MAINTENANCE CLEANUP PLAN

FOR THE TIN MILL CANAL

TRADEPOINT ATLANTIC
SPARROWS POINT, MARYLAND

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TABLE OF CONTENTS

TABLE OF CONTENTS
(CONT.)

FIGURES

DRAWINGS

APPENDICES

1.0 INTRODUCTION

ARM Group Inc. (ARM), on behalf of EnviroAnalytics Group (EAG), has prepared this Maintenance Cleanup Work Plan (Work Plan) for a portion of the Tradepoint Atlantic property that has been designated as Parcel B16, the Tin Mill Canal (TMC). In general, this Work Plan provides for the maintenance of the TMC through the removal of accumulated sediments from the canal to restore its flow capacity, followed by capping of the residual materials to provide for long-term protection of human health and the environment. The remedial activities presented in this Work Plan are based on the findings and recommendations of the "Sediment Characterization Report for the Tin Mill Canal – Revision 0" dated March 15, 2017.

1.1. SITE DESCRIPTION

The TMC is a constructed swale that currently serves as a conveyance for stormwater runoff and groundwater base flow from an approximately 800-acre drainage area of the Sparrows Point site. Waters collected in the TMC are routed to the Humphrey's Creek Waste Water Treatment Plant (HCWWTP) for treatment prior to discharge via the NPDES permitted Outfall 014. The average volume of water flowing through the canal to the HCWWTP during dry weather is approximately 3,000 gallons per minute (gpm), but can increase to over 50,000 gpm during storm events. The TMC is located in the central portion of the Sparrows Point property, south of Interstate 695 and Highway Route 158. An aerial photo that shows the location of the canal is provided as Figure 1**.**

The TMC is approximately 7,500 feet in length, 30 to 50 feet wide and 15 feet below grade. The canal was constructed from slag and includes numerous point discharges (outalls) from the site storm sewer system. The eastern portion of the TMC began operating in the early 1950's. The western (remaining) portions of the canal and HCWWTP were completed and began operating in approximately 1969. Since its construction, the TMC has historically also conveyed wastewater discharged from numerous manufacturing facilities associated with former steelmaking and steel finishing operations at the Sparrows Point site. Over the years, some of the heavier particles and oils in the wastewaters from the steel manufacturing facilities have settled to the bottom of the TMC. The canal still receives and controls stormwater runoff from the Site; the HCWWTP remains operational to treat stormwater runoff prior to discharge. An outfall summary is included in Appendix A.

1.2. REGULATORY SETTING

Environmental actions for the TMC, and for the site in general, are being implemented pursuant to the following:

- Multi-Media Consent Decree (Decree) between Bethlehem Steel Corporation, the United States Environmental Protection Agency, and the Maryland Department of the

Environment (effective October 8, 1997); this Decree has been 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 (effective September 12, 2014); and,
- Settlement Agreement and Covenant Not to Sue (SA) between Sparrows Point Terminal, LLC and the United States Environmental Protection Agency (effective November 25, 2014).

The original Consent Decree for the Sparrows Point facility dealt with many issues associated with ongoing iron-making, steel-making, coking, byproduct, plating, and finishing operations. To the extent that these operations are no longer conducted, and the associated facilities no longer exist, many specific requirements of the Decree are no longer applicable and have been removed in accordance with the stipulated order implementing modifications to the Decree. The TMC is part of the acreage that remains subject to the requirements of the Decree as documented in correspondence received from EPA on September 12, 2014.

1.3. WORK PLAN OBJECTIVES

In general, the objectives of the cleanup work for the TMC are to restore the canal surface to near the original grades, and to leave it in a condition that is protective of both human health and the environment. The proposed measures generally include the removal of solids settled within the canal and subsequent channel stabilization work as previously summarized in the Site Conceptual Cleanup Plan (SCCP; EAG, August 2014a).

As noted above, the canal has been used historically for the conveyance of both stormwater and wastewater to a central wastewater treatment plant (HCWWTP) prior to discharge to surface water through a NPDES-permitted discharge outfall. Materials that contain polychlorinated biphenyls (PCBs), oil/grease, and other constituents have been deposited in the TMC over time from process sewer discharges associated with the steel finishing operations. These materials are located within the entire length and width of the canal and affect water currently being controlled and discharged through the canal. The canal still receives and controls stormwater runoff from the Site; the HCWWTP remains operational to treat stormwater runoff prior to discharge.

Based on the site conditions, the proposed cleanup work focuses on the mitigation of future exposure pathways from contaminated sediment, impacts to stormwater conveyed by the canal, and elimination of contaminants from the aggregate TMC discharge requiring treatment at the HCWWTP as follows:

- Sediment - Prevent potential future direct exposure to contaminated sediments located within the TMC; and

- Surface Water - Mitigate impacts to stormwater conveyed by the TMC and eliminate the need for ongoing treatment of stormwater at the HCWWTP.

To accomplish these goals, the proposed work includes removal and disposal of impacted sediments associated with the canal, and the installation of acceptable isolation and channel stabilization materials (i.e., engineered cap) above the sediments left in place to prevent direct contact exposures and support future stormwater conveyance through the TMC. These proposed measures and the supporting rationale are presented in the balance of this Work Plan.

A Corrective Measures Study will be initiated subsequent to completion of the work identified in this Work Plan in accordance with requirements of the Decree. The Corrective Measures Study will develop and evaluate additional corrective action alternatives and provide recommendations for additional corrective measures as necessary for the TMC.

2.0 SEDIMENT CHARACTERIZATION RESULTS

A detailed investigation of the TMC and associated sediments was conducted to support the planning and design of the maintenance work for the TMC. The results and recommendations from this detailed investigation were presented in the "Sediment Characterization Report for the Tin Mill Canal – Revision 0" dated March 15, 2017 (SCR), and the major findings and recommendations from that report are presented in this section to provide some additional background and basis for the proposed work.

2.1. CHEMICAL CHARACTERIZATION

Based on the significant sampling and testing conducted, the primary constituents of concern in the canal sediments include oil & grease and PCBs.

The oil & grease was generally detected throughout the canal. During former steelmaking operations, oils within contact wastewaters were managed through a series of baffles and oil skimmers installed at at specific locations along the canal. While there is no specific action level for removal of sediments containing oil & grease, sediments will generally be removed along the entire length of the canal to allow for the removal of the existing oil-control structures, and as necessary to restore the flow capacity of the canal after allowing for the placement of a 2-foot thick barrier layer (cap). The proposed work has been designed to manage elevated levels of oil & grease that will be encountered during the sediment removal work so as to minimize discharges of oil & grease to the HCWWTP. The estimated volume of sediments to be removed is approximately 31,000 cubic yards (see calculation in Appendix B).

Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, and total PCBs were identified in sediment samples collected from the TMC. Several deep sediment samples exceeded the level that would warrant mandatory delineation and excavation of total PCBs (i.e., 50 mg/kg). The extent of the TMC where total PCBs were identified above 50 mg/kg has been laterally delineated as generally shown on Sheet 1 of the attached Drawings. Because samples with PCB concentrations over 50 mg/kg were from deep sampling depth intervals, further vertical delineation is required and is planned to be conducted during the sediment excavation process. Material exceeding the threshold of 50 mg/kg is required to be excavated and disposed of at a permitted off-site commercial landfill approved to accept TSCA-regulated PCB waste. The estimate volume of these sediments is approximately 4,500 cubic yards (see calculation in Appendix B).

2.2. PHYSICAL CHARACTERIZATION

As presented in the SCR, the sediments were typically described as dark black fine silt; oily/greasy; and sludge-like. The moisture content of selected samples ranged from 28 to 41.4%,

and dry densities ranged from as high as 109 pounds per cubic foot (pcf) for material described as dryish to 76.8 pcf for more typical material. Therefore, the excavated sediment will need to be dewatered, possibly with the use of drying agents, to remove free liquids to make it suitable for transport off-site or to the on-site Greys landfill. Sediment can be dewatered and solidified with sorbent material (cement kiln dust, lime kiln dust, fly ash, gypsum, sawdust, soil, etc.) until the bulked material no longer contains free liquids and will pass the paint filter test. This may be done in place prior to removal from the canal, in roll-off containers, on a concrete containment pad, and/or in a portable pug mill. Bench scale testing should be conducted to determine and demonstrate the appropriate bulking agent, mix, and mixing method.

2.3. REMEDIATION WASTE CHARACTERIZATION

To support the proposed sediment removal activities, waste characterization activities were previously completed to determine disposal options for the excavated sediments. To supplement earlier waste characterization assessments, and as detailed in the SCR, Toxicity Characterization Leaching Procedure (TCLP) testing of discrete and composite sediment samples recovered from numerous transects along the canal was completed for regulated volatile, semi-volatile and metal constituents. Based on that sampling, no exceedances of the TCLP regulatory limits for hazardous waste were identified. Furthermore, none of the maximum detected concentrations or maximum method detection limits (MDLs) for all hazardous constituents (except for PCBs) exceeded their respective health-based levels below which contaminated environmental media would be considered to no longer contain hazardous waste ("contained-in" criteria i.e., Adjusted RSLs). Therefore, with the exception of sediment with concentrations of PCBs greater than 50 mg/kg, the contaminated environmental media that will be excavated from the canal will be considered "contained out" and will not require management as a hazardous waste.

Sediments or contaminated media containing total PCB concentrations greater than 50 mg/kg are subject to disposal requirements under TSCA. Therefore, material with total PCB concentrations greater than 50 mg/kg will be excavated and segregated for transport and disposal off-site to a permitted hazardous waste landfill approved to accept TSCA-regulated waste.

The sediments contain a high moisture content and exhibit the presence of free liquids. As a result, and to meet the applicable requirements for no free-draining liquids prior to transportation or disposal of solid waste, dewatering, potentially combined with drying agents, will be required prior to disposal in the on-site Greys landfill or transport off-site to a TSCA-permitted landfill. As discussed in Section 3 of this Work Plan, treatability testing will be conducted prior to full-scale implementation of the work to determine an appropriate approach to eliminate free liquids prior to transportation and disposal.

2.4. SCREENING LEVEL RISK ASSESSMENT

Based on an assessment of potential exposure risks as presented in the SCR, it was determined that construction workers potentially exposed to sediments in the TMC would not be subjected to unacceptable exposure risks if standard work and health and safety procedures are followed, but that institutional controls should be implemented for the protection of future site workers to ensure proper oversight and management of any future intrusive construction activity that could involve disturbance materials below the proposed cap. As a result, the Work Plan includes provisions for implementation of the site-specific health and safety plan during the work,

2.5. REMEDIATION RECOMMENDATIONS

As presented in the SCR, sufficient remedial investigation data has been collected to evaluate the nature and extent of constituents of concern in the TMC and further investigation is not warranted. The following actions were recommended to restore its flow capacity and cap residual materials to provide for long-term protection of human health and the environment:

- Sediments impacted by elevated PCBs (>50 mg/kg) in the northern portion of the TMC are required to be excavated. Lateral delineation has been completed, but the depth of sediments containing PCB concentrations greater than 50 mg/kg should be delineated during removal activities. Material exceeding the threshold of 50 mg/kg should be excavated and disposed of at a TSCA-permitted off-site landfill. Excavated sediments with concentrations of PCBs less than 50 mg/kg are considered non-hazardous and can be disposed at Greys Landfill.

- Supplemental excavation of sediments should be implemented to achieve appropriate hydraulic slope and cross-sectional area and to facilitate placement of an engineered barrier for protection of the current and future site worker. This engineered barrier can be designed to achieve acceptable stormwater quality for discharge without active treatment. Environmental capping, after excavation of sediments containing PCB concentrations exceeding 50 mg/kg, would be an acceptable remedy for protection of current and future site worker.

- Institutional controls should be implemented for the protection of future workers to ensure proper maintenance of the engineered barrier, as well as proper oversight and management of any future intrusive construction activity that would disturb sediments from below the cap. These institutional controls would include a requirement for written notice to the MDE of any future intrusive activities, and may require worker health and safety requirements for any excavations of substantial time periods, and proper management and characterization of any material disturbed at the Site.

- If future development proposes disturbance of material below from below the cap, then a detailed risk analysis should be completed and presented in a Response and Development Work Plan to further assess potential exposures to future workers.

3.0 PROPOSED MAINTENANCE CLEANUP WORK FOR TMC

3.1. GENERAL

The proposed work for the TMC is detailed in this section, with support from the attached Figures, Drawings and Appendices. As discussed above, the proposed work generally involves the following:

- excavation and removal of sediment from the TMC to address sediments with PCB concentrations greater than 50 mg/kg, and accumulated sediments that contain elevated levels of oil & grease that restrict the flow capacity of the canal; and
- restoration of the remaining slag fill and sediments by covering with an engineered barrier that will support acceptable future stormwater conveyance through the TMC.

3.2. PLANNING ACTIVITIES

Prior to the start of equipment mobilization and sediment excavation activities, various planning and preparation activities have been or will be conducted to finalize the design plans and prepare for project implementation. The most significant of these activities are discussed in the following subsections.

3.2.1. Outfall Survey

In March of 2017 a detailed inspection and survey of the canal was conducted to support the final design and development of this Work Plan. This work included detailed topographic surveying of the canal invert and banks, identification of critical features and potential obstructions along the canal such as sand bars, scour areas, vegetation and trees, utilities, bridge abutments and other structures, and all influent pipes and outfalls, and additional details regarding the influent pipes and channels such as size, invert elevations, material of construction, flow rate (if any), and general condition. Findings from this investigation are generally summarized in Appendix A of this Work Plan.

3.2.2. Dewatering Studies

Based on the anticipated presence of free-draining liquids in the excavated sediments, and the need to eliminate free-draining liquids from any materials transported off-site or to the on-site Greys landfill, bench and field-scale treatability studies will be conducted to help develop a practical and cost-effective approach to address this requirement. It is currently anticipated that the dewatering process will involve the placement of excavated sediments in windrows on a series of dewatering pads constructed along the canal to allow for gravity drainage of water,

potentially combined with the use of one or more drying agents or processes. The following activities are planned to support refinement and optimization of the approach:

- Bulk sediment samples will be collected from two or more representative locations within the canal.

- The sediment samples will be subjected to a variety of bench-scale and/or field tests to better assess the water content, volume of free-draining liquids, rate of gravity drainage, and effects of adding one or more readily available drying agents (including dried and chopped phragmites), or using vacuum or air-enhanced drying methods. Drained liquids may be subjected to laboratory testing for oil and grease content, and potentially other analyses to support the planning for any water treatment.

- The tests will be conducted using standard health and safety practices, and the sediments and liquids will be returned to the project site at the end of the testing for proper handling (i.e., disposal or containment below the cap) during the project implementation phase.

3.3. PROJECT IMPLEMENTATION

Details of the proposed project implementation are presented in the following subsections of this Work Plan, with supporting information presented on the Drawings and Figures attached to the end of this document.

3.3.1. Erosion and Sediment Controls

Erosion and sediment controls will be installed prior to commencing work. These controls will be constructed in accordance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. The Soil Erosion and Sediment Control Plan will be submitted to the Baltimore County Soil Conservation District for review and approval prior to the start of the work. The Erosion and Sediment Control Plan will include following measures to prevent contaminated sediments from exiting the Site:

- Stabilized construction entrance will be placed where trucks enter and leave the site or work area.
- A dry street sweeper will be used as necessary on adjacent roads, and the swept dust will be collected and properly managed.
- Work will generally be conducted adjacent to the canal, allowing for any eroded sediments to be returned to the canal work area.
- The area of disturbance will be minimized at any one time, with the excavation work conducted between a section of canal that is isolated by upslope and downslope coffer dams.

- Stockpiled sediments undergoing drying will be managed on a controlled dewatering pad with curbing, and will be covered with tarps if warranted to support erosion control.

3.3.2. **Vegetation Removal**

Prior to the start of any earthmoving activities, vegetation within the planned area of sediment excavation, and also within planned staging and support areas, will be cut down to the ground surface. The removed vegetation will be segregated from the sediments to be excavated to minimize the volume of materials requiring special management as part of the work. Based on recent surveys of the canal, the significant majority of this vegetation consists of tall, perennial grasses (phragmites). Due to the volume of these grasses, and based on experience with other projects, these grasses will be spread out on the ground surface in the vicinity of the canal to facilitate air drying to reduce the moisture content and volume of these materials, and to render them potentially suitable for use as a sediment drying agent. If appropriate based on the results of the pre-construction treatability testing, these grasses will be chopped or shredded following drying, and made available for incorporation into the excavated sediments to support the elimination of free-draining liquids from the sediments. The potential rate at which these grasses would be added to the wet sediments would be based on the results of the treatability testing and relevant field observations. Any removed vegetation not otherwise used (e.g., for sediment drying) or recycled (e.g., chipped for mulch), will be properly disposed.

3.3.3. **Demolition/Removal of Structures**

Some existing concrete, metal, and other structures along the canal will be removed during the course of the work to provide for equipment operation and support the excavation of sediments along the entire canal. These structures include utilities, oil-removal stations, fencing, canal crossing manways, inactive outfalls, and other features. Canal road crossings, active utilities and other features that can be worked around will not be demolished or removed. The portions of structures to be removed that are located above the canal sediments and water level will be demolished in a controlled fashion, with the resulting debris re-used on site as clean fill where appropriate (e.g., crushed concrete), or will otherwise be recycled (e.g., metal) or reused on site, or sent off-site for recycling or proper disposal. Structural components that are located below the canal sediment or water level elevation will be kept within the vicinity of the canal following removal, and subsequently decontaminated through washing and removal of all visible debris and staining for reuse or off-site disposal, or will be crushed and used as excavation backfill below the final cap to be constructed along the canal. Structures that currently hold back water or restrict flow in the canal will generally be removed in a gradual and progressive manner starting at the upslope end of the canal.

3.3.4. Staging Area Construction

To support the management of sediments excavated from the canal, a series of staging areas will be constructed along the canal as generally shown on the attached Drawings (Sheets 1 and 2), and potentially elsewhere along the canal as needed to provide for equipment access and staging during the work. As noted on Sheet 1, the staging area referred to as Dewatering Pad No. 1 is already in place, and is consists of a paved asphalt area measuring 150' by 150' constructed over an impermeable membrane and enclosed on three sides by constructed earthen berm. Additional staging areas or material dewatering pads will be constructed with recycled asphalt or compacted slag fines underlain by a geomembrane liner, and will include a perimeter containment berm with vehicle access ramp, and will be sloped to drain back to the canal (for the non-PCB-contaminated areas) or into collection sumps at the corners of the pad (for the PCB-contaminated areas) as shown on Sheet 2 of the Drawings. The pads will be sized to provide sufficient area for the placement and management of excavated sediments for dewatering and mixing with drying agents if needed.

3.3.5. Canal Water Management

Stormwater and groundwater discharging to the canal will be managed during the course of the work to help facilitate sediment excavation and to minimize sediment erosion and migration during the course of the work. A typical layout of the planned canal water management system is presented as the "Typical Channel Bypass Pumping" detail on Sheet 2 of the Drawings. The canal water management will initially be established at the upslope end of the canal, where the sediment removal activities will begin, and will then be moved progressively downstream as each section of the canal is excavated and then backfilled and capped. As shown on Sheet 2, the canal water management system will consist of two primary components as discussed below:

- Surface Water: Surface water flow in the canal upslope and downslope of the active work area will be controlled by a system of coffer dams and bypass pumping. Coffer dams will be installed upstream and downstream of the active work area, and keyed into the canal bottom and sidewalls to help restrict water flow. It is currently anticipated that the coffer dams will be constructed of concrete Jersey barriers and a 20-mil plastic liners, but other effective barriers may also be used. Surface water in the canal upslope of the work area will then be pumped with a centrifugal trash pump or pumps that will be sized to accommodate low-volume storm events, although the coffer dams will be removed and the work will be suspended in the event of storm flows that exceed the available pumping capacity; in such a case in the PCB-contaminated work area, any exposed sediments will be covered to help prevent erosion and downstream migration. The pump intake will be established to minimize suspended solids in the pumped water, and the water will be discharged back to the canal at a location downstream of the active work area.

- Groundwater: Within the active work area between the coffer dams, groundwater (and any additional surface water that may enter the work area from direct runoff or via an existing outfall) will be removed from the work area by pumping with one or more dewatering pumps as necessary to facilitate excavation of the sediments. This water will also be pumped in a manner to minimize suspended solids, and will be discharged to the canal at a location downstream from the active work area. The dewatering pump(s) will be sized to accommodate the anticipated groundwater base flow to that section of the canal, plus some additional surface water flow. Water pumped directly from the PCB-contaminated sediment work area will be treated prior to discharge as generally shown on Sheet 2 (Drawings) and Figure 3.

3.3.6. Sediment Excavation and PCB Vertical Delineation

Sediment excavation activities will be initiated following the removal of water from each active working section of the canal to the extent practical. In general, the sediment excavation activities will be conducted from excavation equipment working along one side of the canal, with the excavated sediments transported to the nearest dewatering pad via sealed haul trucks.

Except for the area of PCB contamination (see Sheet 1 of the Drawings), which is discussed further below and where sediment excavation may be deeper, sediments will be excavated to restore the flow capacity and expose the currently buried discharge ends of outfall pipes along the canal (see Sheet 2 of the Drawings for typical details). After the discharge end of any outfalls within the active work area are exposed, that section of outfall pipe will be flushed out with pipe cleaning equipment, and the associated water and sediments will be directed to the active work area and managed concurrently with the canal water and excavated sediments.

Sediments with concentrations greater than 50 mg/kg will be removed within the previously delineated area of PCB contamination. Sediments from this reach of the canal will be managed separately from the sediments removed from the other sections of the canal because of additional protocols and controls associated with the management of PCB-impacted sediments and pore water. Although the lateral delineation of the PCB-impacted sediments has been completed, additional vertical delineation will be completed as part of the work to ensure that the sediment removal activities include all sediments greater than 50 mg/kg, and to allow for the segregation of any shallow sediments that may have PCB concentrations less than 50 mg/kg to minimize off-site disposal costs.

Prior to or during the sediment removal process in the PCB-contaminated area (shown on Sheet 1 of the Drawings, and based on the sampling results presented in the SCR), additional sampling of shallow sediments will be conducted to determine the depth of any sediments with PCB concentrations less than 50 mg/kg. For cost and timing reasons, sampling may initially be conducted with PCB field test kits (e.g., Clor-N-Soil) to provide an initial guide for the separate segregation of shallow sediments with concentrations less than 50 mg/kg, but with

concentrations to be confirmed with laboratory testing prior to removal of the sediments from the contaminated soil dewatering pad. After excavation of the PCB-contaminated sediments has reached the known depth of PCB concentrations greater than 50 mg/kg, confirmation sampling will be conducted across the bottom of the excavation to verify that all sediments with PCB concentrations of greater than 50 mg/kg have been removed. Again, field test kits may initially be used to support the sediment removal process on a real-time basis, but the vertical extent of excavation will be confirmed with the collection of grab sediment samples on a 25-foot grid across the excavation bottom and laboratory analysis of the samples for PCBs by EPA Method 8082. If any bottom samples exceed a PCB concentration of 50 mg/kg, additional sediment removal will be conducted in any such locations, followed by additional confirmation sampling at the same spacing until the final bottom confirmation samples all have PCB concentrations less than 50 mg/kg. All sample collection, preservation, chain-of-custody and other procedures for the samples submitted to the analytical laboratory will be in accordance with the approved Quality Assurance Project Plan (QAPP) for the site.

3.3.7. **Handling and Dewatering of Excavated Sediments**

As previously discussed, excavated sediments will be transported to an on-site dewatering pad located adjacent to the canal for dewatering, and confirmation sampling in the case of the sediments excavated from the PCB-contaminated area, prior to subsequent loading, transportation and final disposal. The dewatering process is currently anticipated to include the following processes, as generally depicted on the attached Drawings (Sheets 1 and 2), although the actual process may vary depending on the results of the pre-construction treatability studies discussed earlier in this Work Plan:

- Dewatering/Drying: The general dewatering/drying process for all of the excavated sediments is currently anticipated to consist of spreading the sediments into separate windrows across the dewatering pads to facilitate gravity drainage and evaporation. As warranted by the treatability testing and field observations, drying agents will be mixed into the sediments to support the drying process, and the windrows will be periodically mixed with an excavator or other equipment to maximize the rate of drainage and solar drying. During periods of inactivity or wet weather, the piles will be covered with weighted plastic tarps to help keep then dry. Fluids drained from the sediments will be collected and managed in general accordance with the procedures discussed below, with separate processes applicable to the sediments from the PCB-contaminated area versus the sediments from the other sections of the canal. The dewatering process will continue until the sediments no longer have any free-draining liquids as determined by the paint filter test. The actual duration of drying is not currently known, but has generally been estimated for sizing of the dewatering pads and scheduling estimates as shown in the calculations presented in Appendix B.

- Management of Fluids: Fluids drained from the sediments will be collected in sumps, and may be subjected to treatment before being discharged back to the canal for final treatment through the HCWWTP. For the sediments removed from the PCB-contaminated area, the fluids will be collected into 20,000-gallon (approximately) portable frac tanks for flow equalization and settling of solids, followed by passing through an oil-water separator (if warranted) and granular activated carbon (GAC) treatment system for PCB removal prior to being discharged back to the canal at a downstream location for final treatment through the HCWWTP. Any solids collected from the holding tank(s) will be removed, dewatered, and combined with the other sediments for subsequent sampling and disposal. The fluids management process for sediments removed from the PCB-contaminated area is presented on Figure 3.

3.3.8. **Waste Characterization and Disposal**

After field testing indicates that the sediments no longer have any free-draining liquids per the paint filter test, the sediments will be ready for removal from the dewatering pads and subsequent loading, transportation and disposal. For the sediments removed from the PCB-contaminated area, one representative four-part composite sample (separate, approximately equal volume aliquots will be collected randomly and homogenized) will be collected for every 500 cubic yards of material and submitted to an analytical testing laboratory for analysis of PCBs by EPA Method 8082 (all sample collection, preservation, chain-of-custody and other procedures for the samples submitted to the analytical laboratory will be in accordance with the approved QAPP for the site). Materials that are determined to have PCB concentrations greater than 50 mg/kg will be shipped off-site by a licensed waste hauler in accordance with the applicable regulations for disposal at a TSCA-permitted landfill. All other materials will be loaded and transported to the on-site landfill (Greys) for proper disposal. The quantities of all materials that are sent off-site for disposal or transported to the on-site landfill for disposal will be recorded.

3.3.9. **Channel Restoration and Capping**

Following sediment excavation within each of the active work areas, and prior to the removal and relocation of the coffer dams and pumping systems, the residual sediments and fill materials will be covered with a 2-foot thick (minimum) cap to prevent future direct contact exposure risks, and to provide a non-erosive canal lining that will facilitate future stormwater conveyance. Additional slag fill will be placed in the PCB-contaminated sediment removal area as necessary to achieve the desired subgrade elevations prior to cap placement. As generally depicted on Sheet 2 of the Drawings, the cap is planned to consist of a geotextile filter fabric overlain by slag fines and coarse slag up to the final canal grade. The coarse slag will be similar to conventional rip-rap lining, and will be sized in accordance with applicable MD procedures for erosion and sediment control to prevent scour and provide an erosion resistant surface based on the anticipated maximum flow velocities and shear stresses associated with projected flow rates in the canal.

3.3.10. **Equipment Decontamination and Removal**

Following completion of the work within each area, equipment will be properly decontaminated to prevent the tracking of contamination to other areas of the site or off-site areas. Decontamination will generally involve dry brushing to remove any dirt and loose sediments, followed by steam-cleaning or high pressure water washing to remove any residual solids. Decontamination water will generally be directed into the sumps of the dewatering pads where practical, or directly into the canal for subsequent treatment through the HCWWTP. Collected solids will be returned to the canal and placed below the cap where possible, or will be managed in a manner consistent with the excavated sediments.

3.3.11. **Health and Safety Measures**

A site-specific HASP will be developed to present the minimum requirements for worker health and safety protection for the project. All contractors working on the Site will be required to prepare their own HASP that provides a level of protection at least as much as that provided by the site-specific HASP, or on-site contactors may elect to adopt the HASP provided. The HASP for this project will be a minor modification to an earlier site-specific HASP developed for the site.

3.3.12. **Dust Control**

Overall dust control methods shall include:

- Periodic site wetting and dust suppression of active work areas where dry materials are present. Overspraying of water shall be avoided in order to prevent erosion or sediment control complications.
- Reduced vehicle speeds.
- Minimizing drop heights.
- Covering dry stockpiles with tarps.
- Stabilizing exposed surfaces as soon as possible.

General construction operations, including removal of existing structures and utilities, sediment excavation and transport, and cap construction activities will be performed at the Site. To limit worker exposure to contaminants borne on dust and windblown particulates, dust control measures will be implemented, if warranted, when the above activities are performed in areas with impacted materials. The action level proposed for the purpose of determining the need for dust suppression techniques (e.g., watering and/or misting) and/or continuous monitoring during the response and development activities on Site will be 3.0 mg/m³. The lowest of the site-specific dust action levels, OSHA PELs, and ACGIH TLV was selected as the proposed action level.

If visible dust is generated in the breathing zone, air monitoring will be implemented as follows:

- at the start of intrusive activities;
- periodically during intrusive activities (15-minute intervals);
- when contaminants other than those previously identified are being handled;
- when a different type of operation is initiated or conditions change;
- if personnel are working in areas with obvious particulate contamination; and
- if a sufficient reasonable interval has passed so that exposures may have significantly changed.

Air monitoring will be performed using a ThermoElectron Corporation Personal Data RAM 1000AN dust monitor or equivalent real-time air monitoring device. If the action level (3.0 mg/m^3) is exceeded as a result of conditions occurring at the Site, operations will be stopped and dust suppression implemented. The background dust concentration will be utilized to evaluate whether Site activities are the source of the action level exceedance. Background concentrations will be based on measurements over a minimum of a one hour period at the upwind Site boundary. This upwind data will be used to calculate a time weighted average background dust concentration. The background dust concentration may need to be recalculated periodically during the work day, based on changed upwind conditions. Operations may be resumed once monitoring indicates that dust concentrations are below the action level.

As applicable, air monitoring will be conducted during response and development implementation activities in the immediate work zones and surrounding areas to assess levels of exposure to Site workers, establish that the work zone designations are valid, and verify that respiratory protection being worn by personnel, if needed, is adequate. Concurrent with the work zone air monitoring, perimeter air monitoring will also be performed to ensure contaminants are not migrating off-site. Perimeter monitoring will include monitoring along the perimeter of the Site, including both the downwind and upwind portions of the Site. The concentration measured in the downwind portion of the Site shall not exceed the concentration in the upwind portion. If exceedances attributable to Site conditions are identified downwind for more than five minutes, dust control measures and additional monitoring will be implemented. The dust suppression measures may include wetting or misting through use of a hose connected to an available water supply or a water truck stationed on Site.

Dust control measures will be implemented as described above to address dust generated as a result of construction and response activities conducted on Site. However, based on the nature of the area and/or on-going activities surrounding the Site, it is possible that windblown particulates may come from surrounding areas. As discussed above, the dust concentration in the upwind portion of the Site will be considered when monitoring dust levels in the work zone. A pre-construction meeting will be held to discuss the potential of windblown particulates from other activities impacting the air monitoring required for this response plan. Site contact information will be provided to address the possibility of upwind dust impacts.

3.3.13. **Project Oversight and Documentation**

Construction Oversight by a qualified Environmental Professional (EP) will be conducted to ensure and document that the project is completed as planned and that appropriate environmental and safety protocols are followed. Upon completion, the EP will certify that the project was completed in accordance with this Work Plan. Records shall be provided to document:

- daily observations of construction activities;
- sediment excavation, dewatering, sampling and disposal;
- proper cap thickness and construction; and
- proper water management.

4.0 PERMITS, NOTIFICATIONS AND CONTINGENCIES

The participant and their contractors will comply with all local, state and federal laws and regulations by obtaining any necessary approvals and permits to conduct the activities contained herein.

Because the proposed activities will disturb over 5,000 square feet of surface area and over 100 cubic yards of earth, the project will require a grading permit and an approved Sediment and Erosion Control Plan. Following MDE approval of this work plan, Sediment and Erosion Control Plans will be submitted to the Baltimore County Soil Conservation District for approval prior to initiation of land disturbance for this project.

There are no wetlands identified within the project area and no work will be performed beyond the shoreline so no permits are required from the MDE Water Resources Administration.

Contingency measures will include the following:

1. the MDE will be notified immediately of any previously undiscovered contamination, previously undiscovered storage tanks and other oil-related issues, and citations from regulatory entities related to health and safety practices; and

2. any significant change to the implementation schedule will be noted in the progress reports to MDE.

5.0 IMPLEMENTATION SCHEDULE

The currently anticipated project implementation schedule is shown below. This schedule is subject to change based on actual dewatering rates, weather conditions, contractor rate of progress, and other factors. Progress reports will be submitted to MDE periodically to document the progress of the work and any revisions to the project schedule.

Task	**Projected Completion Date**
Anticipated Work Plan Approval	June 15, 2017
Final Design and Planning Phase	
Sample Collection for Dewatering Studies	July 15, 2017
Completion of Dewatering Studies and Final Planning	August 15, 2017
Application and Approval for Erosion and Sediment Control Permit	August 30, 2017
Site Construction Phase	
Equipment Mobilization and Site Staging	September 1, 2017
Vegetation Removal and Drying	September 30, 2017
Sediment Excavation and Capping	September 30, 2018

6.0 REFERENCES

ARM Group, Inc. (2016). *Quality Assurance Project Plan: Sparrows Point Terminal Site*. Revision 3. April 5th, 2016.

EnviroAnalytics Group (EAG), 2014. *Site Conceptual Cleanup Plan*. August 2014.

FIGURES

N

ARM Group Inc.
Earth Resource Engineers and Consultants

0 375 750 1,500
Feet

Site Boundary
Private Property
Area A Boundaries
Area B Boundaries

Tradepoint Atlantic
Area A and Area B Parcels
August 1, 2016

EnviroAnalytics Group	Tradepoint Atlantic	Figure 1
Area A: Project 150298M Area B: Project 150300M	Baltimore County, MD	

Former TMC
Dredging
Drying Pad

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

Outfall 36
Outfall 34
Outfall 33B
Outfall 33A
Outfall 33
Outfall 32
Outfall 31B
Outfall 31C
Outfall 31A
Outfall 30
Outfall 27
Outfall 44
Outfall 42
Outfall 41
HCWWTP

Former Chrome
Recovery
Treatment Facility

Tin Mill Canal Sampling Transects and Stormwater Outfalls

March 8, 2017

Figure 2

EnviroAnalytics Group	Sparrows Point Terminal
170208M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

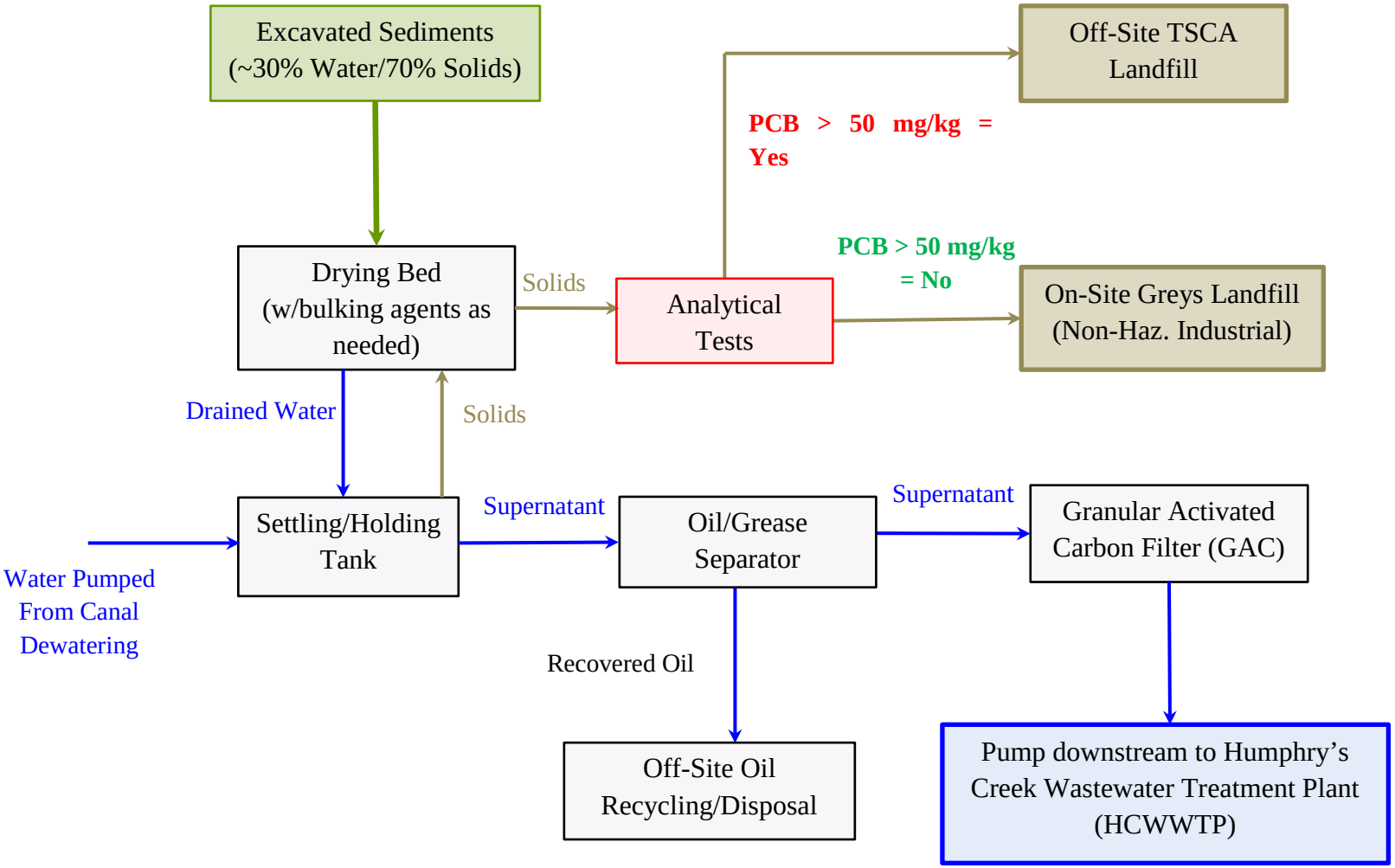
0 125 250 500 Feet

Sampling Transect

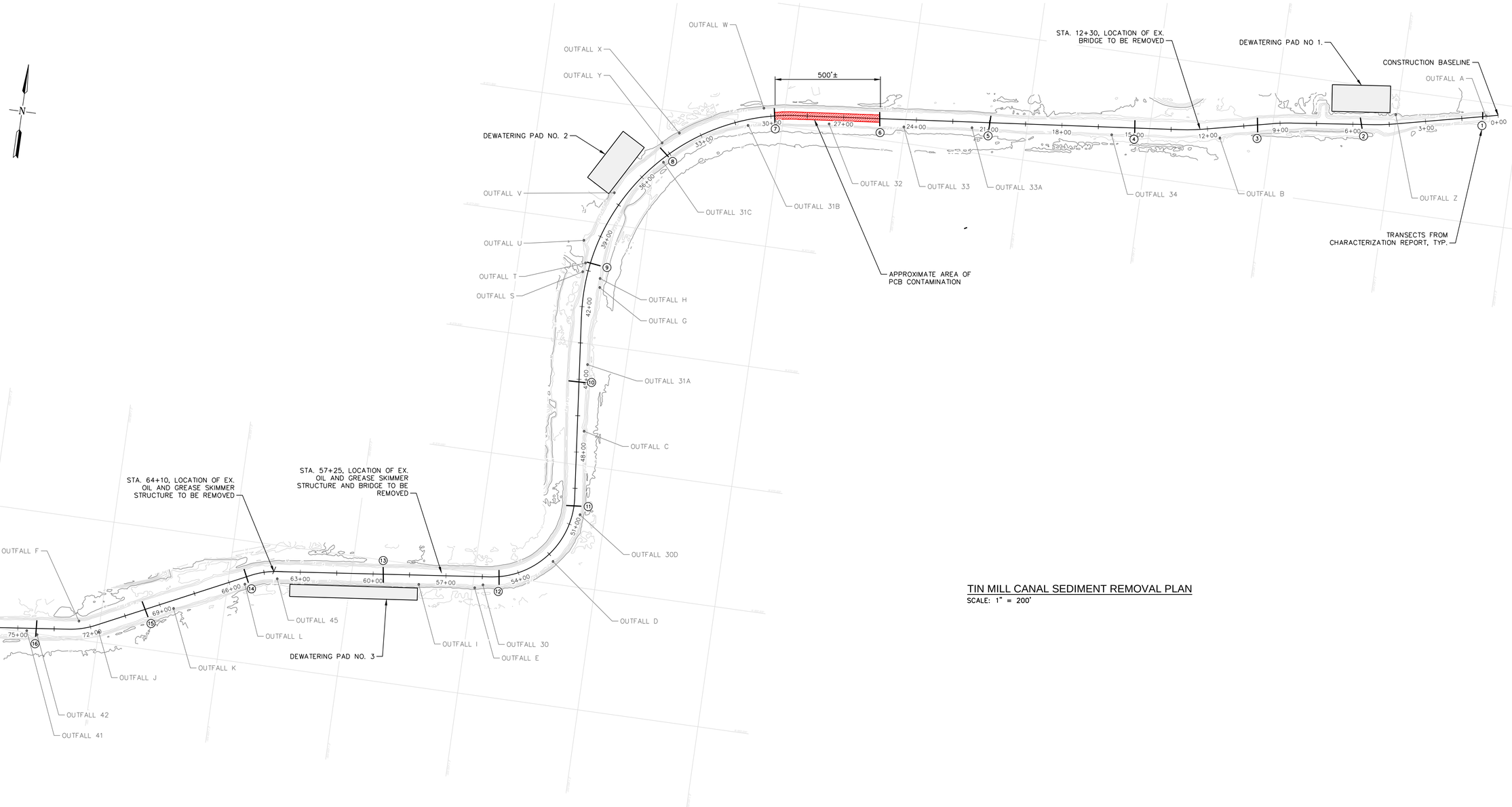
Tin Mill Canal Boundary

\\armygroup.lcl\CorpData\Projects\EnviroAnalytics Group\170208M EAG Tin Mill Canal Sediment Report\GIS\Tin Mill Canal.mxd

FIGURE 3
PROCESS DIAGRAM: TIN MILL CANAL SEDIMENT REMOVAL PLAN
SOLIDS AND LIQUIDS HANDLING FOR PCB-CONTAMINATED AREA



DRAWINGS



TIN MILL CANAL SEDIMENT REMOVAL PLAN
SCALE: 1" = 200'

GENERAL NOTES:

1. TOPOGRAPHIC MAPPING IS FROM AERIAL SURVEY CONDUCTED BY CME ENGINEERING OF SOMERSET, PENNSYLVANIA ON MARCH 30, 2017.
2. DEWATERING PAD NO. 1 IS EXISTING. CONTRACTOR SHALL VERIFY THE INTEGRITY OF THE PAVED SURFACE PRIOR TO STAGING EXCAVATED MATERIAL. CONCERNS ABOUT THE SUITABILITY OF THE PAVED SURFACE SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. DIMENSIONS OF DEWATERING PADS NOS. 2 AND 3 ARE APPROXIMATE AND MAY BE FIELD-ADJUSTED TO MEET SITE OR OPERATIONAL REQUIREMENTS.
4. WINDROW SPACING IS ASSUMED, AND SHALL BE ADJUSTED BY THE CONTRACTOR AS NEEDED TO SUIT ACTUAL EQUIPMENT USED AND THE CONDITION OF EXCAVATED MATERIAL.
5. WINDROWS SHALL BE TURNED DAILY, OR MORE FREQUENTLY. ESTIMATED TIME FOR DRYING IS TWO (2) WEEKS, DEPENDING ON WEATHER CONDITIONS.
6. CONFIRM THE REMOVAL OF STRUCTURES WITH THE OWNER, PRIOR TO DEMOLITION.

SUGGESTED SEQUENCE OF OPERATIONS:

1. SET UP BYPASS PUMPING SYSTEM. BASE FLOW IS ESTIMATED TO BE 3000 GALLONS PER MINUTE.
2. ESTABLISH DEWATERING ZONES IN APPROXIMATE 300 LINEAR FOOT SECTIONS, STARTING AT THE UPSTREAM END OF THE TIN MILL CANAL. INSTALL COFFER DAMS AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE SECTION.
3. INSTALL A SMALL PUMP IN THE SECTION BEING EXCAVATED, TO ASSIST WITH DEWATERING AND TO CONTROL BASE FLOW.
4. SEQUENCE THE FLUSHING OF STORMWATER PIPING SUCH THAT SEDIMENT OR DEBRIS IS NOT DEPOSITED IN SECTIONS OF THE TIN MILL CANAL THAT HAVE ALREADY BEEN EXCAVATED AND RESTORED TO GRADE.
5. EXCAVATE SEDIMENT FROM THE DEWATERED SECTIONS TO A DEPTH OF AT LEAST 2-FEET BELOW THE ORIGINAL CANAL GRADE. INSTALL THE COFFER DAM IN ACCORDANCE WITH THE TYPICAL DETAIL.

DRAFT
NOT FOR CONSTRUCTION

PROFESSIONAL CERTIFICATION.
I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State Of Maryland,

License No. _____,

Expiration Date _____.

SEAL

ARM Group Inc.
Earth Resource Engineers and Consultants
www.armgroup.net

No.	Revision	Date	By

Designed	JBM	scale	1" = 200'
Checked	TNP	date	05/02/2017
Plotted	JBM	project no.	170208M

SCALE IN FEET: 0, 200, 400, 600

drawing title: SEDIMENT REMOVAL PLAN

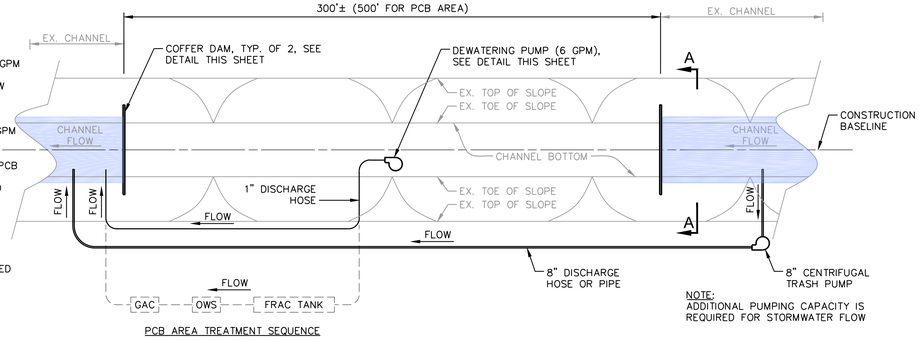
project title: TIN MILL CANAL MAINTENANCE

SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet 1

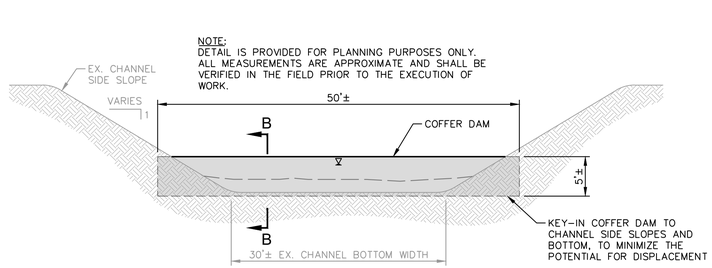
NOTES:

1. APPROXIMATE EXISTING BASE CHANNEL FLOW RATE = 3,000 GPM
2. APPROXIMATE DEWATERING FLOW RATE = 8,600 GPD
4. APPROXIMATE CHANNEL STORMWATER FLOW IS 62,800 GPM (1-YEAR STORM)
5. DEWATERING DISCHARGE FROM PCB CONTAMINATED AREA SHALL BE PUMPED TO A FRAC TANK, AND PROCESSED THROUGH AN OIL/WATER SEPARATOR (OWS) AND GRANULAR ACTIVATED CARBON (GAC) FILTER.
6. ALL PUMPING SHALL BE CONDUCTED THROUGH A FILTERED INTAKE, TO MINIMIZE SEDIMENT TRANSPORT.

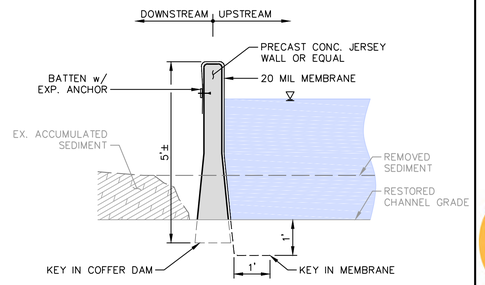


NOTE:
ADDITIONAL PUMPING CAPACITY IS REQUIRED FOR STORMWATER FLOW

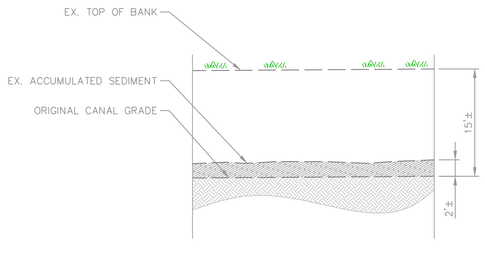
PLAN: TYPICAL CHANNEL BYPASS PUMPING
SCALE: 1" = 40'



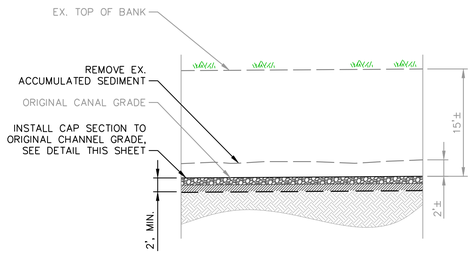
SECTION A-A
SCALE: 1" = 10'



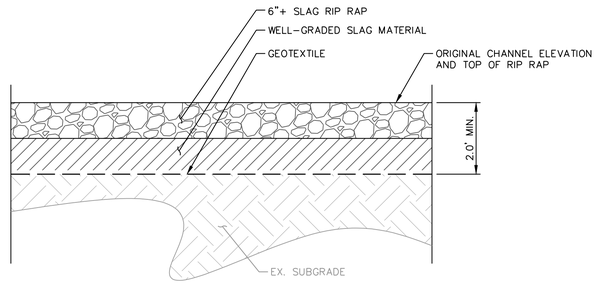
SECTION B-B
SCALE: 1" = 2'



PROFILE: TYPICAL EX. CHANNEL
SCALE: 1" = 10'



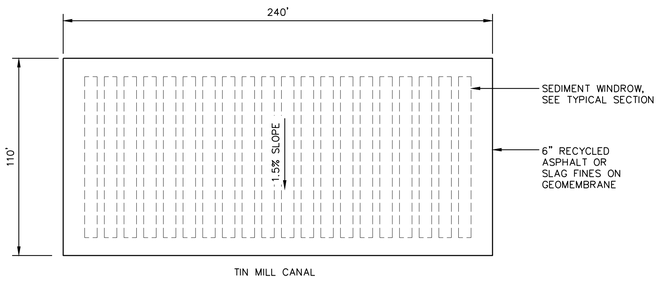
PROFILE: TYPICAL CHANNEL CAP
SCALE: 1" = 10'



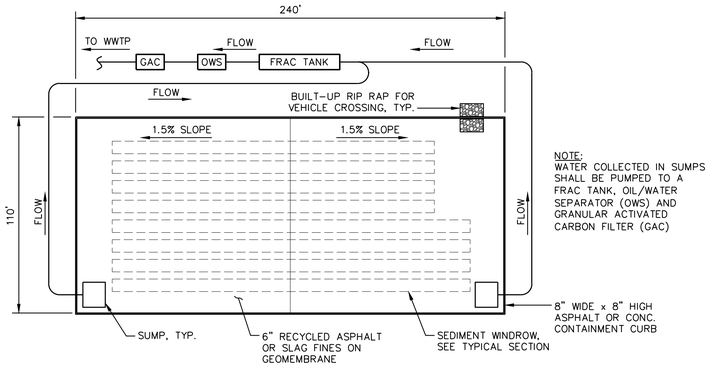
DETAIL: TYPICAL CHANNEL CAP
SCALE: 1" = 2'

GENERAL NOTES:

1. ALL DETAILS AND METHODS PRESENTED ARE SUGGESTED, AND NOTHING SHALL BE CONSTRUED AS TO RESTRICT THE CONTRACTOR'S PREFERRED MEANS AND METHODS, ALL DEVIATIONS SHALL BE PROVIDED TO THE ENGINEER FRO REVIEW AND APPROVAL.
2. ALL DIMENSIONS ARE APPROXIMATE AND SHALL BE ADJUSTED BY THE CONTRACTOR TO SUIT ACTUAL CONDITIONS AND EQUIPMENT.

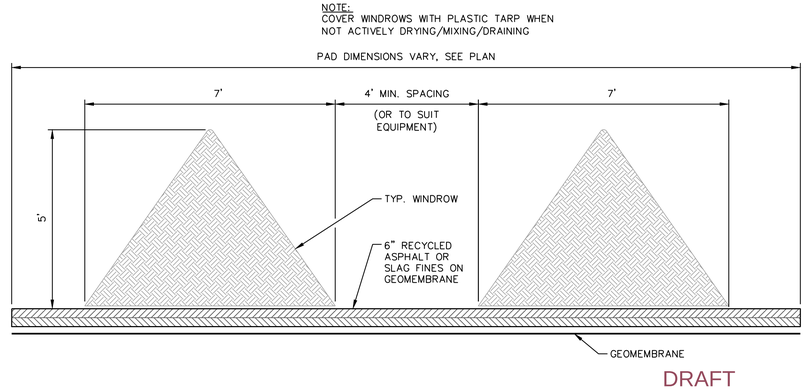


PLAN: TYPICAL SEDIMENT DEWATERING PAD
SCALE: 1" = 40'



NOTE:
WATER COLLECTED IN SUMPS SHALL BE PUMPED TO A FRAC TANK, OIL/WATER SEPARATOR (OWS) AND GRANULAR ACTIVATED CARBON FILTER (GAC)

PLAN: PCB-CONTAMINATED SEDIMENT DEWATERING PAD
SCALE: 1" = 40'



SECTION: TYPICAL DEWATERING PAD
SCALE: 1" = 2'

DRAFT
NOT FOR CONSTRUCTION

PROFESSIONAL CERTIFICATION.
I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State Of Maryland,

License No. _____,

Expiration Date _____.

SEAL

ARM Group Inc.
Earth Resource Engineers and Consultants
www.armgroup.net

No.	Revision	Date	By

1" = 200'
date 05/02/2017
project no. 17020SM

designed JBM
checked TNP
drawn JBM

SCALE IN FEET 0 200 400

drawing title
SEDIMENT REMOVAL DETAILS

project title
TIN MILL CANAL MAINTENANCE

SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet 2

Z:\Active\Analytics Group\17020SM TAO Tin Mill Canal\Phase II Removal Plan\Dwg\Sheet 02_Details.dwg Plotted: May 5, 2017

APPENDIX A

Outfall Survey Summary

TABLE 1: FIELD OUTFALL INVESTIGATION

Name	Type	Diameter (Nom. Inches)	Comments
Outfall A	CONCRETE	84	
Outfall B			buried
Outfall 34	CONCRETE	84	greater than 50 percent buried
Outfall 33a	CONCRETE	60	
Outfall 33	CONCRETE	60	
Outfall 32	CONCRETE	60	
Outfall31b	CONCRETE	84	
Outfall31c			outfall 31c potential location - buried
Outfall 31a	CONCRETE		almost completely buried
Outfall C	CONCRETE	48	partially buried
Outfall 30b	CONCRETE	60	
Outfall D	HDPE	4	
Outfall 30	CONCRETE	84	
Outfall E	pvc	8	
Outfall 45	CONCRETE		mostly buried
Outfall 41	STEEL	16	extend 10'
Outfall 42	CONCRETE	60	partially buried
Outfall F	fiberglass	60	
Outfall G	pvc	4	
Outfall H	pvc	4	
Outfall I	pvc	8	
Outfall J	CONCRETE	72	partially buried
	STEEL	16	partially buried
Outfall K	STEEL	16	
Outfall L	STEEL	18	
Outfall M	STEEL	1	
Outfall N	pvc	4	
Outfall O	STEEL	6	extend 10'
Outfall P	STEEL	18	rusted out - no longer in use
Outfall Q	pvc	4	
Outfall R	STEEL	18	extend out 15'
Outfall S	HDPE	4	adjacent to railroad bridge
Outfall T	HDPE	4	adjacent to railroad bridge
Outfall U	CONCRETE	60	
Outfall V	HDPE	8	
Outfall W	STEEL	18	
Outfall X	STEEL	18	
Outfall Y	pvc	6	
Outfall Z	CONCRETE	48	

PHOTOGRAPHIC LOG

Outfall A: 3/29/2017

Outfall B: 3/29/17

Outfall 34: 3/29/17

Outfall 33a: 3/29/17

Outfall 33: 3/29/17

Outfall 32: 3/29/2017

PHOTOGRAPHIC LOG

Outfall 31b: 3/29/17

Outfall 31c: 3/29/2017

Outfall 31a: 3/29/17

Outfall C: 3/29/17

Outfall 30b: 3/29/2017

Outfall D: 3/29/17

PHOTOGRAPHIC LOG

Outfall 30: 3/29/17

Outfall E: 3/29/2017

Outfall 45: 3/29/17

Outfall 41: 3/29/17

Outfall 42: 3/29/2017

Outfall F: 3/29/17

PHOTOGRAPHIC LOG

Outfall G: 3/29/17

Outfall H: 3/29/2017

Outfall I: 3/29/17

Outfall J: 3/29/17

Outfall K: 3/29/2017

Outfall L: 3/29/17

PHOTOGRAPHIC LOG

Outfall M: 3/29/17

Outfall N: 3/29/2017

Outfall O: 3/29/17

Outfall P: 3/29/17

Outfall Q: 3/29/2017

Outfall R: 3/29/17

PHOTOGRAPHIC LOG

Outfall S: 3/30/17

Outfall T: 3/30/2017

Outfall U: 3/30/17

Outfall V: 3/30/17

Outfall W: 3/30/2017

Outfall X: 3/30/17

PHOTOGRAPHIC LOG

Outfall Y: 3/30/17

Outfall Z: 3/30/2017

APPENDIX B

Supporting Calculations

DESCRIPTION

Estimate the total amount of:

- Wet excavated sediment,
- The dry volume of the sediment,
- The dry volume of PCB-contaminated sediment,
- The quantity of PCB contact water, and
- The flow-through requirements for liquid treatment systems.

SUMMARY

The total volume of excavated sediments that are not contaminated with PCBs is estimated as 13,400 yd^3; these materials may be disposed in the on-site industrial waste landfill (Greys landfill). The total volume of excavated PCB-contaminated sediments is estimated as 1,900 yd^3; these materials may be disposed in an off-site TSCA-permitted landfill. The volume of PCB contact water is estimated as 700,000 gallons (0.7 MG); the contact water will be passed through an oil-water separator and granular activated-carbon filter (GAC) before discharge to the on-site wastewater treatment plant influent. The volume of ordinary (non-PCB contact) water expected to drain from the excavated sediments is estimated as 5 million gallons (5.0 MG); this water will be discharged to the wastewater treatment plant influent.

CALCULATIONS

I. Calculate Volume of Sediment

A. Assumptions

- Assume existing sediments are, on average, 2.0 ft deep;
- Assume the excavation depth for the PCB contaminated area is 8 ft, on average;
- Assume the initial moisture content of excavated sediments is 40% by weight based on the geotechnical investigation;
- Assume the boundary (containment) layer thickness is 2.0 ft, and is installed with the top elevation at the original canal grade.

B. Calculate Quantity of Wet Material

For:

L = 7000 feet (non-PCB sediments)
L_{PCB} = 500 feet (PCB sediments)
W = 30 feet
D = 4 feet

And,

$V = L \times W \times D$ = 7000 ft x 30 ft x 4 ft = 840,000 ft^3 = 31,111 yd^3

$V = L_{PCB} \times W \times D$ = 500 ft x 30 ft x 8 ft = 120,000 ft^3 = 4,444 yd^3

V_{total} = 840,000 ft^3 + 120,000 ft^3 = 960,000 ft^3 = 35,556 yd^3 Say, **36,000 yd^3**

C. Calculate Gallons of Water per Cubic Yard

For initial moisture content of 40% by weight, the amount of water is given by:

$$\frac{Solids}{H_2O} : \frac{110\frac{lbs}{ft^3}}{62.4\frac{lbs}{ft^3}} \Rightarrow \frac{110}{62.4} \approx 1.75$$ So, the ratio of water to solids (by mass) is **1.75:1**

And proportionally, a cubic yard of material is 57% water and 43% solids by volume, so:

$$0.57 yd^3 H_2O \left(\frac{27\, ft^3}{yd^3}\right)\left(\frac{62.4 lbs}{ft^3}\right) = 960.4 lb H_2O \Rightarrow 960.4 lb H_2O \left(\frac{gal H_2O}{8.34 lb H_2O}\right) = 115 gal$$

And each cubic yard of water has: 7.48 gal/ft^3 x 27 ft^3/ yd^3 = 200 gallons (approx.)

D. Calculate Pounds of Solids Per Cubic Yard

For initial moisture content of 40% by weight, the mass of sediments is given by:

$$0.43 yd^3 Solids\left(\frac{27\ ft^3}{yd^3}\right)\left(\frac{110 lbs}{ft^3}\right) = 1277 lbs$$

E. Calculate Total Quantities

(1) PCB-contaminated material:

V = 4,444 yd^3

PCB solids = 0.43 x 4,444 yd^3 = 1,911 yd^3 PCB solids**;**

Say, **1,900 yd^3 PCB sediments**

PCB water = 0.57 x 4,444 yd^3 = 2,533 yd^3 water → 506,600 gallons

Dewatering:

- Assume 50 work days (9 calendar weeks = 63 days total);
- Assume dewatering flow is 6 gpm (8,640 gpd)

63 days x 8,640 gal/day = 544,320 gallons from dewatering

Total water = 506,600 gallons + 544,320 gallons = 1,050,920 gallons, say **1.0 MG**

(2) Ordinary (non-PCB) material:

V = 31,111 yd^3

Solids = 0.43 x 31,111 yd^3 = 13,378 yd^3 solids; Say, **13,400 yd^3 sediments**

Water = 0.57 x 31,111 yd^3 = 17,733 yd^3 water → 3,546,654 gallons

Dewatering:

Assume 311 work days (52 calendar weeks = 365 days total)

365 days x 8,640gal/day = 3,153,600 gallons from dewatering

Total water = 3,546,654 gallons + 3,153,600 gallons = 6,700,254 gallons, say **6.7 MG**

(3) Summary:

Disposal at on-site Landfill (Greys) - **13,400 yd^3** sediments

Disposal at TSCA Landfill - **2,000 yd^3** PCB-contaminated sediments

Granular Activated Carbon Filter flow-through capacity = **1.0 MG**

Oil-Water Separator flow-through capacity = **1.0 MG**

F. Testing Requirements

- Assume test frequency for PCB-contaminated sediments is one (1) per 500 yd^3 of excavated material, dry and with bulking material (add 20% to total volume).

  V = 2,000 yd^3 x 1.2 = 2,400 yd^3, say 2,500 → **5 tests**

II. Discussion

The actual quantity of water could vary. Starting with the assumption that the in situ sediments are 40% water by weight, the canal flow is bypassed and the target segment is pumped out. It is assumed that it will take approximately one (1) week to adequately dewater the section so that the material may be excavated. If the removed material is 30% water by weight, the dewatering effluent may be subtracted from the total water content at 50%. However, this does not account for groundwater and infiltration. The assumption that the total dewatering flow is 6 gallons per minute (gpm) is based on the difference in the amount of water between 40% and 30% moisture content; it is conservative and avoids under-sizing the pumping equipment for dewatering.