzo(a)pyrene	150	58	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202, 203
			Dibenzo(a,h)anthracene	12U	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
			Indeno(1,2,3-c,d)pyrene	93	12	30, p. 44; 31, p. 11; 34, p. 28; 42, pp. 81, 202
SP-2019-SD-BCK05	C0AE8	10/24/19	Aroclor-1248	48U	48	30, p. 44; 31, p. 11; 34, p. 59; 42, p. 82, 227
			Aroclor-1254	10J	48	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 4, 82, 227
			Aroclor-1260	48U	48	30, p. 44; 31, p. 11; 34, p. 59; 42, p. 82, 227
			Naphthalene	34	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204

Table 6. Background Sediment Samples Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**RDL (µg/kg)**	**References**
SP-2019-SD-BCK05	C0AE8	10/24/19	Acenaphthene	6.6	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Fluorene	12	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Anthracene	22	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Fluoranthene	95	23	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Benzo(b)fluoranthene	74	23	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Benzo(k)fluoranthene	50	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Benzo(a)pyrene	54	23	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Dibenzo(a,h)anthracene	4.7U	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
			Indeno(1,2,3-c,d)pyrene	33	4.7	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 85, 204
SP-2019-SD-BCK06	C0AF2	10/24/19	Aroclor-1248	42U	42	30, p. 44; 31, p. 11; 34, p. 89; 43 pp. 43, 258
			Aroclor-1254	42U	42	30, p. 44; 31, p. 11; 34, p. 89; 43 pp. 43, 258
			Aroclor-1260	42U	42	30, p. 44; 31, p. 11; 34, p. 89; 43 pp. 43, 258
			Naphthalene	6.1	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
			Acenaphthene	0.67J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 46, 208
			Fluorene	1.6J	4.2	30, p. 44; 31, p. 1; 34, p. 62; 43, pp. 3, 46, 208
			Anthracene	2.5J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 46, 208
			Fluoranthene	10	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
			Benzo(b)fluoranthene	12	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
			Benzo(k)fluoranthene	4.2	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
			Benzo(a)pyrene	7.8	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
			Dibenzo(a,h)anthracene	4.2U	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
			Indeno(1,2,3-c,d)pyrene	4.8	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 46, 208
SP-2019-SD-BCK07	C0AF3	10/24/19	Aroclor-1248	41U	41	30, p. 44; 31, p. 11; 34, p. 89; 43, pp. 47, 259
			Aroclor-1254	41U	41	30, p. 44; 31, p. 11; 34, p. 90; 43, pp. 47, 259

Table 6. Background Sediment Samples Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**RDL (µg/kg)**	**References**
SP-2019-SD-BCK07	C0AF3	10/24/19	Aroclor-1260	41U	41	30, p. 44; 31, p. 11; 34, p. 90; 43, pp. 47, 259
			Naphthalene	4.2U	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 50, 209
			Acenaphthene	4.2U	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 50, 209
			Fluorene	0.97J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 50, 209
			Anthracene	1.5J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 50, 209
			Fluoranthene	7.2	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 50, 209
			Benzo(b)fluoranthene	7.7	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 50, 209
			Benzo(k)fluoranthene	3.6J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 50, 209
			Benzo(a)pyrene	4.0J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 50, 209
			Dibenzo(a,h)anthracene	4.2U	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 50, 209
			Indeno(1,2,3-c,d)pyrene	2.8J	4.2	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 50, 209
SP-2019-SD-BCK08	C0AF1	10/24/19	Aroclor-1248	41U	41	30, p. 44; 31, p. 11; 34, p. 89; 43, pp. 39, 257
			Aroclor-1254	41U	41	30, p. 44; 31, p. 11; 34, p. 89; 43, pp. 39, 257
			Aroclor-1260	41U	41	30, p. 44; 31, p. 11; 34, p. 89; 43, pp. 39, 257
			Naphthalene	7.2	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Acenaphthene	1.9J	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 42, 235
			Fluorene	2.7J	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 3, 42, 235
			Anthracene	5.1	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Fluoranthene	21	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Benzo(b)fluoranthene	24	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Benzo(k)fluoranthene	13	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Benzo(a)pyrene	15	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Dibenzo(a,h)anthracene	4.1U	4.1U	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235
			Indeno(1,2,3-c,d)pyrene	9.2	4.1	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 42, 235

Table 6. Background Sediment Samples Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**RDL (µg/kg)**	**References**
SP-2019-SD-BCK09	C0AE9	10/24/19	Aroclor-1248	98U	98	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 86, 228
			Aroclor-1254	63J	98	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 4, 86, 228
			Aroclor-1260	98U	98	30, p. 44; 31, p. 11; 34, p. 59; 42, pp. 86, 228
			Naphthalene	140	9.6	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206
			Acenaphthene	**25**	9.6	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206
			Fluorene	49	9.6	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206
			Anthracene	79	9.6	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206
			Fluoranthene	230	48	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206, 207
			Benzo(b)fluoranthene	190	48	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206, 207
			Benzo(k)fluoranthene	64	48	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206, 207
			Benzo(a)pyrene	140	48	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206, 207
			Dibenzo(a,h)anthracene	9.6U	9.6	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206
			Indeno(1,2,3-c,d)pyrene	79	9.6	30, p. 44; 31, p. 11; 34, p. 29; 42, pp. 89, 206
SP-2019-SD-BCK10[1]	C0AF0	10/24/19	Aroclor-1260	67U	67	30, p. 44; 31, p. 11; 34, p. 89; 43, pp. 35, 256
			Aroclor-1260	67U	67	30, p. 44; 31, p. 11; 34, p. 89; 43, pp. 35, 256
			Naphthalene	140	33	30, p. 44; 31, p. 11; 34, p. 61; 43, pp. 38, 233
			Acenaphthene	23J	33	30, p. 44; 31, p. 1; 34, p. 61; 43, pp. 3, 38, 233
			Fluorene	**52**	33	30, p. 44; 31, p. 11; 34, p. 61; 43, pp. 38, 233
			Anthracene	**110**	33	30, p. 44; 31, p. 11; 34, p. 61; 43, pp. 38, 233
			Fluoranthene	480	33	30, p. 44; 31, p. 11; 34, p. 61; 43, pp. 38, 233
			Benzo(b)fluoranthene	330	33	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 38, 233
			Benzo(k)fluoranthene	120	33	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 38, 233
			Benzo(a)pyrene	**210**	33	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 38, 233
			Dibenzo(a,h)anthracene	33U	33	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 38, 233

Table 6. Background Sediment Samples Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**RDL (µg/kg)**	**References**
SP-2019-SD-BCK10[1]	C0AF0	10/24/19	Indeno(1,2,3-c,d)pyrene	**130**	33	30, p. 44; 31, p. 11; 34, p. 62; 43, pp. 38, 233

Notes:

- The Reporting Detection Limit (RDL) is the Contract Required Quantitation Limit (CRQL) adjusted for sample weight, volume, dilution, and percent solid (Ref. 32, pp. 130-134, 503, 504; 42, pp. 2, 4; 43 pp. 2, 4). Since the samples were analyzed through the CLP, the adjusted CRQLs/RDLs presented above is equivalent to the CRQL as defined by the HRS (Ref. 1, Sections 1.1 and 2.3).
- Qualified data were used in accordance with EPA Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. (Ref. 33 p. 1-18).
- Compounds detected below the CRQLs are qualified “J,” with no associated bias (Refs. 42, p. 4; 43, p. 3).
- Bold values represent highest concentration for each hazardous substance.
- [1] The correct field sample ID for CLP sample C0AF0 is SP-2019-SD-BCK10 as documented on the Chain of Custody (COC) (Ref. 31, p. 11). The incorrect sample location of SP-SD-BCK09 was entered in the Sample Location field for sample C0AF0 instead of SP-SD-BCK10 on the Chain of Custody (Ref. 31, p. 11). The data for CLP sample C0AF0 is reported on pages 38 and 233 of Reference 43 and pages 61 and 62 of Reference 34. Page 38 of Reference 43 and pages 61 and 62 of Reference 34 incorrectly shows the sample location/sample ID as SP-SD-BCK09 because these fields pull this information from the Location field on the chain of custody.
- µg/kg= micrograms per kilogram
- CLP = Contract Laboratory Program
- J = The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (Refs. 42, p. 6; 43, p. 6).
- U = The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit (Refs. 42, p. 6; 43, p. 6).

Table 7. Background Sediment Samples - Inorganic

Field Sample ID	CLP Sample ID	Date	Percent Solids	Hazardous Substance	Concentration (mg/kg)	RDL (mg/kg)	References
SP-2019-SD-BCK01	MC0AC9	10/23/19	22	Cadmium	**5.7J[1] (8.03)**	0.5	30, p. 47; 31, p. 3; 33, pp. 8, 18; 35, p. 7; 39, pp. 3, 44, 95
				Chromium	**709**	1	30, p. 47; 31, p. 3; 35, p. 9; 39, pp. 43, 83
				Lead	**195J[1] (280.8)**	0.5	30, p. 47; 31, p. 3; 33, pp. 8, 18; 35, p. 7; 39, pp. 3, 44, 95
				Mercury	0.32J+[1]	0.1	30, p. 47; 31, p. 3; 35, p. 10; 39, pp. 3, 42, 107
				Selenium	3.8	2.5	30, p. 47; 31, p. 3; 35, p. 7; 39, pp. 43, 83
				Silver	1.1J[1] (**1.914**)	0.5	30, p. 47; 31, p. 3; 33, pp. 8, 18; 35, p. 7; 39, pp. 3, 44, 95
				Zinc	**2570**	6	30, p. 47; 31, p. 3; 35, p. 10; 39, pp. 43, 83
SP-SD-BCK002	MC0AD3	10/23/19	21.3	Cadmium	5.2	0.5	30, p. 47; 31, p. 4; 35, p. 8, 39 pp. 67, 98
				Chromium	385	1	30, p. 47; 31, p. 4; 35, p. 10; 39, pp. 66, 86
				Lead	207	0.5	30, p. 47; 31, p. 4; 35, p. 8, 39 pp. 67, 98
				Mercury	**0.36**	0.1	30, p. 47; 31, p. 4; 35, p. 10; 39, pp. 65, 110
				Selenium	3	2.5	30, p. 47; 31, p. 4; 35, p. 8, 39 pp. 67, 98
				Silver	1.1	0.5	30, p. 47; 31, p. 4; 35, p. 8, 39 pp. 67, 98
				Zinc	1320	6	30, p. 47; 31, p. 4; 35, p. 10; 39, pp. 66, 86
SP-SD-BCK03	MC0AD2	10/23/19	25.8	Cadmium	5.4	0.5	30, p. 47; 31, p. 4; 35, p. 7; 39, pp. 63, 97
				Chromium	518	1	30, p. 47; 31, p. 4; 35, p. 10; 39, pp. 62, 85
				Lead	197	0.5	30, p. 47; 31, p. 4; 35, p. 7; 39, pp. 63, 97
				Mercury	0.34	0.1	30, p. 47; 31, p. 4; 35, p. 10; 39, pp. 61, 109
				Selenium	4.6	2.5	30, p. 47; 31, p. 4; 35, p. 7; 39, pp. 63, 97
				Silver	1.2	0.5	30, p. 47; 31, p. 4; 35, p. 8; 39, pp. 63, 97
				Zinc	1540	6	30, p. 47; 31, p. 4; 35, p.10; 39, pp. 62, 85
SP-SD-BCK04	MC0AE7	10/24/19	30.3	Cadmium	4.2	1.6	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 73, 136

Table 7. Background Sediment Samples - Inorganic							
Field Sample ID	**CLP Sample ID**	**Date**	**Percent Solids**	**Hazardous Substance**	**Concentration (mg/kg)**	**RDL (mg/kg)**	**References**
SP-SD-BCK04	MC0AE7	10/24/19	30.3	Chromium	181	2.9	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 72, 116
				Lead	188	1.6	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 73, 136
				Mercury	0.31U	0.31	30, p. 44; 31, p. 13 35, p. 22; 40, pp. 73, 136
				Selenium	5.2J[2]	7.9	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 73, 136
				Silver	1.2J[2]	1.6	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 73, 136
				Zinc	437	17.7	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 72, 116
				Cyanide	0.11J[2]	1.7	30, p. 44; 31, p. 13; 35, p. 23; 40, pp. 3, 70, 176
SP-SD-BCK05	MC0AE8	10/24/19	70.6	Cadmium	0.58J[2]	0.68	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 77, 137
				Chromium	86.7	1.3	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 76, 117
				Lead	41.3	0.68	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 77, 137
				Selenium	0.97J[2]	3.4	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 77, 137
				Silver	0.22J[2]	0.68	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 77, 137
				Zinc	113	7.7	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 76, 117
				Cyanide	0.059J[2]	0.68	30, p. 44; 31, p. 13; 35, p. 23; 40, pp. 3, 74, 177
SP-SD-BCK06	MC0AF2	10/24/19	79.2	Cadmium	0.0073J[2]	0.62	30, p. 44; 31, p. 13; 35, p. 17; 40 pp. 3, 93, 141
				Chromium	14.6	1.2	30, p. 44; 31, p. 13; 35, p. 22; 40, pp. 92, 121
				Lead	10.8	0.62	30, p. 44; 31, p. 13; 35, p. 17; 40 pp. 93, 141
				Selenium	0.31J[2]	3.1	30, p. 44; 31, p. 13; 35, p. 17; 40 pp. 3, 93, 141
				Silver	0.063J[2]	0.62	30, p. 44; 31, p. 13; 35, p. 17; 40 pp. 3, 93, 141
				Zinc	25.4	7.2	30, p. 44; 31, p. 13; 35, p. 22; 40, pp. 92, 121
				Cyanide	0.16J[2]	0.56	30, p. 44; 31, p. 12; 35, p. 23; 40, pp. 3, 90, 181
SP-SD-BCK07	MC0AF3	10/24/19	78.4	Cadmium	0.59U	0.59	30, p. 44; 31, p. 14; 35, p. 18; 40, pp. 97, 142
				Chromium	25.7	1.2	30, p. 44; 31, p. 14; 35, p. 22; 40, pp. 96, 122
				Lead	8.7	0.59	30, p. 44; 31, p. 14; 35, p. 18; 40, pp. 97, 142

Table 7. Background Sediment Samples - Inorganic

Field Sample ID	CLP Sample ID	Date	Percent Solids	Hazardous Substance	Concentration (mg/kg)	RDL (mg/kg)	References
SP-SD-BCK07	MC0AF3	10/24/19	78.4	Selenium	2.9U	2.9	30, p. 44; 31, p. 14; 35, p. 18; 40, pp. 97, 142
				Silver	0.59U	0.59	30, p. 44; 31, p. 14; 35, p. 18; 40, pp. 97, 142
				Zinc	36.7	7.2	30, p. 44; 31, p. 14; 35, p. 22; 40, pp. 96, 122
				Cyanide	0.2J[2]	0.57	30, p. 44; 31, p. 14; 35, p. 23; 40, pp. 3, 94 182
SP-SD-BCK08	MC0AF1	10/24/19	80.2	Cadmium	0.13J[2]	0.6	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 3, 89, 140
				Chromium	18.5	1.1	20, p. 44; 21, p. 13; 25, p 21; 40, pp. 88, 120
				Lead	9.1	0.6	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 89, 140
				Selenium	0.44J[2]	3	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 3, 89, 140
				Silver	0.1J[2]	0.6	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 3, 89, 140
				Zinc	32.4	6.8	30, p. 44; 31, p. 13; 35, p 22; 40, pp. 88, 120
				Cyanide	0.22J[2]	0.56	30, p. 44; 31, p. 13; 35, p 23; 40, pp. 3, 86, 180
SP-SD-BCK09	MC0AE9	10/24/19	38.3	Cadmium	1J[2]	1.2	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 81, 138
				Chromium	341	2.5	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 80, 118
				Lead	169	1.2	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 81, 138
				Mercury	0.35	0.25	30, p. 44; 31, p. 13; 35, p. 22; 40, pp. 3, 79, 158
				Selenium	**5.8J[2]**	6.1	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 81, 138
				Silver	1.3	1.2	30, p. 44; 31, p. 13; 35, p. 16; 40, pp. 3, 81, 138
				Zinc	563	15.2	30, p. 44; 31, p. 13; 55, p. 21; 40, pp. 80, 118
				Cyanide	0.23J[2]	1.3	30, p. 44; 21, p. 13; 55, p. 23; 40, pp. 3, 78, 178
SP-SD-BCK10	MC0AF0	10/24/19	45.6	Cadmium	0.74J[2]	1	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 3, 85, 139
				Chromium	309	2	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 84, 119
				Lead	62.9	1	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 85, 139
				Selenium	1.4J[2]	5.1	30, p. 44; 31, p. 13; 35, p. 17; 40, pp. 3, 85, 139
				Silver	0.95J[2]	1	30, p. 44; 321, p. 13; 35, p. 17; 40, pp. 3, 85, 139

Table 7. Background Sediment Samples - Inorganic							
Field Sample ID	**CLP Sample ID**	**Date**	**Percent Solids**	**Hazardous Substance**	**Concentration (mg/kg)**	**RDL (mg/kg)**	**References**
SP-SD-BCK10	MC0AF0	10/24/19	45.6	Zinc	293	12.2	30, p. 44; 31, p. 13; 35, p. 21; 40, pp. 84, 119
				Cyanide	**0.42J[2]**	1	30, p. 44; 31, p. 13; 35, p. 23; 40, pp. 3, 82, 179

Notes:

- The Reporting Detection Limit (RDL) is the Contract Required Quantitation Limit (CRQL) adjusted for adjusted for sample weight, volume, dilution, and percent solid (Ref. 36, pp. 150, 218, 219, 242, 243). Since the samples were analyzed through the CLP, the adjusted CRQLs/RDLs presented above is equivalent to the CRQL as defined by the HRS- (Ref. 1, Sections 1.1 and 2.3; 39, pp. 2, 3; 40, pp. 2, 3; 43, p. 2, 3).
- Qualified data were used in accordance with EPA Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination*. (Ref. 33 p. 1-18).
- Bold values represent highest concentration for each hazardous substance.
- [1] Indicates result was qualified due to failing quality assurance/quality control (QA/QC) criteria (Ref. 39, p. 3).
- [2]Compounds detected below the CRQLs are qualified "J," with no associated bias (Refs. 39, p. 3; 40 p. 3).
- CLP = Contract Laboratory Program
- ( ) = Indicates adjusted value in accordance with EPA Fact Sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (Ref. 33, pp. 8 and 18).
- J = The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (Refs. 39, p. 5; 40, p. 4).
- J+ = The result is an estimated quantity, but the result may be biased high (Ref. 39, pp. 3, 5)
- mg/kg = milligrams per kilogram
- U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit (Refs. 39, p. 5; 40, p. 4).

Table 8. Background Comparison Concentrations			
Background Sample ID	Hazardous Substance	Background Concentration	Concentrations Used to Establish Observed Release
SP-2019-SD-BCK02	Aroclor-1248	160U	160 µg/kg
SP-2019-SD-BCK02	Aroclor-1254	82J	246 µg/kg
SP-2019-SD-BCK02	Aroclor-1260	160U	160 µg/kg
SP-2019-SD-BCK04	Naphthalene	170	510 µg/kg
SP-2019-SD-BCK04	Acenaphthene	25	75 µg/kg
SP-2019-SD-BCK10	Fluorene	52	156 µg/kg
SP-2019-SD-BCK10	Anthracene	110	330 µg/kg
SP-2019-SD-BCK01	Fluoranthene	500	1,500 µg/kg
SP-2019-SD-BCK01	Benzo(b)fluoranthene	470	1410 µg/kg
SP-2019-SD-BCK01	Benzo(k)fluoranthene	190	570 µg/kg
SP-2019-SD-BCK10	Benzo(a)pyrene	210	630 µg/kg
SP-2019-SD-BCK02	Dibenzo(a,h)anthracene	79U	79 µg/kg
SP-2019-SD-BCK01/ SP-2019-SD-BCK10	Indeno(1,2,3-c,d)pyrene	130	390 µg/kg
SP-2019-SD-BCK01	Cadmium	8.03J	24.09 mg/kg
SP-2019-SD-BCK01	Chromium	709	2,127 mg/kg
SP-2019-SD-BCK01	Lead	280.8J	842.4 mg/kg
SP-2019-SD-BCK02	Mercury	0.36	1.08 mg/kg
SP-2019-SD-BCK09	Selenium	5.8J	17.4 mg/kg
SP-2019-SD-BCK09	Silver	1.914	5.74 mg/kg
SP-2019-SD-BCK01	Zinc	2,570	7,710 mg/kg
SP-2019-SD-BCK10	Cyanide	0.42J	1.26 mg/kg

µg/kg= micrograms per kilogram
mg/kg = milligrams per kilogram
J = The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Table 9. Observed Release Sediment Samples – Organic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (µg/kg)	MDL/ RDL[1] (µg/kg)	References
SD-C03		10/13/14	Indeno(1,2,3-c,d)pyrene	470	37	22, pp. 446, 585; 48, p. 1
SD-E03		10/14/14	Fluoranthene	1900	78	22, pp. 449, 687; 48, p. 3
SD-F01		10/14/14	Aroclor-1248	1600	0.65	22, pp. 451, 688; 48, p. 4
SD-G01		10/14/14	Aroclor-1248	260	2.1	22, pp. 450, 690; 48, p. 4
SD-G02		10/14/14	Benzo(a)pyrene	1700	66	22, pp. 452, 675; 48, p. 4
SD-H01		10/14/14	Arolcor-1248	600	1.8	22, pp. 450, 692; 48, p. 4
SD-H02		10/14/14	Aroclor-1248	570	1.9	22, pp. 450, 693; 48, p. 4
SD-DE02-0406		4/30/15	Naphthalene	1400	18	22, pp. 473, 475, 1032; 49, p. 2
			Fluorene	250	27	22, pp. 473, 475, 1032; 49, p. 2
			Anthracene	350	20	22, pp. 473, 475, 1031; 49, p. 2
			Fluoranthene	1800	22	22, pp. 473, 475, 1032; 49, p. 2
			Benzo(a)pyrene	840	20	22, pp. 473, 475, 1031; 49, p. 2
			Indeno(1,2,3-c,d)pyrene	660	21	22, pp. 473, 475, 1032; 49, p. 2
SD-E03-0204		4/30 /15	Naphthalene	580	4.5	22, pp. 472, 476, 1052; 49, p. 3
			Dibenzo(a,h)anthracene	160	5.8	22, pp. 472, 476, 1051; 49, p. 3
			Benzo(a)pyrene	900	5.2	22, pp. 472, 476, 1051; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	440	5.4	22, pp. 472, 476, 1052; 49, p. 3
SD-F03-0002		5/1/15	Aroclor-1248	5100	17	22, pp. 459, 479, 1211; 49, p. 5
			Aroclor-1254	1800	16	22, pp. 459, 479, 1211; 49, p. 5
			Arolcor-1260	540	15	22, pp. 459, 479, 1212; 49, p. 5
			Acenaphthene	770	10	22, pp. 459, 479, 1103; 49, p. 5
			Fluorene	980	14	22, pp. 459, 479, 1104; 49, p. 5
SD-F04-0002		5/1/15	Aroclor-1260	160	2.3	22, pp. 462, 477, 1220; 49, p. 5
			Naphthalene	1700	72	22, pp. 462, 477, 1112; 49, p. 5
			Fluorene	1700	110	22, pp. 462, 477, 1112; 49, p. 5
			Anthracene	2100	82	22, pp. 462, 477, 1111; 49, p. 5
			Fluoranthene	8600	90	22, pp. 462, 477, 1112; 49, p. 5
			Benzo(b)fluoranthene	2600	130	22, pp. 462, 477,1111; 49, p. 5
			Benzo(a)pyrene	2500	84	22, pp. 462, 477, 1111; 49, p. 5
			Indeno(1,2,3-c,d)pyrene	1800	87	22, pp. 462, 477, 1112; 49, p. 5
SD-F04-0406		5/1/15	Aroclor-1248	2800	15	22, pp. 462, 477, 1221; 49, p. 5
			Aroclor-1260	250	13	22, pp. 462, 477, 1222; 49, p. 5
			Acenaphthene	160	12	22, pp. 462, 477, 1113; 49, p. 5
			Fluorene	290	16	22, pp. 462, 477, 1114; 49, p. 5
SD-F06-0406		5/1/15	Naphthalene	2000	8.9	22, pp. 472, 478, 1098; 49, p. 4
			Acenaphthene	160	9.9	22, pp. 472, 478, 1097; 49, p. 4
			Fluorene	230	14	22, pp. 472, 478, 1098; 49, p. 4
			Anthracene	440	10	22, pp. 472, 478, 1097; 49, p. 4

Table 9. Observed Release Sediment Samples – Organic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (µg/kg)	MDL/ RDL[1] (µg/kg)	References
SD-F06-0406		5/1/15	Fluoranthene	2100	11	22, pp. 472, 478, 1098; 49, p. 4
			Benzo(a)pyrene	1000	10	22, pp. 472, 478, 1097; 49, p. 4
			Dibenzo(a,h)anthracene	250	11	22, pp. 472, 478, 1097; 49, p. 4
			Indeno(1,2,3-c,d)pyrene	830	11	22, pp. 472, 478, 1098; 49, p. 4
SD-F07-0406		4/30/15	Naphthalene	2200	9	22, pp. 472, 474, 1014; 49, p. 2
			Acenaphthene	190	10	22, pp. 472, 474, 1013; 49, p. 2
			Fluorene	370	14	22, pp. 472, 474, 1014; 49, p. 2
			Anthracene	830	10	22, pp. 472, 474, 1013; 49, p. 2
			Fluoranthene	4700	11	22, pp. 472, 474, 1014; 49, p. 2
			Benzo(k)fluoranthene	910	21	22, pp. 472, 474, 1013; 49, p. 2
			Benzo(b)fluoranthene	2100	16	22, pp. 472, 474, 1013; 49, p. 2
			Benzo(a)pyrene	1700	10	22, pp. 472, 474, 1013; 49, p. 2
			Dibenzo(a,h)anthracene	400	12	22, pp. 472, 474, 1013; 49, p. 2
			Indeno(1,2,3-c,d)pyrene	1400	11	22, pp. 472, 474, 1014; 49, p. 2
SD-G01-0002		5/1/15	Aroclor-1248	260	2.9	22, pp. 462, 477, 1171; 49, p. 3
			Naphthalene	1800	16	22, pp. 462, 477, 1064; 49, p. 3
			Acenaphthene	450	18	22, pp. 462, 477, 1063; 49, p. 3
			Fluorene	2000	24	22, pp. 462, 477, 1064; 49, p. 3
			Anthracene	3100	18	22, pp. 462, 477, 1063; 49, p. 3
			Fluoranthene	12000	20	22, pp. 462, 477, 1064; 49, p. 3
			Benzo(a)pyrene	3300	18	22, pp. 462, 477, 1063; 49, p. 3
			Dibenzo(a,h)anthracene	800	20	22, pp. 462, 477, 1063; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	2600	19	22, pp. 462, 477, 1064; 49, p. 3
SD-G02-0406		4/30/15	Aroclor-1254	2800	32	22, pp. 461, 475, 1136; 49, p. 2
			Arolcor-1260	840	30	22, pp. 461, 475, 1136; 49, p. 2
			Acenaphthene	1700	41	22, pp. 461, 475, 1027; 49, p. 2
			Fluorene	3200	57	22, pp. 461, 475, 1028; 49, p. 2
			Fluoranthene	6700	46	22, pp. 461, 475, 1028; 49, p. 2
			Benzo(k)fluoranthene	1400	87	22, pp. 461, 475, 1027; 49, p. 2
SD-G03-0406		4/30/15	Aroclor-1254	2700	33	22, pp. 459, 474, 1125; 49, p. 2
			Arolcor-1260	760	30	22, pp. 459, 474, 1126; 49, p. 2
			Naphthalene	2200	19	22, pp. 459, 474, 1018; 49, p. 2
			Acenaphthene	310	21	22, pp. 459, 474,1017; 49, p. 2
			Fluorene	740	29	22, pp. 459, 474,1018; 49, p. 2
			Anthracene	1300	22	22, pp. 459, 474,1017; 49, p. 2
			Fluoranthene	7300	24	22, pp. 459, 474,1018; 49, p. 2
			Benzo(k)fluoranthene	710	44	22, pp. 459, 474,1017; 49, p. 2
			Benzo(b)fluoranthene	2100	35	22, pp. 459, 474,1017; 49, p. 2

Table 9. Observed Release Sediment Samples – Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**MDL/ RDL[1] (µg/kg)**	**References**
SD-G03-0406		4/30/15	Benzo(a)pyrene	1900	22	22, pp. 459, 474,1017; 49, p. 2
			Dibenzo(a,h)anthracene	600	24	22, pp. 459, 474,1017; 49, p. 2
			Indeno(1,2,3-c,d)pyrene	1300	23	22, pp. 459, 474, 1018; 49, p. 2
SD-G04-0406		5/1/15	Naphthalene	1700	3.8	22, pp. 459, 477, 1070; 49, p. 3
			Acenaphthene	110	4.3	22, pp. 459, 477, 1069; 49, p. 3
			Fluorene	210	5.9	22, pp. 459, 477, 1070; 49, p. 3
			Anthracene	510	4.4	22, pp. 459, 477, 1069; 49, p. 3
			Fluoranthene	3400	4.8	22, pp. 459, 477, 1070; 49, p. 3
			Benzo(b)fluoranthene	1500	7	22, pp. 459, 477, 1069; 49, p. 3
			Benzo(a)pyrene	1200	4.5	22, pp. 459, 477, 1069; 49, p. 3
			Dibenzo(a,h)anthracene	270	5	22, pp. 459, 477, 1069; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	1200	4.6	22, pp. 459, 477, 1070; 49, p. 3
SD-G05-0406		05/01/15	Aroclor-1248	1900	6.4	22, pp. 459, 477, 1183; 49, p. 4
			Arolcor-1254	540	6.1	22, pp. 459, 477, 1184; 49, p. 4
			Naphthalene	4400	3.5	22, pp. 459, 477, 1076; 49, p. 4
			Acenaphthene	170	3.9	22, pp. 459, 477, 1075; 49, p. 4
			Fluorene	250	5.3	22, pp. 459, 477, 1076; 49, p. 4
			Benzo(k)fluoranthene	590	8.2	22, pp. 459, 477, 1075; 49, p. 4
			Benzo(a)pyrene	850	4.0	22, pp. 459, 477, 1075; 49, p. 4
			Dibenzo(a,h)anthracene	180	4.5	22, pp. 459, 477, 1075; 49, p. 4
			Indeno(1,2,3-c,d)pyrene	560	4.2	22, pp. 459, 477, 1076; 49, p. 4
SD-G06-0002		4/30/15	Naphthalene	3500	4.3	22, pp. 472, 475, 1040; 49, p. 3
			Acenaphthene	110	4.8	22, pp. 472, 475, 1039; 49, p. 3
			Fluorene	290	6.6	22, pp. 472, 475, 1040; 49, p. 3
			Anthracene	660	4.9	22, pp. 472, 475, 1039; 49, p. 3
			Fluoranthene	4000	5.3	22, pp. 472, 475, 1040; 49, p. 3
			Benzo(k)fluoranthene	800	10	22, pp. 472, 475, 1039; 49, p. 3
			Benzo(b)fluoranthene	1800	7.9	22, pp. 472, 475, 1039; 49, p. 3
			Benzo(a)pyrene	1600	5	22, pp. 472, 475, 1039; 49, p. 3
			Dibenzo(a,h)anthracene	380	5.6	22, pp. 472, 475, 1039; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	1400	5.1	22, pp. 472, 475, 1040; 49, p. 3
SD-H01-0002		5/1/15	Naphthalene	3300	92	22, pp. 462, 478, 1080; 49, p. 4
			Acenaphthene	1400	100	22, pp. 462, 478, 1079; 49, p. 4
			Fluorene	3200	140	22, pp. 462, 478, 1080; 49, p. 4
			Anthracene	4100	100	22, pp. 462, 478, 1079; 49, p. 4
			Fluoranthene	14000	110	22, pp. 462, 478, 1080; 49, p. 4
			Benzo(b)fluoranthene	5800	170	22, pp. 462, 478, 1079; 49, p. 4
			Benzo(a)pyrene	4300	110	22, pp. 462, 478, 1079; 49, p. 4
			Indeno(1,2,3-c,d)pyrene	3200	110	22, pp. 462, 478, 1080; 49, p. 4

Table 9. Observed Release Sediment Samples – Organic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (µg/kg)	MDL/ RDL[1] (µg/kg)	References
SD-H03-0406		5/1/15	Arolcor-1248	1900	3.1	22, pp. 460, 478, 1193; 49, p. 4
			Aroclor-1254	620	3	22, pp. 460, 478, 1193; 49, p. 4
			Arolcor-1260	170	2.7	22, pp. 460, 478, 1194; 49, p. 4
			Naphthalene	1500	17	22, pp. 460, 478, 1086; 49, p. 4
			Acenaphthene	810	19	22, pp. 460, 478, 1085; 49, p. 4
			Fluorene	1200	26	22, pp. 460, 478, 1086; 49, p. 4
			Benzo(b)fluoranthene	1300	31	22, pp. 460, 478, 1085; 49, p. 4
			Benzo(a)pyrene	890	20	22, pp. 460, 478, 1085; 49, p. 4
SD-H04-0406		5/1/15	Naphthalene	6400	12	22, pp. 459, 478, 1092; 49, p. 4
			Acenaphthene	660	13	22, pp. 459, 478, 1091; 49, p. 4
			Fluorene	750	18	22, pp. 459, 478,1092; 49, p. 4
			Anthracene	1300	14	22, pp. 459, 478, 1091; 49, p. 4
			Fluoranthene	6200	15	22, pp. 459, 478, 1092; 49, p. 4
			Benzo(k)fluoranthene	1000	28	22, pp. 459, 478, 1091; 49, p. 4
			Benzo(b)fluoranthene	2800	22	22, pp. 459, 478, 1091; 49, p. 4
			Benzo(a)pyrene	2100	14	22, pp. 459, 478, 1091; 49, p. 4
			Dibenzo(a,h)anthracene	440	16	22, pp. 459, 478, 1091; 49, p. 4
			Indeno(1,2,3-c,d)pyrene	1700	14	22, pp. 459, 478, 1092; 49, p. 4
SD-H05-0002		4/30/15	Naphthalene	760	37	22, pp. 460, 474, 1008; 49, p. 2
			Fluorene	850	57	22, pp. 460, 474, 1007; 49, p. 2
			Anthracene	1300	42	22, pp. 460, 474, 1007; 49, p. 2
			Fluoranthene	7300	46	22, pp. 460, 474, 1008; 49, p. 2
			Benzo(k)fluoranthene	890	88	22, pp. 460, 474, 1007; 49, p. 2
			Benzo(b)fluoranthene	2100	68	22, pp. 460, 474, 1007; 49, p. 2
			Benzo(a)pyrene	2200	43	22, pp. 460, 474, 1007; 49, p. 2
			Indeno(1,2,3-c,d)pyrene	1800	45	22, pp. 460, 474, 1008; 49, p. 2
SD-H07-0002-FD		4/30/15	Naphthalene	4200	9.4	22, pp. 471, 475 1036; 49, p. 2
			Acenaphthene	110	10	22, pp. 471, 475, 1035; 49, p. 2
			Fluorene	280	14	22, pp. 471, 475, 1036; 49, p. 2
			Anthracene	1000	11	22, pp. 471, 475, 1035; 49, p. 2
			Fluoranthene	10000	12	22, pp. 471, 475, 1036; 49, p. 2
			Benzo(k)fluoranthene	1700	22	22, pp. 471, 475, 1035; 49, p. 2
			Benzo(b)fluoranthene	5000	17	22, pp. 471, 475, 1035; 49, p. 2
			Benzo(a)pyrene	4600	11	22, pp. 471, 475, 1035; 49, p. 2
			Dibenzo(a,h)anthracene	1100	12	22, pp. 471, 475, 1035; 49, p. 2
			Indeno(1,2,3-c,d)pyrene	3300	11	22, pp. 471, 475, 1036; 49, p. 2
SD-H07-0406		4/30/15	Naphthalene	1400	3.1	22, pp. 471, 475, 1038; 49, p. 2
			Fluoranthene	1700	3.8	22, pp. 471, 475, 1038; 49, p. 2
			Benzo(a)pyrene	890	3.6	22, pp. 471, 475, 1037; 49, p. 2
			Dibenzo(a,h)anthracene	250	4	22, pp. 471, 475, 1037; 49, p. 2

Table 9. Observed Release Sediment Samples – Organic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (µg/kg)	MDL/ RDL[1] (µg/kg)	References
SD-H07-0406		4/30/15	Indeno(1,2,3-c,d)pyrene	740	3.7	22, pp. 471, 475, 1038; 49, p. 2
SD-I01-0001		5/1/15	Naphthalene	750	2.2	22, pp. 471, 478, 1100; 49, p. 4
			Benzo(a)pyrene	930	2.5	22, pp. 471, 478, 1099; 49, p. 4
			Dibenzo(a,h)anthracene	250	2.8	22, pp. 471, 478, 1099; 49, p. 4
			Indeno(1,2,3-c,d)pyrene	750	2.6	22, pp. 471, 478, 1100; 49, p. 4
SD-I02-0204		4/30/15	Arclor-1254	450	1.6	22, pp. 471, 476, 1168; 49, p. 3
			Aroclor-1260	160	1.4	22, pp. 471, 476, 1168; 49, p. 3
			Naphthalene	3400	4.5	22, pp. 471, 476, 1060; 49, p. 3
			Acenaphthene	190	5.1	22, pp. 471, 476, 1059; 49, p. 3
			Fluorene	270	7	22, pp. 471, 476, 1060; 49, p. 3
			Anthracene	360	5.2	22, pp. 471, 476, 1059; 49, p. 3
			Fluoranthene	3200	5.6	22, pp. 471, 476, 1060; 49, p. 3
			Benzo(b)fluoranthene	1400	8.3	22, pp. 471, 476, 1059; 49, p. 3
			Benzo(a)pyrene	1300	5.3	22, pp. 471, 476, 1059; 49, p. 3
			Dibenzo(a,h)anthracene	250	5.9	22, pp. 471, 476, 1059; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	810	5.4	22, pp. 471, 476, 1060; 49, p. 3
SD-I03-0002		4/30/15	Naphthalene	2300	4.3	22, pp. 471, 476, 1044; 49, p. 3
			Fluorene	210	6.5	22, pp. 471, 476, 1044; 49, p. 3
			Anthracene	650	4.8	22, pp. 471, 476, 1043; 49, p. 3
			Fluoranthene	6700	5.3	22, pp. 471, 476, 1044; 49, p. 3
			Benzo(k)fluoranthene	1500	10	22, pp. 471, 476, 1043; 49, p. 3
			Benzo(b)fluoranthene	3500	7.8	22, pp. 471, 476, 1043; 49, p. 3
			Benzo(a)pyrene	3200	4.9	22, pp. 471, 476, 1043; 49, p. 3
			Dibenzo(a,h)anthracene	780	5.5	22, pp. 471, 476, 1043; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	2400	5.1	22, pp. 471, 476, 1044; 49, p. 3
SD-I03-0204		4/30/15	Naphthalene	530	3.3	22, pp. 471, 476, 1046; 49, p. 3
			Dibenzo(a,h)anthracene	140	4.3	22, pp. 471, 476, 1045; 49, p. 3
			Indeno(1,2,3-c,d)pyrene	480	4	22, pp. 471, 476, 1046; 49, p. 3
SD-J02-0204		5/1/15	Aroclor-1248	620	2.9	22, pp. 472, 478, 1215; 49, p. 5
			Aroclor-1254	420	2.8	22, pp. 472, 478, 1216; 49, p. 5
			Naphthalene	3000	20	22, pp. 472, 478, 1108; 49, p. 5
			Anthracene	370	23	22, pp. 472, 478, 1107; 49, p. 5
			Fluoranthene	2500	25	22, pp. 472, 478, 1108; 49, p. 5
			Benzo(a)pyrene	1200	23	22, pp. 472, 478, 1107; 49, p. 5
			Dibenzo(a,h)anthracene	260	26	22, pp. 472, 478, 1107; 49, p. 5
			Indeno(1,2,3-c,d)pyrene	830	24	22, pp. 472, 478, 1108; 49, p. 5
SS18-01-1		10/10/18	Naphthalene	4200	450	28, p. 26; 29, p. 3; 44, p. 8
			Fluoranthene	3400	610	28, p. 26; 29, p. 3; 44, p. 7
SS18-02-0.5		10/10/18	Fluoranthene	3600	820	28, p. 27; 29, p. 3; 44, p. 11

Table 9. Observed Release Sediment Samples – Organic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (µg/kg)	MDL/ RDL[1] (µg/kg)	References
SS18-02-1		10/10/18	Arolcor-1260	2200J (220)	4.3	28, p. 27; 29, p. 3; 33, pp. 8, 16; 44, pp. 3, 34
			Fluoranthene	5800	790	28, p. 27; 29, p. 3; 44, p. 13
SS18-03-0.5		10/10/18	Fluoranthene	1900	430	28, p. 27; 29, p. 3; 44, p. 15
SS-18-06-0.5		10/10/18	Acenaphthene	1100	270	28, p. 26; 29, p. 3; 44, p. 23
			Fluoranthene	2600	250	28, p. 26; 29, p. 3; 44, p. 23
			Fluorene	1600	180	28, p. 26; 29, p. 3; 44, p. 23
			Naphthalene	3200	180	28, p. 26; 29, p. 3; 44, p. 24
SS-18-06-1		10/10/18	Arolcor-1260	3900J (390)	4.8	28, p. 27; 29, p. 3; 33, pp. 8, 16; 44, pp. 3, 44
			Fluoranthene	2100	360	28, p. 27; 29, p. 3; 44, p. 25
			Fluorene	1600	270	28, p. 27; 29, p. 3; 44, p. 25
			Naphthalene	5000	270	28, p. 27; 29, p. 3; 44, p. 26
SS18-07-0.5		10/09/18	Benzo(a)pyrene	660	120	28, p. 25; 29, p. 1; 45, p. 8
			Naphthalene	530	100	28, p. 25; 29, p. 1; 45, p. 9
SS18-07-01		10/09/18	Benzo(b)fluoranthene	2300	150	28, p. 25; 29, p. 1; 45, p. 10
			Benzo(a)pyrene	1700	130	28, p. 25; 29, p. 1; 45, p. 10
			Fluoranthene	3900	160	28, p. 25; 29, p. 1; 45, p. 10
			Indeno(1,2,3-c,d)pyrene	1300	120	28, p. 25; 29, p. 1; 45, p. 10
			Naphthalene	670	120	28, p. 25; 29, p. 1; 45, p. 11
SP-SD-DD02	C0AE1	10/23/19	Naphthalene	2500	1400	30, p. 43; 31, p. 8; 34, p. 27; 42, pp. 73, 199
			Acenaphthene	5700	1400	30, p. 43; 31, p. 8; 34, p. 27; 42, pp. 73, 199
			Fluorene	1900	1400	30, p. 43; 31, p. 8; 34, p. 28; 42, pp. 73, 199
			Anthracene	9800J-	1400	30, p. 43; 31, p. 8; 34, p. 28; 33, p. 8; 42, pp. 3, 73, 199
			Fluoranthene	15000J-	1400	30, p. 43; 31, p. 8; 34, p. 28; 33, p. 8; 42, pp. 3, 73, 199
			Benzo(b)fluoranthene	10000	1400	30, p. 43; 31, p. 8; 34, p. 28; 42, pp. 73, 199
			Benzo(a)pyrene	4100	1400	30, p. 43; 31, p. 8; 34, p. 28; 42, pp. 73, 199
SP-SD-EE01	C0AD6	10/23/19	Naphthalene	1800	980	30, p. 47; 31, p. 8; 34, p. 26; 42, pp. 53, 189
			Acenaphthene	6100	980	30, p. 47; 31, p. 8; 34, p. 26; 42, pp. 53, 189
			Fluorene	2600	980	30, p. 47; 31, p. 8; 33, p. 8; 34, p. 26; 42, pp. 53, 189
			Anthracene	15000J-	980	30, p. 47; 31, p. 8; 33, p. 8; 34, p. 26; 42, pp. 3, 53, 189
			Fluoranthene	1600J-	980	30, p. 47; 31, p. 8; 33, p. 8; 34, p. 26; 42, pp. 3, 53, 189

Table 9. Observed Release Sediment Samples – Organic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (µg/kg)**	**MDL/ RDL[1] (µg/kg)**	**References**
SP-SD-EE01	C0AD6	10/23/19	Benzo(b)fluoranthene	8600	980	30, p. 47; 31, p. 8; 34, p. 26; 42, pp. 53, 189
			Benzo(a)pyrene	4200	980	30, p. 47; 31, p. 8; 34, p. 26; 42, pp. 53, 189

Notes:

- [1] Analytical results for samples collected in 2019 are compared to Reporting Detection Limits (RDL). All other sample analytical results are compared to Method Detection Limits (MDL).
- The Method Detection Limit (MDL) for the non-CLP result is the minimum measured quantity of a substance that can be reported with 99% confidence that the concentration is distinguishable from method blank results, consistent with 40CFR Part 136 Appendix B, August, 2017 (Ref. 37, p. 2). The samples were analyzed by a non-CLP laboratory. MDLs presented above are equivalent to the MDL as defined by HRS Section 1.1 (Ref. 1, Sections 1.1 and 2.3).
- The Reporting Detection Limit (RDL) is the Contract Required Quantitation Limit (CRQL) adjusted for sample weight, volume, dilution, and percent solid (Ref. 32, pp. 130-134, 503, 504). The samples were analyzed through the CLP. The adjusted CRQLs/RDLs presented above are equivalent to the CRQL as defined by the HRS (Ref. 1, Sections 1.1 and 2.3).
- Qualified data were used in accordance with EPA Fact Sheet Using Qualified Data to Document an Observed Release and Observed Contamination. (Ref. 33 p. 1-18)
- ( ) = Indicates adjusted value in accordance with EPA Fact Sheet Using Qualified Data to Document an Observed Release and Observed Contamination (Ref. 33, pp. 8 and 16).
- µg/kg= micrograms per kilogram
- CLP = Contract Laboratory Program
- J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample (Ref. 44, pp. 4).
- J- = The result is an estimated quantity, but the result may be biased low (Ref. 42, pp. 3, 6).

Table 10. Observed Release Sediment Samples – Inorganic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**MDL/ RDL[1] (mg/kg)**	**References**
SD-C03		10/13/14	Cyanide	1.5	0.34	22, pp. 446, 639; 48, p. 1
SD-E03		10/14/14	Cyanide	7.3	0.36	22, pp. 449, 751; 48. p. 3
SD-G02		10/14/14	Cyanide	21	0.33	22, pp. 452, 756; 48, p. 4
			Chromium	2700	0.11	22, pp. 452, 722; 48, p. 4
SD-H01		10/14/14	Cyanide	2.8	0.19	22, pp. 450, 757; 48, p. 4
SD-H03		10/14/14	Cadmium	45	0.11	22, pp. 451, 731; 48, p. 4
			Chromium	2600	0.095	22, pp. 451, 731; 48, p. 4
			Zinc	10000	1	22, pp. 451, 731; 48, p. 4
			Cyanide	12	0.3	22, pp. 451, 759; 48, p. 4
SD-DE01		4/23/15	Cyanide	1.6	0.11	22, pp. 469, 872; 49, p. 1
SD-DE02-0002		4/30/15	Cyanide	4.5J (2.9)	0.42	22, pp. 473, 475, 879, 1347; 33, pp. 8, 18; 49, p. 2

Table 10. Observed Release Sediment Samples – Inorganic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**MDL/ RDL[1] (mg/kg)**	**References**
SD-DE02-0406		4/30/15	Lead	1000	0.0057	22, pp. 473, 475, 1236; 49, p. 2
			Cyanide	8.2	0.25	22, pp. 473, 475, 1349; 49, p. 2
SD-E03-0002		4/30/15	Cyanide	29J (18.7)	0.41	22, pp. 472, 476, 895, 1362; 33, pp. 8, 18; 49, p. 3
SD-E03-0204		4/30/15	Lead	1000	0.0058	22, pp. 472, 476, 1246; 49, p. 3
			Selenium	17	0.076	22, pp. 472, 476, 1246; 49, p. 3
			Cyanide	27J (17.41)	0.25	22, pp. 472, 476, 895, 1364; 33, pp. 8, 18; 49, p. 3
SD-F03-0002		5/1/15	Cyanide	6.2	0.13	22, pp. 459, 479, 1400; 49, p. 5
SD-F04-0002		5/1/15	Chromium	3100	0.0077	22, pp. 462, 477, 1276; 49, p. 5
			Cyanide	4.2	0.21	22, pp. 462, 477, 1406; 49, p. 5
SD-F06-0406		5/1/15	Cyanide	26J (16.77)	0.26	22, pp. 472, 478, 895, 1396; 33, pp. 8, 18; 49, p. 4
			Lead	1200	0.0057	22, pp. 472, 478, 1269; 49, p. 4
SD-F07-0002		4/30/15	Cyanide	15J (9.68)	0.39	22, pp. 472, 474, 879, 1333; 33, pp. 8, 18; 49, p. 2
SD-F07-0406		4/30/15	Lead	1300	0.0059	22, pp. 472, 474, 1227; 49, p. 2
			Mercury	1.5	0.017	22, pp. 472, 474, 1227; 49, p. 2
			Cyanide	13	0.26	22, pp. 472, 474, 1335; 49, p. 2
SD-G01-0002		5/1/15	Chromium	2900	0.0083	22, pp. 462, 477, 1252; 49, p. 3
			Cyanide	17J (10.97)	0.22	22, pp. 462, 477, 895, 1371; 33, pp. 8, 18; 49, p. 3
SD-G01-0406		5/1/15	Cadmium	90J (63.83)	0.012	22, pp. 462, 477, 879, 891, 1253; 33, pp. 8, 18; 49, p. 3
			Chromium	7300J (5658.91)	0.1	22, pp. 462, 477, 879, 1253; 33, pp. 8, 18; 49, p. 3
			Silver	10J (5.74)	0.0066	22, pp. 462, 477, 879, 1253; 33, pp. 8, 18; 49, p. 3
			Zinc	16000J (10666.66)	1.1	22, pp. 462, 477, 879, 1253; 33, pp. 8, 18; 49, p. 3
			Cyanide	4.8J (3.10)	0.28	22, pp. 462, 477, 879, 895, 1373; 33, pp. 8, 18; 59, p. 3

Table 10. Observed Release Sediment Samples – Inorganic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**MDL/ RDL[1] (mg/kg)**	**References**
SD-G02-0002		4/30/15	Chromium	3900J (3023.26)	0.012	22, pp. 461, 475, 879, 1233; 33, pp. 8, 18; 49, p. 2
			Zinc	11000J (7333.33)	1.2	22, pp. 461, 475, 879, 1233; 33, pp. 8, 18; 49, p. 2
			Cyanide	8.4J (5.41)	0.32	22, pp. 461, 475, 879, 1344; 33, pp. 8, 18; 49, p. 2
SD-G02-0406		4/30/15	Cadmium	71J (50.35)	0.011	22, pp. 461, 475, 891, 1234; 33, pp. 8, 18; 49, p. 2
			Chromium	5600	0.098	22, pp. 461, 475, 1234; 49, p. 2
			Lead	840	0.0061	22, pp. 461, 475, 1234; 49, p. 2
			Mercury	1.8	0.018	22, pp. 461, 475, 1234; 49, p. 2
			Silver	12	0.0063	22, pp. 461, 475, 1234; 49, p. 2
			Zinc	12000	1	22, pp. 461, 475, 1234; 49, p. 2
			Cyanide	15	0.26	22, pp. 461, 475, 1346; 49, p. 2
SD-G03-0002		4/30/15	Cyanide	4J (2.58)	0.31	22, pp. 459, 474, 879, 1336; 33, pp. 8, 18; 49, p. 2
SD-G03-0406		4/30/15	Lead	1200	0.0062	22, pp. 459, 474, 1229; 49, p. 2
			Mercury	1.7	0.018	22, pp. 459, 474, 1229; 49, p. 2
			Cyanide	24	0.27	22, pp. 459, 474, 1338; 49, p. 2
SD-G04-0002		5/1/15	Chromium	4200J (3255.81)	0.012	22, pp. 459, 477, 879, 1254; 33, pp. 8, 18; 49, p. 3
			Cyanide	8.2J (5.29)	0.33	22, pp. 459, 477, 879, 895, 1374; 33, pp. 8, 18; 49, p. 3
SD-G04-0406		5/1/15	Lead	840	0.005	22, pp. 459, 477, 1255; 49, p. 3
			Mercury	1.4	0.013	22, pp. 459, 477, 1255; 49, p. 3
			Selenium	30	0.066	22, pp. 459, 477, 1255; 49, p. 3
			Cyanide	7J (4.51)	0.22	22, pp. 459, 477, 895, 1376; 33, pp. 8, 18; 49, p. 3
SD-G05-0002		5/1/15	Cyanide	12J (7.74)	0.38	22, pp. 459, 477, 895, 879, 1378; 33, pp. 8, 18; 49, p. 4
SD-G05-0406		5/1/15	Cyanide	3J (1.94)	0.2	22, pp. 459, 477, 895, 1380; 33, pp. 8, 18; 49, p. 4

Table 10. Observed Release Sediment Samples – Inorganic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (mg/kg)	MDL/ RDL[1] (mg/kg)	References
SD-G05-0607		5/1/15	Cyanide	7.4J (4.77)	1.7	22, pp. 459, 477, 895, 1381; 33, pp. 8, 18; 49, p. 4
SD-G06-0002		4/30/15	Lead	1100	0.0057	22, pp. 472, 475, 1240; 49, p. 3
			Cyanide	18	0.24	22, pp. 472, 475, 1355; 49, p. 3
SD-H01-0406		5/1/15	Cadmium	81J (57.45)	0.013	22, pp. 462, 478, 879, 891, 1261; 33, pp. 8, 18; 49, p. 4
			Chromium	5300J (4108.53)	0.011	22, pp. 462, 478, 879, 1261; 33, pp. 8, 18; 49, p. 4
SD-H01-0406		5/1/15	Cyanide	5.2J (3.35)	0.3	22, pp. 462, 478, 879, 895, 1384; 33, pp. 8, 18; 49, p. 4
SD-H03-0002		5/1/15	Cadmium	110J (78.01)	0.015	22, pp. 460, 478, 879, 891, 1262; 33, pp. 8, 18; 49, p. 4
			Chromium	4600J (3565.89)	0.013	22, pp. 460, 478, 879, 1262; 33, pp. 8, 18; 49, p. 4
			Zinc	17000J (11333.33)	0.14	22, pp. 460, 478, 879, 1262; 33, pp. 8, 18; 49, p. 4
			Cyanide	16J (10.32)	0.36	22, pp. 460, 478, 879, 895, 1385; 33, pp. 8, 18; 49, p. 4
SD-H03-0406		5/1/15	Cadmium	32	0.01	22, pp. 460, 478, 1263; 49, p. 4
			Chromium	3700	0.091	22, pp. 460, 478, 1263; 49, p. 4
			Lead	1000	0.0056	22, pp. 460, 478, 1263; 49, p. 4
			Mercury	1.3	0.013	22, pp. 460, 478, 1263; 49, p. 4
			Cyanide	6.4	0.24	22, pp. 459, 478, 1387; 49, p. 4
SD-H03-0607		5/1/15	Cyanide	7J (4.51)	0.18	22, pp. 460, 478; 895, 1393; 33, pp. 8, 18; 49, p. 4
SD-H04-0002		5/1/15	Chromium	3400J (2635.66)	0.012	22, pp. 459, 478, 879, 1264; 33, pp. 8, 18; 49, p. 4
			Cyanide	7.1J (4.58)	0.33	22, pp. 459, 478, 879, 895, 1388; 33, pp. 8, 18; 49, p. 4
SD-H04-0406		5/1/15	Lead	1200	0.0053	22, pp. 459, 478, 1266; 49, p. 4
			Cyanide	7.2J (4.65)	0.23	22, pp. 459, 478, 895, 1392; 33, pp. 8, 18; 49, p. 4
SD-H05-0002		4/30/15	Cyanide	3.3	0.27	22, pp. 460, 474, 1330; 49, p. 2
SD-H05-0406		4/30/15	Cyanide	13J (8.39)	0.29	22, pp. 460 474, 879, 1332; 33, pp. 8, 18; 49, p. 2

Table 10. Observed Release Sediment Samples – Inorganic						
Field Sample ID	**CLP Sample ID**	**Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**MDL/ RDL[1] (mg/kg)**	**References**
SD-H06-0002		4/30/15	Cyanide	2.5J (1.61)	0.38	22, pp. 460, 474, 879, 1339; 33, pp. 8, 18; 49, p. 2
SD-H06-0204		4/30/15	Cadmium	36J (25.53)	0.014	22, pp. 460, 474, 879, 891, 1232; 33, pp. 8, 18; 49, p. 2
			Chromium	4000J (3100.78)	0.012	22, pp. 460, 474, 879, 1232; 33, pp. 8, 18; 49, p. 2
			Cyanide	14J (9.03)	0.34	22, pp. 460, 474, 879, 895, 1343; 33, pp. 8, 18; 49, p. 2
SD-H07-0002		4/30/15	Cyanide	34J (21.94)	0.27	22, pp. 471, 475, 879, 1350; 33, pp. 8, 18; 49, p. 2
SD-H07-0406		4/30/15	Mercury	1.1	0.011	22, pp. 471, 475, 1239; 49, p. 2
			Cyanide	8.1J (5.23)	0.18	22, pp. 471, 475, 895, 1354; 33, pp. 8, 18; 49, p. 2
SD-I01-001		5/1/15	Cyanide	9.6J (6.20)	0.15	22, pp. 471, 478, 895, 1397; 33, pp. 8, 18; 49, p. 4
SD-I02-0002		4/30/15	Cyanide	13J (8.39)	0.35	22, pp. 471, 476, 879, 895, 1367; 33, pp. 8, 18; 49, p. 3
SD-I02-0204		4/30/15	Cyanide	6.5J (4.19)	0.26	22, pp. 471, 476, 895, 1369; 33, pp. 8, 18; 49, p. 3
SD-I03-0002		4/30/15	Lead	840	0.0055	22, pp. 471, 476, 1242; 49, p. 3
			Mercury	1.5	0.017	22, pp. 471, 476, 1242; 49, p. 3
			Cyanide	22	0.24	22, pp. 471, 476, 1358; 49, p. 3
SD-J02-0204		5/1/15	Cyanide	11	0.24	22, pp. 472, 478, 1404; 49, p. 5
SS18-01-0.5		10/10/18	Cyanide	22J- (34.1)	0.17	33, pp. 8, 18; 29, p. 3; 47, pp. 3, 16
SS18-01-1		10/10/18	Cyanide	22	0.2	28, p. 26; 29, p. 3; 47, p. 17
SS18-02-0.5		10/10/18	Cyanide	31	0.28	28, p. 27; 29, p. 3; 47, p. 19
			Chromium	3000	1.2	28, p. 27; 29, p. 3; 47, p. 8
			Zinc	11000	6.2	28, p. 27; 29, p. 3; 47, p. 8
SS18-02-1		10/10/18	Cyanide	13	0.25	28, p. 27; 29, p. 3; 47, p. 20
			Chromium	4500	1.2	28, p. 27; 29, p. 3; 47, p. 9
			Silver	6.5	0.25	28, p. 27; 29, p. 3; 47, p. 9
			Zinc	150000	6	28, p. 27; 29, p. 3; 47, p. 9
SS18-03-0.5		10/10/18	Cyanide	32	0.24	28, p. 27; 29, p. 3; 47, p. 21
SS18-03-1		10/10/18	Cyanide	31	0.23	28, p. 27; 29, p. 3; 47, p. 22
SS18-04-0.5		10/10/18	Cyanide	37	0.26	28, p. 28; 29, p. 3; 47, p.23
SS18-05-0.5		10/9/18	Cyanide	16	0.12	28, p. 23; 29, p. 1; 46, p. 13

Table 10. Observed Release Sediment Samples – Inorganic

Field Sample ID	CLP Sample ID	Date	Hazardous Substance	Concentration (mg/kg)	MDL/ RDL[1] (mg/kg)	References
SS18-06-0.5		10/10/18	Cyanide	31	0.28	28, pp. 26, 27; 29, p. 3; 47, p. 25
			Chromium	3800	1.2	28, pp. 26, 27; 29, p. 3; 47, p. 14
			Silver	5.8	0.26	28, pp. 26, 27; 29, p. 3; 47, p. 14
			Zinc	13000	6.1	28, pp. 26, 27; 29, p. 3; 47, p. 14
SS18-06-1		10/10/18	Cyanide	14	0.31	28, pp. 26, 27; 29, p. 3; 47, p. 26
			Chromium	5200	1.3	28, pp. 26, 27; 29, p. 3; 47, p. 15
			Silver	6.5	0.28	28, pp. 26, 27; 29, p. 3; 47, p. 15
			Zinc	17000	6.7	28, pp. 26, 27; 29, p. 3; 47, p. 15
SS18-07-0.5		10/9/18	Cyanide	46	0. 3	28, p. 25; 29, p. 1; 46, p. 14
SS18-07-1		10/9/18	Cyanide	51	0.34	28, p. 25; 29, p. 1; 46, p. 15
SS18-09-0.5		10/9/18	Cyanide	44	0.3	28, p. 24; 29, p. 1; 46, p. 17
SS18-09-1		10/9/18	Cyanide	55J- (85.25)	0.36	28, p. 24; 29, p. 1; 33, pp. 8, 18; 46, pp. 4, 19
SP-2019-SD-DD02	MC0AE1	10/23/19	Cadmium	42.2	0.5	30, p. 43; 31, p. 12; 35, p. 14; 40, pp. 49, 130
			Chromium	4100	20	30, p. 43; 31, p. 12; 35, p. 19; 40, pp. 48, 110
			Zinc	13600	120	30, p. 43; 31, p. 12; 35, p. 20; 40, pp. 48, 110
SP-2019-SD-EE01	MC0AD6	10/23/19	Chromium	3380	20	30, p. 47; 31, p. 12; 35, p. 18; 40, pp. 28, 105
			Zinc	8100	120	30, p. 47; 31, p. 12; 35, p. 19; 40, pp. 28, 105

Notes:

- [1] Analytical results for samples collected in 2019 are compared to Reporting Detection Limits (RDL). All other sample analytical results are compared to Method Detection Limits (MDL).
- The Method Detection Limit (MDL) for the non-CLP result is the minimum measured quantity of a substance that can be reported with 99% confidence that the concentration is distinguishable from method blank results, consistent with 40CFR Part 136 Appendix B, August, 2017 (Ref. 37, p. 2). Since the samples were analyzed by a non-CLP laboratory, MDLs presented above are used in place of the HRS-defined sample quantitation limits (SQL) and are equivalent to the MDL as defined by HRS Section 1.1 (Ref. 1, Sections 1.1 and 2.3).
- The Reporting Detection Limit (RDL) is the Contract Required Quantitation Limit (CRQL) adjusted for sample weight, volume, dilution, and percent solid (Refs. 35, p. 1; 36, pp. 150, 218, 219, 242, 243). Since the samples were analyzed through the CLP, the adjusted CRQLs/RDLs presented above are equivalent to the CRQL as defined by the HRS (Ref. 1, Sections 1.1 and 2.3).
- Qualified data were used in accordance with EPA Fact Sheet Using Qualified Data to Document an Observed Release and Observed Contamination. (Ref. 33 p. 1-18)
- ( ) = Indicates adjusted value in accordance with EPA Fact Sheet Using Qualified Data to Document an Observed Release and Observed Contamination (Ref. 33, pp. 8 and 18).
- CLP = Contract Laboratory Program

- J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (Ref. 22 p. 898).
- J- = The result is an estimated quantity, but the result may be biased low (Refs. 46, p. 5; 47, p. 4).
- mg/kg = milligrams per kilogram

<u>Attribution</u>

Source 1, the Tin Mill Canal (TMC), is an undefined volume of accumulated waste material in Tin Mill Canal (TMC) that resulted from historical discharges to the canal from numerous steel manufacturing process wastewaters. The waste has been characterized by waste samples collected from the TMC and summarized in **Tables 2 and 3** of this HRS documentation record. Hazardous substances associated with the TMC have the potential to discharge directly to Bear Creek because the wastes are not contained. Water in the TMC formerly discharged directly to Humphreys Creek, which discharged directly into Bear Creek (Refs. 11, pp. 113, 152; 12, p. 37, 46, 100; 13, pp. 150-156, 180-185). Later, the TMC discharged to the HCWWTP, which in turn discharged to Bear Creek via NPDES permitted Outfall 014 (Refs. 11, p. 7; 10, pp. 13, 33, 67, 76; 14, p. 14; Figures 2 and 3). The treatment of the wastewaters at HCWWTP consisted of pH adjustment with spent pickle liquor and lime, mixing, aeration, flocculation (polymer addition), and sedimentation prior to discharge at Outfall 014 (Ref. 11, pp. 64, 65). The HCWWTP is still currently in operation, primarily treating stormwater from the TMC as well as water collected from the groundwater pump and treat system currently in operation at the Rod and Wire Mill (Refs. 13, p. 20; 70, pp. 6, 14, 22). The HCWWTP utilizes an ACTIFLO® microsand ballasted clarification process (Ref. 8, p. 93). Stormwater is treated to reduce metals, oil and grease, and total suspended solids (TSS) in accordance with the current individual NPDES permit requirements at Outfall 014 (Refs. 14, pp. 14-16). The same hazardous substances detected in the TMC have been detected in the samples collected from Bear Creek documenting an observed release to Bear Creek (see **Tables 2 and 3** and Section 4.0 of this HRS documentation record). Although there are numerous sources of possible contamination to Bear Creek, Source 1 is at least partially attributable to hazardous substances detected in Bear Creek at concentrations meeting the observed release criteria.

TMC was constructed between 1950 and 1970 by placing slag that had been generated as part of steel making operations on the peninsula into Humphreys Creek and then digging out TMC from the slag (Ref. 11, pp. 13, 103, 104). TMC was constructed to convey steel manufacturing process wastewater (Ref. 11, p. 103). Prior to 1969, TMC discharged directly into Humphreys Creek (Ref. 11, p. 113; 13, pp. 57, 58, 60). Historically, Humphreys Creek was an open water body that flowed into Bear Creek (Refs.; 12, pp. 35, 46, 61; 13, pp. 152-156, 181-185). Between 1969 and 1970, Humphreys Creek was completely filled with slag and enclosed to create Humphreys Impoundment and the construction of TMC was complete (Refs. 11, pp. 13, 16, 103, 152; 12, p. 35; 13, pp. 21, 52). Industrial wastewater discharge pipes into Humphreys Creek were routed to TMC and conveyed to the newly constructed Humphreys Creek Wastewater Treatment Plant (HCWWTP) (Refs. 11, pp. 103, 105, 152; 12 p. 35). TMC accepted process wastewaters from all finishing mills at the facility. These wastewaters typically contained waste oil (e.g., rolling oil, lubricating oils and hydraulic oils), pickling rinsewaters, alkaline wastewaters and mill scale (Ref. 11, pp. 64 and 65).

TMC accepted process wastewaters from all finishing mills at the facility. The process wastewaters containing Resource Conservation and Recovery Act (RCRA) Hazardous Waste were conveyed to TMC through up to twenty-three internal discharge/outfall pipes from the various process areas throughout the steel manufacturing facility and included spent pickle liquor (K062); cyanide electroplating slurry, wastewater, and sludge (F007 and F008); chromium wastewater and waste chromic acid (D007); corrosive rinsewater (D002); ammonia lime sludge (K060); and ignitable spent caustic solution (D001); as well as oily waste (Refs. 11, pp. 1, 7, 103, 108-110; 12, pp. 72). These waste streams included oil, grease, suspended solids and metals such as iron, lead, zinc, tin, and chromium (Ref. 11, p. 107). A 1998 report prepared under the Consent Decree identified metals, such as cadmium, chromium, lead, nickel, and zinc, cyanide, and PAHs such as acenaphthene, acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene as well as numerous volatile organic compounds (SVOCs) as chemicals of potential interest associated with TMC based on analytical data of accumulated material in the canal presented in the 1993 Final RCRA Facility Assessment report and process knowledge (Refs. 11, pp. 114 and 115; 12, pp. 74 and 75).

Source 1 is an undefined volume of accumulated waste material in Tin Mill Canal (TMC) that resulted from historical discharges to the canal from numerous steel manufacturing process wastewaters. Analytical results samples collected in 2015 and 2016 of the waste material in the canal showed the presence of PCBs; PAHs; inorganics such as cadmium, chromium, lead, mercury, silver, selenium, and zinc; and cyanide (see **Section 2.2** of this HRS documentation record). In accordance with EPA's Statement of Basis and Final Remedy for TMC, in 2018 and 2019, impacted sediments in the canal were removed and an engineered cap installed above the sediments left in place to prevent direct contact exposures and support future stormwater conveyance through the TMC (Refs. 18, p. 7; 70, pp. 4, 6, 7, 14, 16, 23). Even though a removal has occurred for the source, all waste material in the canal was not completely removed and associated historic release to surface water have not been completely addressed.

The Bear Creek Sediments site is located in a heavily industrial and commercial area in southwestern Baltimore, Maryland, along the Patapsco River, which is located in the Baltimore Harbor Watershed (Ref. 85, p. 1; **Figure 1**). Numerous processes potentially contributing to the contamination of sediments in Bear Creek are located in Sparrows Point peninsula, the location of a steel manufacturing facility for more than a century (Refs. 11, p. 24; 13, pp. 2, 3, 17, 18, 19, 20). The area of actual contamination within Bear Creek is located within a tidally-influenced estuary (Refs. 51, pp. 1, 2; 52, pp. 1, 2; 85, p. 1; 86, p. 2; 87, p. 17; 89, pp. 11, 13; **Figure 4**). The tidal influence of the surface water in the area of the site could potentially result in the mixing of hazardous substances released from the source (i.e., waste material in TMC) with hazardous substances potentially released from other possible sources associated with the numerous industrial facilities in the area or even other possible sources associated with the former steel manufacturing facility located on Sparrows Point.

To document whether the significant increase in PCBs, PAHs, cyanide, and metals in Bear Creek is the result of a source or sources other than the source being evaluated in this HRS documentation record, three background sediment samples were collected from Bear Creek (BCK-01, BCK-02, BCK-03) and seven background sediment samples were collected from the Patapsco River (BCK-4 through BCK-10) (**Figure 4**). The background sediment samples were used to establish background conditions and chemical compositions of the sediment materials offshore of Sparrows Point peninsula and Tin Mill Canal. Analytical results of the background sediment samples establish representative background concentrations of site-attributable hazardous substances, which were then used to demonstrate significant increases of hazardous substances in sediment samples collected from Bear Creek offshore of Tin Mill Canal (**Section 4.1.2.1.1** of this documentation record).

As previously stated, source samples showed the presence of PCBs; PAHs; inorganics such as cadmium, chromium, lead, mercury, silver, selenium, and zinc; and cyanide (see **Section 2.2** of this HRS documentation record). These hazardous substances were documented in observed release sediment samples from Bear Creek, including samples collected north of TMC, as a result of tidal influence Canal (**Section 4.1.2.1.1** of this documentation record). Contamination of site-attributable hazardous substances in sediments within Bear Creek were documented to depths of 4 to 6 feet below top of sediment providing evidence of the long-term historical release of hazardous substances from the Source. The organic hazardous substances present in the sediments such as PCBs and some PAHs do not break down or readily dissolve in water and tend to stick to solid particles and settle to the bottoms of lakes or rivers (Refs. 63, p. 1; 64, p. 1). The inorganic hazardous substances present in the sediment in Bear Creek do not break down or dissolve but may change form over time depending on conditions (Refs. 65, p. 1; 66, p. 1; 67, p. 1; 68, p. 1, and 69, p. 1). Therefore, the significant increase in contamination in the surface water pathway is at least partially attributable to a release from the site.

<u>Hazardous Substances Released:</u>

Aroclor-1248
Aroclor-1254
Aroclor-1260
Acenaphthene
Anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Dibenzo(a,h)anthracene
Fluorene
Fluoranthene
Indeno(1,2,3-cd)pyrene
Naphthalene
Cyanide
Cadmium
Chromium
Lead
Mercury
Selenium

Silver
Zinc
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Observed Release Factor Value: 550

4.1.3.2 Human Food Chain Threat - Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Table 11 lists toxicity, persistence, and bioaccumulation factor values for hazardous substances that were detected in the source, which has a containment factor value exceeding 0, and hazardous substances that were documented in the observed release. The combined toxicity, persistence, and bioaccumulation factor values are assigned in accordance with Reference 1, Section 4.1.3.2.1.

Table 11. Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Substance in Observed Release?	Toxicity Factor Value	River Persistence Factor Value[1]	Food Chain Bioaccumulation Value[2]	Toxicity/ Persistence/ Bioaccumulation Factor Value	Reference
PCBs[3]	1	Y	10,000	1	50,000	$5X10^8$	2, p. 76
Acenaphthene	1	Y	10	0.4	500	2,000	2, p. 1
Anthracene	1	Y	10	0.4	50,000	200,000	2, p. 6
Benzo(a)pyrene	1	Y	10,000	1	50,000	$5X10^8$	2, p. 16
Benzo(b)fluoranthene	1	Y	NA	NA	NA	NA	
Benzo(k)fluoranthene	1	Y	10	1	50,000	500,000	2, p. 26
Dibenzo(a,h)anthracene	1	Y	10,000	1	50,000	$5X10^8$	2, p. 46
Fluoranthene	1	Y	100	1	50,000	$5X10^6$	2, p. 21
Fluorene	1	Y	100	1	500	50,000	2, p. 51
Indeno(1,2,3-c,d)pyrene	1	Y	100	1	50,000	$5X10^6$	2, p. 56
Naphthalene	1	Y	1,000	0.07	50,000	$3.5X10^6$	2, p. 71
Cyanide	1	Y	1,000	0.4	0.5	200	2, p. 41
Cadmium	1	Y	10,000	1	50,000	$5X10^8$	2, p. 31
Chromium	1	Y	10,000	1	500	$5X10^6$	2, p. 36
Lead	1	Y	10,000	1	5,000	$5X10^7$	2, p. 61
Mercury	1	Y	10,000	1	50,000	$5X10^8$	2, p. 66
Selenium	1	Y	100	1	500	50,000	2, p. 81
Silver	1	Y	100	1	50,000	$5X10^6$	2, p. 86
Zinc	1	Y	10	1	50,000	500,000	2, p. 91

Notes:
[1] Persistence factor value for rivers
[2] Salt concentrations of the tidal portion of Baltimore Harbor, which includes Bear Creek and the Patapsco River, range from 5 to 18 parts per thousand (Refs. 85, p. 1; 86, p. 2; 87, p. 17; 88, pp. 1-3, 13; 89, pp. 11, 13). Species that inhabit brackish waters are found within the TDL (Ref. 57, pp. 1-5). In accordance with the HRS for brackish water (salinity greater than 0.45 but less than 34 parts per thousand), the higher of the freshwater or saltwater bioaccumulation value was used for each substance (HRS Section 4.1.3.2.1.3).
[3] PCBs associated with the Site Source and Observed Release include: Aroclor-1248, Aroclor-1254, and Aroclor-1260
Y = Yes
NA = Not applicable

4.1.3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (HRS Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1	>0, but unknown	No

Sum of Values: >0, but unknown

A hazardous waste quantity of >0 is estimated for Source 1 at the Site. This yields a hazardous waste quantity of 1 based on Table 2-6 of the HRS (Ref. 1, Section 2.4.2.2). However, as documented in Section 2.4.2.2 of the HRS, if the hazardous constituent quantity is not adequately determined for one or more sources and any target for the migration pathway is subject to Level I or Level II concentrations, a value of 100 can be assigned as the hazardous waste quantity factor value for that pathway. As demonstrated in **Section 4.1.2.3.2.3**, fisheries are subject to Level II concentrations in the surface water pathway, and a minimum value of 100 can be assigned for the hazardous waste quantity factor value (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.3.2.3 Waste Characteristics Factor Category Value

PCBs, benzo(a)pyrene, dibenzo(a,h)anthracene, cadmium, and mercury associated with Site Source that have surface water pathway containment factor values greater than 0 for the watershed, corresponds to a toxicity/persistence factor value of 10,000 and bioaccumulation potential factor value of 50,000.

Toxicity/Persistence Factor Value = 10,000
Hazardous Waste Quantity (HWQ) Factor Value = 100
Bioaccumulation Potential Factor Value (BPFV) = 50,000

(Toxicity/Persistence Factor Value) × (Hazardous Waste Quantity Factor Value) = 10,000 × 100 = 1,000,000
subject to a maximum of 1×10^{8}

(Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value)
× (Bioaccumulation Potential Factor Value) = $(1 \times 10^{6}) \times (50,000) = 5 \times 10^{10}$
Subject to a maximum of 1×10^{12}

The value of 5×10^{10}
corresponds to a Waste Characteristics Factor Category Value of 320 (Ref. 1, Table 2-7)

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Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^{8}
Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 320

4.1.3.3 Human Food Chain Threat - Targets

Observed releases in the surface water pathway for the human food chain threat can be established based on sediment samples that meet the criteria for an observed release with hazardous substances that have a bioaccumulation potential factor value of 500 or greater (Ref. 1, Section 4.1.3.3). **Sections 4.1.2.1.1** and **4.1.3.2.1** document observed releases of one or more hazardous substances meeting these criteria in Bear Creek.

Recreational fisheries for various species, including crabs, exist in the surface water bodies (i.e., Bear Creek, Patapsco River, and Chesapeake Bay) adjacent to Sparrows Point peninsula and throughout the 15-mile TDL (Refs. 30, pp. 26, 27, 41, 44; 52, p. 1; 53, pp. 1, 2; 54, p. 1; 55, p. 1; 56, pp. 1, 2; 57, pp. 1-5). A local marina and The Baltimore County Department of Environmental Protection and Sustainability Watershed Monitoring and Planning Manager confirms that the surface water bodies subject to actual contamination, Bear Creek and Patapsco River, adjacent to Sparrows Point peninsula are fished for consumption purposes (Refs. 52, pp. 1, 2; 57, pp. 1-5). Commercial fisheries also exist in the Patapsco River and Chesapeake Bay within the 15-mile TDL (Refs. 58, pp. 1-8; 61, pp. 1-4). An approximate average of 573,863 pounds of fish and crab were commercially fished from the Patapsco River and Chesapeake Bay during 2015-2020 (Ref. 61, p. 4).

Fish consumption advisories on the Patapsco River and Chesapeake Bay exist for numerous fish species and crab (Ref. 59, pp. 1-10). These consumption advisories do not prohibit fish consumption, but rather provide suggested limits for consumption due elevated levels of contaminants (Ref. 59, pp. 1-10). There are numerous fishing/crabbing piers and public boat ramps along Bear Creek and the Patapsco River (Ref. 60, pp. 2, 4).

Actual Human Food Chain Contamination

The observed release to sediment from Source 1 associated with the Bear Creek Sediment site is established by sediment sample analytical results (see **Section 4.1.2.1.1** of this documentation record). Based on the analytical results of sediment samples, the following hazardous substances attributed to Source 1 have been detected at concentrations significantly above background in sediments (see **Section 4.1.2.1.1** of this documentation record). The sediment samples presented, which define the zone of actual contamination, were collected from Bear Creek (**Figure 4**). Bear Creek is actively fished for human consumption of fish and crabs (Ref. 52, p. 1; 57, p. 1). The samples in Table 12 below define the limits of the zone of actual contamination from sample SD-C03, most upstream sample that meets the criteria for an observed release, to sample SD-J02-0204, the most downstream sample that meets the criteria for an observed release, that contain hazardous substances with a bioaccumulation factor value of 500 or greater (see Section **4.1.3.2.1**).

Table 12. Zone of Actual Contamination

Sample ID	Distance from PPE (in feet)	Hazardous Substances with BPFV of 500 or Greater	Reference(s)
SD-C03	5,227	Indeno(1,2,3-cd)pyrene	**Figure 4**; 74, p. 1
SD-J02-0204	4,224 feet	Aroclor-1248, Aroclor-1254, Naphthalene, Anthracene, Fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Indeno(1,2,3-c,d)pyrene	**Figure 4**; 74, p. 1

Notes:
BPFV = Bioaccumulation Potential Factor Value
PPE = Probably point of entry

4.1.3.3.1 Food Chain Individual

As noted in **Sections 4.1.2.1.1 and 4.1.3.2.1**, an observed release of hazardous substances associated with the source and having a bioaccumulation factor value of 500 or greater has been documented in Bear Creek. As documented in **Section 4.1.3.3**, Bear Creek, the Patapsco River, and the Chesapeake Bay are fisheries within the TDL. Additionally, it has been documented that fish caught in the area of actual contamination are consumed (Ref. 57, pp. 1-5). However, fish tissue samples are not available for Bear Creek for comparison to applicable health-based benchmarks; therefore, the Bear Creek fishery is subject to Level II actual contamination (Ref. 1, Section 4.1.3.3.2.2). As a result, a Food Chain Individual Factor Value of 45 is assigned (Ref. 1, Section 4.1.3.3.1).

Food Chain Individual Factor Value: 45

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

The observed release to sediment from the Bear Creek Sediment site is established by sediment sample analytical results (see **Section 4.1.2.1.1** of this documentation record). However, fish tissue samples are not available for comparison to applicable health-based benchmarks; therefore, the fishery in the Bear Creek is evaluated as subject to Level II actual contamination (Ref. 1, Section 4.1.3.3)

Level I Concentrations Human Food Chain Population Value: 0

4.1.3.3.2.2 Level II Concentrations

As documented in **Section 4.1.3.3,** fish are caught and consumed within the zone of actual contamination (**Figure 4**; Refs. 52, pp. 1, 2; 57, pp. 1-5). The fish consumption rate for the fisheries is not documented, so the fishery is assigned to the category "Greater than 0 to 100 pounds per year" (Ref. 1, Section 4.1.3.3.2.2). The category corresponds to the assigned Human Food Chain Population Value of 0.03 in Table 4-18 of the HRS, which is assigned as the Level II Concentrations Factor Value (Ref. 1, Table 4-18).

Level II Concentrations Human Food Chain Population Value: 0.03

4.1.3.3.2.3 Potential Contamination

As documented in **Section 4.1.3.3**, the Patapsco River and the Chesapeake Bay are fished recreationally and commercially for consumption within the 15-mile TDL. The recreational fish consumption rate for the downstream fishery is not documented. An approximate average of 527,516 pounds and 24,653.5 pounds of fish and crab were commercially fished from the Patapsco River and Chesapeake Bay during 2015-2020, respectively; however, these rates represent the average over the 5-year period and are not specific to the area encompassed by the 15-mile TDL (Ref. 61, p. 4). Therefore, these fisheries are assigned to the category "Greater than 0 to 100 pounds per year," which corresponds to the assigned Human Food Chain Population Value of 0.03 in Table 4-18 of the HRS [Ref. 1].

Identity of Fishery	Annual Production (pounds)	Type of Surface Water Body	Average Annual Flow (cfs)	Population Value (P_i)	Dilution Weight (D_i)	P_i x D_i
Patapsco River	>0	Coastal Tidal	NA	0.03	0.0001	0.000003
Chesapeake Bay	>0	Coastal Tidal	NA	0.03	0.0001	0.000003

Sum of P_i x D_i: 0.000006
(Sum of P_i x D_i)/10: 0.0000006
(Ref. 1, Section 4.1.3.3.2.3, Table 4-13, Table 4-18; 61, p. 4)

Potential Human Food Chain Contamination Factor Value: 0.0000006

4.1.4.2 Environmental Threat - Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Table 13. Ecosystem/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Substance in Observed Release?	Ecotoxicity Factor Value	River Persistence Factor Value[1]	Environment Bioaccumulation Value[2]	Ecotoxicity/ Persistence/ Bioaccumulation Factor Value	Reference
PCBs[3]	1	Y	10,000	1	50,000	$5X10^8$	2, p. 76
Acenaphthene	1	Y	10,000	0.4	500	$2X10^6$	2, p. 1
Anthracene	1	Y	10,000	0.4	50,000	$2X10^8$	2, p. 6
Benzo(a)pyrene	1	Y	10,000	1	50,000	$5X10^8$	2, p. 16
Benzo(b)fluoranthene	1	Y	NA	NA	NA	NA	
Benzo(k)fluoranthene	1	Y	0	1	50,000	0	2, p. 26
Dibenzo(a,h)anthracene	1	Y	0	1	50,000	0	2, p. 46
Fluoranthene	1	Y	10,000	1	50,000	$5X10^8$	2, p. 21
Fluorene	1	Y	1,000	1	5,000	$5X10^6$	2, p. 51
Indeno(1,2,3-c,d)pyrene	1	Y	0	1	50,000	0	2, p. 56
Naphthalene	1	Y	1,000	0.07	50,000	$3.5X10^6$	2, p. 71
Cyanide	1	Y	1,000	0.4	0.5	200	2, p. 41
Cadmium	1	Y	10,000	1	50,000	$5X10^8$	2, p. 31
Chromium	1	Y	10,000	1	500	$5X10^6$	2, p. 36
Lead	1	Y	1,000	1	50,000	$5X10^7$	2, p. 61
Mercury	1	Y	10,000	1	50,000	$5X10^8$	2, p. 66
Selenium	1	Y	1,000	1	500	500,000	2, p. 81
Silver	1	Y	10,000	1	50,000	$5X10^8$	2, p. 86
Zinc	1	Y	100	1	50,000	$5X10^7$	2, p. 91

Notes:
[1] Persistence factor value for rivers
[2] Salt concentrations of the tidal portion of Baltimore Harbor, which includes Bear Creek and the Patapsco River, range from 5 to 18 parts per thousand (Refs. 85, p. 1; 86, p. 2; 87, p. 17; 88, pp. 1-3, 13; 89, pp. 11, 13). Species that inhabit brackish waters are found within the TDL (Ref. 57, pp. 1-5). In accordance with the HRS, for brackish water (salinity greater than 0.45 but less than 34 parts per thousand), the higher of the freshwater or saltwater value was used for each substance (HRS Section 4.1.4.2.1.1).
[3] PCBs associated with the Site Source and Observed Release include: Aroclor-1248, Aroclor-1254, and Aroclor-1260
Y = Yes
NA = Not applicable

4.1.4.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (HRS Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1	>0	No

Sum of Values: >0, rounded to 1

A hazardous waste quantity of >0 is estimated for sources at the site. This yields a hazardous waste quantity of 1 based on Table 2-6 of the HRS (Ref. 1, Section 2.4.2.2). However, as documented in Section 2.4.2.2 of the HRS, if the hazardous constituent quantity is not adequately determined for one or more sources and any target for the migration pathway is subject to Level I or Level II concentrations, a value of 100 can be assigned as the hazardous waste quantity factor value for that pathway. As demonstrated in **Section 4.1.4.3.1.2**, sensitive environments are subject to Level II concentrations in the surface water pathway, and a minimum value of 100 can be assigned for the hazardous waste quantity factor value (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value = 100

4.1.4.2.3 Waste Characteristics Factor Category Value

Hazardous substance, including PCBs, PAHs, such as benzo(a)pyrene, and inorganics such as cadmium, mercury, and silver associated with Source 1, which has a surface water pathway containment factor value greater than 0 for the watershed, correspond to an Ecotoxicity/Persistence Factor Value of 10,000 and Bioaccumulation Potential Factor Value of 50,000.

(Ecotoxicity/Persistence Factor Value) x (Hazardous Waste Quantity Factor Value) = 10,000 x 100 = 1 x 10^6

(Ecotoxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value)
x (Bioaccumulation Potential Factor Value) = (1 x 10^6) x (50,000) = 5 x 10^{10}
Subject to a maximum of 1 x 10^{12}

The product corresponds to a Waste Characteristics Factor Category Value of 320 (Ref. 1 Table 2-7)

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Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 320

4.1.4.3 Environmental Threat - Targets

The Chesapeake Bay, which is within the TDL, is a habitat known to be used by two Federal designated endangered species under the Endangered Species act (ESA), the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)* and the Shortnose Sturgeon (*Acipenser brevirostrum*) (Refs. 77, pp. 1, 2; 78, pp. 1, 2; 79, pp. 1, 2; 82, pp. 1, 2; 83, p. 41). Furthermore, the Chesapeake Bay is a designated critical habitat for the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)* (Ref. 84, p. 1). Both species are anadromous and migrate to spawn in estuaries and coastal river (Refs. 78, p. 4; 79, pp. 4 and 5). Additionally, both species are bottom feeders and consume bottom-dwelling invertebrates such as crustaceans, worms, and mollusks, insects, and bottom-dwelling fish such as sand lance (Refs. 79, p. 4; 79, p. 4).

<u>Most Distant Level I Sample</u>

Level I Concentrations are not established, because benchmarks are not available for sediment, and surface water was not collected.

<u>Most Distant Level II Sample</u>

The most distant Level II observed release attributable to the site and within the TDL extends 5,227 feet (approximately 1 mile) north from the PPE to sample SD-C03, most upstream sample as a result of tidal influence that meets the criteria for an observed release, to the farthest downstream sample location that meets the criteria for an observed release, SD-J02-0204 (**Figures 4; Section 4.1.2.1.1;** Ref. 74, p. 1). Level II Concentrations have not been established in Chesapeake Bay, the location of the two Federal designated endangered species, the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)* and the Shortnose Sturgeon (*Acipenser brevirostrum*) (Refs. 77, pp. 1, 2; 78, pp. 1, 2; 79, pp. 1, 2; 82, pp. 1, 2; 83, p. 41; 84, p. 1; **Figures 3 and 4**).

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

There are no sensitive environments subject to Level I concentrations and the Level I Concentrations Factor Value is 0 (Ref. 1, Section 4.1.4.3.1).

Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

No sensitive environments have been identified within the zone of actual contamination, therefore there are no sensitive environments subject to Level II concentrations and the Level II Concentrations Factor Value is 0 (**Section 4.1.4.3**).

Level II Sensitive Environments Factor Value: 0

4.1.4.3.1.3 Potential Contamination

The Chesapeake Bay, which is within the TDL, is a habitat known to be used by two Federal designated endangered species under the Endangered Species act (ESA), the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)* and the Shortnose Sturgeon (*Acipenser brevirostrum*) (Refs. 77, pp. 1, 2; 78, pp. 1, 2; 79, pp. 1, 2; 82, pp. 1, 2; 83, p. 41). Furthermore, the Chesapeake Bay is a designated critical habitat for the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)* (Ref. 84, p. 1).

Table 14. Potential Contamination – Chesapeake Bay

Sensitive Environment	Sensitive Environment Value (Ref. 1, Table 4-23)	Surface Water Dilution Weight (Ref. 1, Table 4-13)	Reference(s)
Critical habitat known to be used by Federal designated or proposed endangered or threatened species (Atlantic sturgeon)	100	0.0001 (Coastal Tidal Waters)	77, pp. 1, 2; 78, pp. 1, 2; 79, pp. 1; 2
Habitat known to be used by Federal designated or proposed endangered or threatened species (Shortnose sturgeon)	75	0.0001 (Coastal Tidal Waters)	77, pp. 1, 2; 78, pp. 1, 2; 79, pp. 1; 2

Sum of Sensitive Environment Values x Dilution Weight: 0.0175
(Sum of Sensitive Environment Values x Dilution Weight) ÷ 10: 0.00175

Potential Contamination Factor Value: 0.00175