Draft Final Remedial Action Report

Former Astoria Marine Construction Company
DEQ Task Order 067-23-13
ECSI No. 1898
92134 Front Road
Astoria, Oregon

Prepared for:

Oregon Department of Environmental Quality

October 23, 2025
Project No. M0785.29.001

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The material and data in this report were prepared under the supervision and direction of the undersigned.

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Abbreviations

AMCCO	Astoria Marine Construction Company
BMP	best management practice
the County	Clatsop County Public Works Department
CQA	Construction Quality Assurance
cy	cubic yards
DEQ	Oregon Department of Environmental Quality
EMNR	enhanced monitored natural recovery
EPA	United States Environmental Protection Agency
FRDR	Final Remedial Design Report
GPS	global positioning system
the Hillsboro Landfill	Waste Management's Hillsboro Subtitle D Landfill
ISM	incremental sampling methodology
In-Water Contractor	J.E McAmis Inc.
MFA	Maul Foster & Alongi, Inc.
mg/kg	milligram per kilogram
NAVD88	North American Vertical Datum 1988
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PMR&C	performance monitoring, review and contingency plan
PRG	preliminary remediation goal
PRP	Potentially Responsible Party
RA	remedial action
RBC	risk-based concentration
ROD	Record of Decision
SAP	sampling and analysis plan
the Site	Astoria Marine Construction Company located at 92134 Front Road, Astoria Oregon 97103
sf	square feet
TPH	total petroleum hydrocarbons
Trails End Recovery	Custom Excavating recycling facility located at 2060 SE Airport Ln, Warrenton, OR 97146
Upland Contractor	Custom Excavating by Dean Larson, Inc
ug/kg	microgram per kilogram
USACE	United States Army Corps of Engineers

1 Background

1.1 Introduction

Maul Foster & Alongi, Inc. (MFA) prepared this Remedial Action Report for the former Astoria Marine Construction Company (AMCCO) sediment site in Astoria, Oregon (the Site; see Figure 1-1). The Site is listed in the Oregon Department of Environmental Quality's (DEQ) Your DEQ Online database as Cleanup Project 1898. This report was prepared for DEQ under Task 6 of Task Order 067-23-13.

In 2011, the United States Environmental Protection Agency (EPA) proposed to place the Site on the National Priorities List. In 2012, an agreement between EPA and DEQ deferred the Site listing and transferred EPA site management to DEQ. Remedial action (RA) was completed at the Site between 2020 and 2022. This Remedial Action Report has been prepared to support formal close-out of the EPA/DEQ Deferral Agreement and to document the functional operation of the RA and ongoing operation and maintenance at the Site (EPA 1992). The *AMCCO Remedial Action Construction Completion Report* provides a detailed summary of the RA activities (MFA 2024).

1.2 Site Location, History, and Description

The approximately seven-acre upland property is located at 92134 Front Road, Astoria, Oregon. The Site is just outside the eastern boundary of Warrenton and three miles southwest of Astoria, Oregon, at township 8 north, range 10 west, southeast quarter of section 25, Clatsop County. The sediment Site is in the Lewis and Clark River and Jeffers Slough.

AMCCO was founded in 1924. Between 1924 and the 1940s, AMCCO manufactured and repaired wooden-hulled boats (e.g., fishing boats, tow boats, military crafts). During World War II, the Korean Conflict, and the Vietnam War, the company was recognized for its high-quality craftsmanship. Historical activities conducted at the facility impacted upland soil and groundwater on the Site and sediments in the adjacent Lewis and Clark River. Historical activities included construction, refurbishing, maintenance, and repair of wooden and metal ships, which involved painting and sandblasting. Figure 1-2 shows the main site features that are referenced throughout this report.

AMCCO was placed on the U.S. Department of the Interior's National Register of Historic Places in January 2014 (USDOI 2014) because it is an excellent extant example of the many small shipyards once employed to build and repair the Pacific Navy fleet during World War II and the Korean Conflict (MFA/GSI 2016).

1.3 Project Purpose and Scope

In accordance with the Record of Decision (ROD) issued by the DEQ in 2017 (DEQ 2017), the purpose of the RA was to address the presence of metals, total petroleum hydrocarbon (TPH), dioxins, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) in contaminated soils; and metals, tributyltin, dioxins, and PCBs in contaminated sediment at the Site.

Figure 1-3 shows locations of sediment and upland soil hot spot excavation areas. The selected RA consisted of the following elements:

- Excavation and off-site removal and disposal of contaminated soil (e.g., hot spots)
- Capping of the on-site soils that show contaminants at lower concentrations
- Modification of the upland stormwater system to reduce migration of residually contaminated soil
- Excavation and off-site removal and disposal of contaminated sediment (e.g., marine ways, debris piles, and north dredge area)
- Placement of a sand layer above residual sediment contamination and enhanced monitored natural recovery (EMNR)
- Institutional controls to maintain the upland soil cap and manage the sediment remedy
- Long-term monitoring and maintenance for sediment recovery

RA implementation began in July 2020 and was completed in the summer of 2022 by AMCCO under the Consent Judgment between AMCCO and DEQ (Case No. 19CV13270, effective March 25, 2019) and per the Final Remedial Design Report (FRDR; MFA 2020a).

2 Chronology of Events

2.1 Pre-Construction Timeline

In March 2011, EPA proposed to place the Site on the National Priorities List of sites warranting priority cleanup under the federal Comprehensive Environmental Response, Compensation, and Liability Act. The Clatsop County Board of Commissioners requested EPA delay the National Priorities List listing. The request was subsequently granted, and oversight of cleanup activities was transferred to the DEQ. As part of the Deferral Agreement with EPA, DEQ consulted with EPA, several Federally recognized Tribes, several state agencies, and other Federal Natural Resource Trustees on the decision making for the project.

In 2015, AMCCO completed a Remedial Investigation and Feasibility Study and in 2017 DEQ issued a ROD for cleanup, which identified preliminary remediation goals (PRGs) for sediment based on the Site uses and potential human and ecological receptors (DEQ 2017). These screening levels were used to inform selection of the RA, which required targeted dredging and placement of a sand layer for areas with the most contaminated sediments (approximately 65,700 square feet [sf]) and EMNR for the remaining in-water portion of the Site (approximately 580,000 sf based on remedial design estimates).

The upland and in-water remediation components of the project were awarded to two separate contractors. Custom Excavating (the Upland Contractor) was contracted to complete upland remediation and nearshore sediment excavation and backfill work, while J.E. McAmis (the In-Water Contractor) was contracted for in-water remediation work, including piling and in-water structure

removal, sand transport, and EMNR sand placement. MFA was contracted as lead project engineer for the project under contract with AMCCO. MFA prepared the engineering designs for the project and acted as engineer of record during the construction phase of the project. MFA was supported by geotechnical engineers from NV5, Inc., for verification of the dike restoration construction.

2.2 Construction Timeline

2019—Project permits were obtained prior to construction, with the extensive United States Army Corps of Engineers (USACE) Section 408 Permit authorization granted in December 2019.

2020—In consultation with and approval by DEQ, AMCCO performed a focused removal of debris piles early in 2020 to minimize potential erosion of contaminated solids that would have resulted from the removal of overwater structures protecting the debris piles (see Figure 1-3 for locations of debris piles) (MFA 2020b). Prior to removal activities, the Upland Contractor installed upland and water quality best management practices (BMPs) in related areas. Overwater building structure demolition work took place between February 1 and February 28, 2020. Following demolition of the pipe shop and partial demolition of the work shop/lunch room, debris piles located below the pipe shop and work shop/lunch room were removed and staged in an upland area that was located directly over one of the upland hot spots. The debris piles were later separated and removed from the Site and disposed with other excavated hot spot materials and dredge materials. The rest of the upland structures were demolished between February and June 2020.

In-water structures, dock floats and associated piles, cradle system rails at Marine Ways #1, #2, and #3, and portions of wooden bents supporting the rails were removed from the Site by the In-Water Contractor in early July 2020. All wood and metal debris were transported to the Upland Contractor's recycling facility (Trails End Recovery located at 2060 SE Airport Ln, Warrenton, OR 97146 [Trails End Recovery]) for recycling.

Construction of the primary in-water and upland remediation work commenced in July 2020. The Upland Contractor performed upland Site preparation and nearshore dredging. The In-Water Contractor installed the EMNR sand layer. All in-water work was finalized by September 2020. Upland hot spot excavation and removal work was completed between August and October 2020.

Dike restoration work commenced in September of 2020 and was halted in October of 2020 due to wet weather, a shortage of suitable dike construction material, and regional forest fires that produced hazardous air conditions.

2021–2022— Dike construction resumed and was completed in September 2021. The construction of the Site stormwater improvements was started in the 2021 construction season and completed in the 2022 construction season. A total of two stormwater ditches were excavated; one ditch to convey stormwater from the southwestern portion of the Site and the other to convey stormwater from the southeastern edge of the Site. North yard gravel capping was completed in 2021; south yard subgrade grading and gravel capping were completed in 2022.

A final site walk for the project was conducted on October 20, 2022. MFA provided AMCCO with verbal notice of substantial completion at the conclusion of the final site inspection in coordination with DEQ.

3 Performance Standards and Construction Quality Control

3.1 Performance Standards Overview

The performance standards for the Site were established in the DEQ ROD and the Consent Judgment (DOJ 2019). These standards required that remedial actions achieve the following:

- **Import Materials Standards**: Use import materials that meet DEQ clean fill criteria for metals and organics.
- **Sediment Cleanup Standards**: Removal of contaminated sediments containing metals, tributyltin, dioxins, and PCBs exceeding applicable DEQ risk-based concentrations (RBCs) (DEQ 2003), followed by placement of a sand cap and EMNR.
- **Water Quality Standards**: Compliance with the Clean Water Act Section 401 Water Quality Certification during in-water work, including water quality monitoring for turbidity criteria.
- **Soil Cleanup Standards**: Removal of upland "hot spot" soils with metals, TPH, dioxins, PCBs, and PAHs exceeding applicable DEQ RBCs and backfill with a minimum 12-inch gravel layer or equivalent, to isolate remaining low-level contamination.
- **Institutional and Engineering Controls**: Installation of BMPs, installation and maintenance of stormwater controls (perimeter ditches, detention pond, lined channels) to prevent recontamination of surface waters, and long-term inspection and maintenance obligations for the upland caps by AMCCO, with DEQ assuming responsibility for long-term sediment monitoring.

3.2 Performance Standards and Construction Quality Control for BMP Installation

Erosion and sediment controls and other construction site BMPs were installed prior to the start of work or during the construction process. MFA's Construction Quality Control (CQA) officer verified the installation of the following BMPs:

- Perimeter stormwater runoff control berm
- Construction entrance
- Establishment of sediment dewatering cells
- Silt fence
- Debris booms
- Turbidity curtain

3.3 Performance Standards and CQA for Import Material

All import material, including sand, dike construction clay, crushed rock, and topsoil, were analyzed in accordance with the sampling and analysis plan (SAP) provided in the FDR (MFA 2020a). Tables 3-1 and 3-2 summarize the analytical results for in-water materials and upland and dike materials, respectively. Screening analysis confirmed that selected material sources were suitable for their intended use.

3.3.1 In-Water Import Material

Clean sand was imported to the Site from a local sand source (Grampson Property in Warrenton) by the Upland and In-Water Contractors for placement as backfill and as EMNR cover material to be placed in aquatic areas. A five-point composite sample was collected from the sand source prior to transporting sand material to the Site. Once the sand source was approved, one sample for every 1,000 cubic yards (cy) of imported sand was collected to document placed sediment quality. A 30-point composite sample was collected at the source location.

The composite sediment samples were submitted to Apex Laboratories LLC for the following analysis:

- Organics by Organotins SIM
- Diesel- and oil-range-TPH by NWTPH-Dx
- Total Metals by EPA Method 6020A
- Pesticides by EPA Method 8081A
- Total PCBs as Aroclors by EPA Method 8082A
- Semi volatile organic compounds by EPA Method 8270D
- Dioxins by EPA Method 1613B

All import materials placed in water met the sediment fill criteria, which were based on both the sediment toxicity criteria and the sediment background values that had been presented in the Screening Level Human Health and Ecological Risk Assessment (MFA 2015a), as identified in the FDR.

3.3.2 Upland and Dike Import Material

For dike construction soils, clayey soil was sourced from Upland Contractor's commercial landscaping supply facility (Trails End Recovery) and sampled consistent with the SAP. Incremental sampling methodology (ISM) samples were collected from Trails End Recovery, where the soils were stored as a single stockpile. A 30-point ISM sample was collected from the soil embankment. An ISM sample was obtained for every 2,500 cy of import soil. Approximately 5,950 cy of dike soil was imported to the Site.

The ISM soil samples were submitted to Apex Laboratories LLC for analysis of:

- RCRA 8 metals by EPA Method 6020A
- Diesel- and oil-range-TPH by NWTPH-Dx
- PAHs by EPA Method 8270D

- Organochlorine Pesticides by EPA Method 608.3
- Herbicides by EPA Method 8151A

Import materials for the upland and dike met the clean fill criteria, except for three sample results for topsoil that was placed on a small area (a 10-foot-wide swath) along the north property line to support a vegetative buffer). Analytical results are provided in Table 3-2. The topsoil is not expected to result in any unacceptable risk to human health or ecological receptors for the following reasons (see highlighted values in Table 3-2):

- Cadmium exceeds the clean fill natural background-based criterion of 0.54 milligrams per kilogram (mg/kg). The detection of 0.765 mg/kg is marginally above the maximum detected background concentration of 0.701 mg/kg that was used to develop the criterion (DEQ 2013) relevant to the Site (Coast Range) The detection is also two orders of magnitude below the lowest DEQ human health RBC for soil of 78 mg/kg and the lowest DEQ 2020 ecological RBC of 32 mg/kg.
- Dibenzofuran exceeds the clean fill criterion of 2 micrograms per kilogram (ug/kg). The criterion is based on an outdated ecological RBC. The detection of 56.1 ug/kg is two orders of magnitude below the lowest and current DEQ 2020 ecological RBC of 6,100 ug/kg.
- Naphthalene exceeds the clean fill criterion of 77 ug/kg. The clean fill criterion is based on a soil-leaching-to-groundwater RBC for residential properties. The Site is nonresidential, and the detected value of 219 ug/kg is well below the soil-leaching-to-groundwater RBC for an occupational scenario (340 ug/kg). The detection is also well below the lowest DEQ human health RBC for direct soil contact (5,300 ug/kg) and the lowest DEQ 2020 ecological RBC of 1,000 ug/kg.

3.4 Performance Standards and CQA for Sediment Excavation

The in-water work addressed the ROD requirements to remove and dispose of sediments with contaminant concentrations exceeding DEQ's acceptable risk levels and place a sand layer over areas with lower-level contamination to promote EMNR. Engineering and operational controls were implemented throughout construction to prevent the release of contaminated sediment to surrounding waters.

Hot spot sediments were dredged and backfilled with clean sand "in the dry" during low tide cycles. Areas with lower-level contamination were capped by the controlled placement of clean sand from a crane derrick. Global positioning system (GPS) tracking was used to ensure accurate coverage and thickness of the sand cap.

The in-water work schedule was coordinated with tidal conditions. Nearshore dredging required that excavation, confirmation sampling, and backfilling be completed during low tide. In contrast, EMNR sand placement was timed with high tide conditions to prevent the barge from grounding and to allow uniform distribution of material.

CQA oversight was provided full-time by MFA's CQA officer. Oversight activities included verifying that the horizontal limits of excavation matched permit requirements and confirming dredge depths through sidewall measurements. The CQA officer also documented activities with photographs and

daily reports (MFA 2024). This documentation provides visual confirmation that excavation and backfill were completed in accordance with project specifications.

3.4.1 Sediment Excavation Leave Surface Analysis

The sediment excavations achieved the RA goal of significantly reducing contaminant mass at all targeted locations. Documentation (leave surface) samples were collected in accordance with the approved SAP. Because excavations were conducted sequentially and backfilled immediately during low tide conditions, sampling was performed at the time of excavation as part of a turbidity management and residuals control strategy. Analytical results are summarized in Table 3-3.

Leave surface documentation samples were collected as follows:

- A combined composite sample was collected for Marine Ways #1 and #2.
- An individual composite sample was collected for Marine Way #3.
- An individual composite sample was collected for the North Dredge area, located below the former Burn Pit.

Each composite sample consisted of five aliquots from predetermined locations consistent with the SAP.

Results indicated that the combined Marine Ways #1 and #2 sample met all sediment PRGs. At Marine Way #3, the leave surface sample showed that copper exceeded sediment PRGs, while lead and total PCBs exceeded ecological hot spot values. Similarly, the North Dredge area leave surface sample showed exceedances for lead (above sediment PRGs) and total PCBs (above ecological hot spot values).

At Marine Way #3 and the North Dredge area, the residual concentrations were isolated beneath more than 3.5 feet of clean sand backfill. Multiple lines of evidence indicate that these residual concentrations do not pose unacceptable risk to human health or ecological receptors:

- A minimum of 3.5 feet of sand backfill physically isolates residual contamination.
- Both areas are depositional environments, where clean sediments are expected to accumulate, further burying residual contamination.
- Bioturbation in sediments is typically limited to the top 4 inches, far shallower than the placed backfill layer.
- Risk-driving contaminants such as PCBs and dioxins are strongly sorbed to sediment, with little potential for migration into surface water.
- Groundwater discharge to the Lewis and Clark River is limited, and with the thick sand backfill, the potential for long-term contaminant transport through the cap is considered extremely low.

MFA prepared and submitted a memorandum to DEQ on July 30, 2021, summarizing remediation activities at Marine Way #3, the CQA protocols implemented, and considerations for future use of the area considering the elevated PCB concentrations (MFA 2024).

3.4.2 EMNR Sand Thickness Verification

To verify the placement and stability of the EMNR sand layer, three core sampling events were conducted at approximately one-year intervals following construction (2020, 2021, and 2022). Each event documented the thickness of the sand layer and confirmed the presence of a distinct interface between the clean sand and underlying native sediment. A Russian peat borer device was used at all events to collect cores up to two feet deep, allowing for visual inspection of the sand–sediment transition.

The first core sampling event, conducted in September 2020, included 11 sampling points within the nearshore placement area (MFA 2024). Results of the first core sampling event showed an average sand thickness of 12.5 inches, with a minimum of 10 inches and a maximum of 15 inches. The second event, in August 2021, re-sampled the same 11 points and added a twelfth location. The third event, in August 2022, collected data from five of the previously sampled locations to evaluate stability of the sand layer over two years of tidal and wave exposure on the Lewis and Clark River. Handheld GPS and global information system mapping were used to accurately relocate sample locations. All coring was performed "in the dry" during low tide conditions.

Results from all three sampling events confirmed that the EMNR sand layer exceeded the design performance standard of 6 inches in thickness. Although the remedy does not require the sand cap to maintain a fixed thickness over time—due to anticipated natural mixing, erosion, and deposition processes—the 2022 data demonstrated that the minimum thickness continued to exceed 6 inches. No evidence of mixing between the clean sand layer and the underlying native sediment was observed.

3.5 Performance Standards and CQA for Water Quality Monitoring

Water quality monitoring was conducted throughout the duration of in-water construction in compliance with the Clean Water Act Section 401 Water Quality Certification. Turbidity measurements were collected from July 5 through September 10, 2020, at both a background monitoring point located approximately 100 feet upstream of the work area and a compliance point located 100 feet downstream.

Measurements were obtained using an Aqua TROLL 600 multiparameter sonde deployed from a boat at two-hour intervals during active in-water work. Data from background and compliance locations were highly correlated, demonstrating no significant water quality impacts during construction. No visible turbidity plumes were observed during in-water demolition activities. All daily monitoring results were documented in the construction daily reports (MFA 2024).

Visual turbidity inspections were performed through the completion of shoreline work, with no visual indications of turbidity observed. In-water construction activities were therefore completed in compliance with the Clean Water Act Section 401 Water Quality Certification.

3.6 Performance Standards and CQA for Upland Soil Excavation

The upland remedial design addressed the ROD requirements for removal and isolation of contaminated soils within the Site. The remedy included:

- Excavation and off-site disposal of highly contaminated “hot spot” soils located in three areas identified in the ROD: two smaller areas on the southern portion of the property (e.g., Excavation Areas 7 and 8) and the former Burn Pit area on the northern portion (Excavation Area 6).
- Construction of an engineered cap over soils with lower-level contamination within site boundaries. The design required a minimum of 12 inches of clean gravel or soil cover to physically isolate residual contamination and prevent exposure.
- Removal of contaminated sediment from stormwater ditches surrounding the property, with reconstruction of stormwater control features to reduce the potential for recontamination of nearby surface waters.

CQA oversight was provided full-time by MFA’s CQA officer. Oversight responsibilities included verifying that horizontal excavation limits matched permitted boundaries, confirming excavation depth targets through sidewall measurements, and ensuring that capping thickness met or exceeded the design requirement of 12 inches. Documentation confirmed that excavation limits were not exceeded and that cap placement achieved the specified design thickness.

All excavation and capping activities were photo-documented, with records provided in the daily construction reports (MFA 2024).

3.6.1 Hot Spot Excavations

Two upland hot spot areas identified in the remedial design—Excavation Areas 7 and 8—were excavated to a depth of 30 inches and to the horizontal limits shown on the construction drawings (see Appendix A, sheet C3.0).

Leave surface documentation samples were collected from each excavation to confirm that residual soils met performance standards. A five-point composite sample was collected from each excavation area in accordance with the approved SAP.

Analytical results from the leave surface samples confirmed that residual soil concentrations were below DEQ RBCs for site contaminants of concern. These results verified that excavation achieved the targeted cleanup levels and that no additional removal was required.

Upon completion of excavation and confirmation sampling, the hot spot areas were backfilled with clean import soil. Excavated hot spot soils were temporarily stockpiled in soil management area #2 cell for disposal characterization and subsequently transported off-site to a licensed disposal facility (Appendix A, sheet C2.1).

3.6.2 Upland Soil Excavation in and Around the Existing Dike Prism

During remedial construction, the excavation footprint of the former Burn Pit was reduced in coordination with DEQ to target areas with higher potential contaminant concentrations. Although

the footprint was smaller than planned, the total volume of contaminated material removed increased due to excavation to a greater depth than originally anticipated.

The ISM approach for leave surface documentation, as described in the approved SAP, was modified to reflect the reduced excavation footprint. Specifically, the number of increments was reduced from 30 to 20. The modified ISM approach remained representative of leave surface concentrations. Sample increments were located using GPS to ensure accuracy. Triplicate ISM samples were collected at each designated sampling location, with duplicates and triplicates obtained within five feet of each location to evaluate reproducibility.

In addition, a ten-point field composite waste characterization sample was collected from the stockpiled soil and debris placed in Soil Management Area 1 (see Sheet C2.1 in the Record Drawings) This composite sample was analyzed for disposal characterization. Analytical results were provided to Waste Management's Hillsboro Subtitle D Landfill (the Hillsboro Landfill) to support acceptance of the material for off-site disposal at the licensed facility.

3.6.3 Leave Surface Analysis

Leave surface sampling was performed in accordance with the SAP included in the FDR (MFA 2020a). The performance standard required that leave surface concentrations not exceed soil PRGs or sediment PRGs, as appropriate, and that residual contamination be effectively isolated and managed through capping.

Leave surface analytical results for Excavation Areas 7 and 8 are summarized in Table 3-4. Results indicate that all parameters were below soil PRGs, apart from a minor exceedance of the total PCB soil PRG at Excavation Area 7. This isolated exceedance was determined not to present unacceptable risk given the Site's low soil permeability and the low solubility of PCBs in water. In accordance with the remedial investigation findings (MFA/GSI 2015), the remaining soil is fully managed by the constructed upland soil cap.

Triplicate leave surface samples were collected from the former Burn Pit excavation area (see results in Table 3-5). Results were screened against soil PRGs, as the Burn Pit is an upland location, with sediment PRGs also provided for reference because the excavation abuts the riverward dike face. The analytical results show exceedances of upland PRGs for arsenic and lead, and exceedances of sediment PRGs for chromium, lead, and PCBs. However, no results exceeded the DEQ-defined hot spot levels. The RA therefore achieved the performance standard of removing hot spot soils, while ensuring that remaining concentrations are managed by engineering controls.

Excavation of the Burn Pit targeted visibly burnt debris and ash deposits while maintaining dike stability. In accordance with the USACE dike restoration plan, the excavation was immediately backfilled to protect the dike's structural function.

The former Burn Pit leave surface was capped with a minimum of two feet of compacted clayey soil and subsequently vegetated, consistent with the approved design. This engineered cap provides effective control of residual metals and PCBs, significantly reducing the potential for direct exposure, erosion, or migration to the Lewis and Clark River.

The leave surface sampling results, in combination with the soil cap construction, confirm that remedial performance standards were achieved. All hot spot soils were removed, and residual concentrations are protective of human health and the environment under the long-term management strategy (MFA 2020a).

4 Construction Activities

4.1 Site Setup, BMP Installation, and Equipment Mobilization

Prior to initiating remedial construction, AMCCO coordinated site preparation activities including:

- Installation of perimeter erosion control BMPs.
- Utility locates, minor clearing and grubbing, and relocation of facility power service.
- Demolition of designated upland and overwater structures.

Construction BMPs installed included perimeter berms, silt fencing, turbidity curtains, dewatering cells, and rock construction entrances.

A variety of upland equipment was mobilized during the 2020 construction season, including excavators (standard and long-reach), loaders, bulldozers, drum rollers, dump trucks, and specialized attachments (e.g., pin-wheel compactor). In-water equipment included a crane derrick, material barges, a tugboat, and support skiffs.

4.2 In-Water Work

In-water work addressed ROD requirements to remove and dispose of highly contaminated sediment and to place a clean sand layer over areas with residual contamination (i.e., EMNR). Engineering and operational controls were implemented to prevent the release of contaminated sediment above DEQ risk thresholds.

Sediment hot spots were dredged “in the dry” during low tide, immediately backfilled with clean sand, and confirmed through leave-surface documentation sampling. Lower-level contaminated sediments were capped with clean sand placed from a derrick with GPS-tracking to ensure precision.

4.2.1 Structure Removal

In accordance with the Natural Resource Damage Injury Evaluation and Restoration Plan, which was an attachment to the Consent Judgement (DOJ 2019), floating docks and pilings that were shown in Drawing C2.4 (Appendix A), along with the pilings needed to be removed for barge access were removed by the In-Water Contractor prior to start of dredge and sand placement. A total of 81 pilings were removed. Removed wood was recycled at Trails End Recovery facility in Warrenton, Oregon.

4.2.2 Nearshore Sediment Excavation

Dredge prisms for the North Dredge area and Marine Ways #1–#3 were surveyed and staked at corners with white polyvinyl chloride posts. In-water rails and wood supports within prisms were removed to permit excavation. Field cuts confirmed the wood was untreated; materials were recycled at Trails End Recovery.

The Upland Contractor performed dry-cycle dredging during low tides using a long-reach excavator, working to the plan extents (Appendix A, Sheet C4.0). Work advanced in daily dredge units: each unit was excavated to target depth (approximately 3 to 4 ft below existing grade), photographed, sampled where designated, and immediately backfilled with clean sand before tide return. Adjacent units were keyed by exposing the previous day's backfill to maintain continuity.

Before handling clean backfill, crews broomed and shook residual sediment from the bucket over the active prism. Backfill thickness generally matched dredge cut (approximately 0.5 to 4.5 ft), restoring grade and isolating residuals.

Excavated sediment was hauled to the nearest of three lined containment/dewatering cells. Dewatering occurred primarily via evaporation.

Dredged sediments were profiled per landfill acceptance criteria and disposed of off-site at the Hillsboro Landfill. Table 4-1 tabulates total project disposal quantities under the three different waste profiles at the Hillsboro Landfill.

4.2.2.1 Debris Piles

Two existing debris piles composed of sediment and waste material were located along the bank beneath the former workshop/lunch room and the abandoned pipe shop structures (Appendix A, sheet C3.0). For clarity, the debris pile located below the workshop/lunch room is referred to as the "coffee shop debris pile", and the debris pile located beneath the abandoned pipe shop is referred to as the "pipe shop debris pile".

Partial deconstruction of the workshop/lunch room was required to provide access to the coffee shop debris pile. The coffee shop debris pile was excavated and temporarily placed over upland Hot Spot Excavation Area 8 as cover material prior to final removal. The material was subsequently transported off site and disposed of at the Hillsboro Landfill along with dredged sediments from Marine Ways #1 and #2 under Waste Management Profile No. 133315 (see Table 4-1). The total volume of the coffee shop debris pile was approximately 18 cy.

The pipe shop debris pile was excavated and disposed of together with dredged material from Marine Way #3 and upland hot spot material under Waste Management Profile No. 133937 (see Table 4-1). The total volume of the pipe shop debris pile was approximately 27 cy.

4.2.2.2 North Dredge Area

Excavation depth reached 40 inches from existing grade, resulting in a total of 400 cy of sediment removal from the North Dredge area. In the North Dredge area, the excavated sediment was classified as predominantly silt with high levels of organics and high water content. Stockpiled sediments from the North Dredge area were blended with Enviroblend CS lead stabilizing agent (2.5 to 3 percent by weight) prior to waste sampling. Due to the high silt and organics content, dewatering of sediment from the North Dredge area required three to four weeks' time.

4.2.2.3 Marine Way #1

Support pilings under the rails and bents could not be removed. After receiving approval from DEQ, the Upland Contractor was instructed to excavate around the pilings to remove any residuals around the pilings before backfilling occurred. The excavation bottom ranged between 4 and 5 feet below existing grade. Pilings left in place were covered with approximately 12 inches of clean sand. The pilings on the north side of the dredge area that were supporting the dock between Marine Ways #1

and #2 were taller and could not be trimmed before the incoming tide. After MFA determined that the piles were untreated wood, DEQ approved leaving the taller piles (at approximately 12 inches above finished grade). Where the target depth of excavation could not be achieved in one low tide cycle, the active excavation surface was covered with a minimum of 4 to 6 inches of temporary clean sand cover layer, before the tide returned to the work area. The following day, the sacrificial layer was excavated until the target depth was advanced and the sacrificial layer was discarded along with the rest of the excavated sediment from the work area. Marine Way #1 was dredged after placement of EMNR sand adjacent to the dredge area. The extent of the clean backfill projected 2 feet out of the dredge boundary, overlapping recently placed EMNR sand. A total of 200 cy of sediment was excavated and disposed of at the Hillsboro Landfill.

4.2.2.4 Marine Way #2

Wooden piling supports for Marine Way #2 could not be removed within the dredge prism. After excavating hot spot sediment as described in the *AMCCO Remedial Action Construction Completion Report* (MFA 2024), pilings were left in place and buried with approximately 12 inches of clean sand backfill. The average excavation depth for Marine Way #2 was 3.5 feet (42 inches). A total of 200 cy of sediment was removed and disposed of at the Hillsboro Landfill.

4.2.2.5 Marine Way #3

Support pilings for Marine Way #3 could not be removed so the Upland Contractor excavated around the pilings and used manual labor and shovels to remove any residuals around the pilings before backfilling occurred. The excavation boundary for Marine Way #3 was inadvertently set such that it encroached in the dock structure that was to remain. The Upland Contractor was instructed to excavate as close as possible to the north edge of the dock, without compromising the support structure.

The average excavation depth was 4 feet (48 inches), which also corresponds to the thickness of clean backfill sand. All the pilings were covered with between 1.5 feet and 2 feet of clean sand after backfill. Excavated Marine Way #3 material was blended with a lead stabilizing agent (Enviroblend CS), due to high concentrations of lead. A total of 390 cy of hot spot sediment was removed and disposed of at the Hillsboro Landfill.

4.2.3 EMNR Sand Layer Placement

The In-water and Upland Contractor transported clean sand via barge from the sand source site in Warrenton, Oregon. The in-water contractor placed clean sand from a crane derrick equipped with an 8-cy-capacity clamshell bucket and real-time GPS tracking technology. EMNR sand placement was placed by the Upland Contractor for a portion of the project between Marine Way #4 and the former Burn Pit area, where the barge could not reach. The Upland Contractor overlapped the clean sand placed by barge by a minimum of 2 feet along the transition area. As required in the project specifications, EMNR sand was placed in 6- to 12-inch sand lifts within the designated areas shown on the plans. The work was performed during high tide conditions.

A total of 2,100 cy of imported clean sand was placed over an area that was approximately 65,700 sf in size, corresponding to an average EMNR thickness of 10.4 inches, satisfying the design specification (MFA 2024). The approximate footprints of individual in-water remediation areas are listed below:

- North dredge area: 2,630 sf
- Marine Ways #1 and #2 dredge area: 4,850 sf
- Marine Way #3 dredge area: 2,475 sf
- EMNR sand area outside the dredge areas: 55,745 sf

4.2.4 In-Water Issues and Resolutions

During preparation for sediment dredging at Marine Ways #1 and #2, the Upland Contractor ran into unexpected deep pilings. Due to the location of the pilings, neither the In-Water nor the Upland Contractor was able to establish equipment to safely pull the pilings. Upon review with the DEQ during a weekly progress meeting on July 28, 2020, it was agreed that if the pilings were untreated, they could be left in place and covered with clean sand. Treated pilings would need to be cut at the excavation subgrade. MFA provided the DEQ with photo documentation on August 4, 2020, of cut piling cross sections showing no evidence of chemical treatment. Consistent with the DEQ agreement, pilings were left in place and backfill was placed around them. The piling ends are covered by approximately 1.5 to 2 feet of sand cover.

Prior to the start of sediment dredging at Marine Way #3, it was determined that the southernmost portion of the dredge area overlapped with the dock structure to the south, which was to remain. Due to the angle of the equipment relative to the support piling, the sediment could not be reached without compromising the structural integrity of the dock's supporting structure. Per discussions with the DEQ during a weekly work progress meeting on August 19, 2020, it was decided that the dock should not be demolished because the area of restricted access represented less than five percent of the subject dredge area. Therefore, the excavation limits were slightly revised to avoid undermining the dock.

4.3 Upland Remediation

The upland remedial design addressed the ROD requirements to remove and dispose of more highly contaminated "hot spot" soil, to construct a cap over soil with low-level contamination within the Site extents, and to remove contaminated sediment from stormwater ditches surrounding the Site. The ROD identified three hot spot areas, two smaller ones on the southern portion of the property (e.g., Excavation Areas 7 and 8) and the former Burn Pit area on the northern portion of the Site.

In 2020, units of work completed include site preparation, impacted soil excavation, backfill, site regrading, and perimeter control fence construction. Hot spot soil was removed by excavator and disposed of at the Hillsboro Landfill. The 2020 work addressed a majority of the on-site and off-site ditches that were required to be cleaned out and excavated.

In 2021, units of work included the completion of the stormwater basin construction, partial completion of the on-site stormwater ditches, and completion of the northern upland gravel cap.

In 2022, upland remediation units of work included the excavation and rock lining of the on-site stormwater ditches, completion of the rest of the upland gravel cap (south yard capping), and the remaining grit excavation around the existing structures, substantially completing all required activities.

4.3.1 Upland Structure Removal

Several upland structures were demolished or partially demolished by the Upland Contractor to facilitate remediation. Overwater structures, including the pipe shop and coffee shop, were demolished during the February 2020 in-water work window. Upland structures were demolished between March and July, which included a portion of the ship building and three other support structures. All upland structure demolition debris were managed by AMCCO and the Upland Contractor recycled at the Trails End Recovery facility. Volume and weight data were not collected for structure demolition wastes.

4.3.2 Upland Excavation and Handling, Transport, and Disposal

Upland contaminated soil was excavated between July and October 2020. All contaminated soil excavated from the Site during remediation was disposed of at the Hillsboro Landfill. The total amount of soil hauled from the Site and disposed of was approximately 3,060 tons (Table 4-1).

4.3.2.1 Upland Hot Spot Excavation

Hot Spot Excavation Areas 7 and 8 were excavated to a depth of 30 inches and to the extents shown on the plans (Appendix A, sheet C5.0). Approximately 150 cy of contaminated material was excavated from Excavation Area 7, and 25 cy of material was excavated from Excavation Area 8.

4.3.2.2 Former Burn Pit Excavation Area

Prior to excavation, AMCCO surveyed the limits of the Former Burn Pit area. Potholing along the northern boundary revealed additional hot spot material extending beyond the design footprint, while review of the southern boundary indicated non-hot spot soils could be excluded. MFA prepared an analysis (MFA 2024) comparing the benefit of prioritizing hot spot removal over source control exceedances. DEQ directed the excavation to proceed as designed, with priority on complete hot spot removal.

The Upland Contractor initiated excavation from the northwest quadrant along the riverward dike face. Per agreement with DEQ[1], operators used visual markers—burnt debris, changes in soil color, and textural shifts—to guide excavation limits. This approach resulted in expansion of the excavation footprint on the landward side and increased the excavation depth, while maintaining a balance to avoid undermining the dike prism (Appendix A, Sheet C3.0). Encountered material included burnt debris such as cables, metals, and coarse grit. Excavation continued until firm, fine-grained subgrade soils largely free of debris were reached.

Although the design anticipated excavation to approximately 3 feet below grade, field conditions revealed burnt debris extending greater than 6-foot depth. The final excavation bottom was approximately 36 inches below grade and tied into the adjacent sediment hot spot cut at the toe of the dike, with over 10 feet of vertical material removed from the dike surface in some locations. The total volume excavated was approximately 1,600 cy, exceeding the planned 1,400 cy identified in the ROD and design plans.

[1] McDonnell, E. 2020. Telephone communication (re: former burn pit excavation remediation at AMCCO) with Cem Gokcora, Maul Foster & Alongi, Inc., Portland, OR. September 25.

All excavated soils and debris were transported via loader to Soil Management Area 1 for staging and dewatering. The subgrade was described as dark brown to gray, with no notable odors, consistent with soils observed at the toe of the dike. Prior to backfill, loose material was shaken from the excavator bucket over the cut to minimize mixing.

The excavation subgrade was stair-stepped in accordance with the approved dike restoration plan. The area was then backfilled with compacted clean clay (Figure 4-1) to restore stability and meet USACE requirements.

As excavation advanced and it became clear that removal volumes would exceed ROD estimates, DEQ concurred that the focus should remain on complete hot spot removal rather than source control areas. While some soil outside the excavation footprint remained above PRGs, DEQ and MFA agreed these areas could be effectively managed with vegetation to control erosion and prevent contaminant migration to surface water.

The Former Burn Pit excavation successfully removed all mapped hot spot soils, including the designated 4- and 7-foot-deep zones, and part of the 2-foot zone. The work exceeded planned removal quantities and achieved the remedial performance standard of eliminating highly contaminated soils while maintaining dike integrity.

4.3.2.3 Burn Pit Issues and Resolutions

Prior to full-scale excavation, a test pit was advanced along the northern edge of the Former Burn Pit to confirm excavation limits. The pit revealed significant burnt debris extending beyond the remedial investigation boundary. Approximately 5 cy of debris were removed and temporarily stockpiled in Soil Management Area 1 The test pit was backfilled with sand pending DEQ review.

MFA and DEQ reviewed photo documentation of the debris and concurred that buried burnt debris represented the primary environmental concern at the Site and should be removed to the maximum extent practicable. As excavation progressed, visual field indicators (burnt debris, soil color, and texture) guided the operator, resulting in removal volumes exceeding the design estimate.

To address the discrepancy between planned and actual excavation volumes, MFA reexamined remedial investigation data and figures from the 2016 Supplemental Remedial Investigation Results (GSI 2016). Figures depicting hot spot and source control exceedances were compiled and incorporated into ROD figures (see Figure 4-2). MFA prepared an analysis recommending that excavation focus on highly contaminated hot spot soils rather than broader areas with residual concentrations above source screening values (MFA 2024). This proposal optimized limited project funding while maximizing environmental benefit.

Risk-based rationale for partial source control exclusion:

- **Copper exceedances:** The shallow (2-foot) excavation area was initially defined by copper exceedances screened against sediment cleanup levels. However, copper concentrations in the excluded southern area, except for the shallow, isolated, copper concentration detected at SB-14, were <1,000 mg/kg, more than two orders of magnitude lower than the upland hot spot criterion (120,000 mg/kg; see Figure 4-3) (MFA 2024).
- **Physical erosion risk:** Original assumptions conservatively treated the dike face as susceptible to wholesale erosion. MFA and DEQ concluded this scenario was unrealistic given the dense vegetative cover maintained by the diking district under USACE

requirements. The approved dike restoration design also added 2–3 feet of fill over much of the shallow excavation footprint, further isolating residual soils.

- **Short-term risk considerations:** Removing surface soils and temporarily disturbing dike vegetation would have elevated short-term risk of erosion or dike failure. Limiting disturbance maintained protective function while achieving hot spot removal.
- **Contingency analysis:** If limited erosion were to occur, dispersion through root mass or flood mixing conditions would reduce concentrations below levels of concern. Flood energy in the Lewis and Clark River at this location is relatively low due to estuarine backwater conditions.

Based on this analysis, MFA and AMCCO proposed, and DEQ concurred (email August 28, 2020 (MFA 2020c); follow-up meeting September 1, 2020 [McDonnell 2020]), to leave in place approximately 5,400 sf (approximately 500 cy) of copper-impacted soil in the southern shallow area. Of this, roughly 3,000 sf were permanently capped beneath the restored dike crest road, and the remainder was stabilized with dense vegetative cover. Figure 4-4 depicts the adjusted excavation limits.

This adaptive approach balanced remedial performance standards with engineering and safety considerations. Hot spot soils were completely removed, while low-level copper-impacted soils were managed with reliable long-term erosion controls, consistent with the ROD and DEQ concurrence.

4.3.2.4 Grit Excavation and Backfill Around Existing Structures

The Upland Contractor began excavating grit from the perimeters of the building in 2021 as identified in the ROD. Work also addressed remaining backfill placement following the completion of the hot spot and former Burn Pit area excavation. Grit excavation for site buildings included 6-inch-deep excavation trenches with widths of approximately 3 feet around the main ship building, the machine shop, the welding shop, and the sand blast shop. Demarcation fabric was placed on the ditch subgrade before being covered with a 12-inch-thick gravel cap. Approximately 60 cy of material was removed around the existing structures. The excavated material was hauled to and disposed of at the Hillsboro Landfill using the same waste profile that was generated for upland hot spot excavation material and burn pit material (Waste Management Profile 134181). All grit excavation and backfill activities were completed in mid-July 2022.

4.3.2.5 Upland Excavation Issues and Resolutions

Two project modifications occurred during the completion of work at the former Burn Pit area. First, the extent of the hot spot removal area was expanded significantly as initial potholing revealed that material was spread further north than originally expected. To pursue removing the significant extra volume of hot spot material, MFA and the DEQ agreed to reduce the extent of the non-hot spot excavation on the dike face in the area to the south of the burn pit. This modification allowed AMCCO to remove and dispose of more highly contaminated material from the Site.

4.4 Waste Disposal

Waste profiles were generated using historical sampling information from each excavation area combined with post-excavation waste characterization sample results. Excavated materials were sampled for Toxicity Characteristic Leaching Procedure metals analysis for waste profiling in accordance with the SAP and Waste Management Northwest's waste acceptance criteria. Soil and sediment for disposal did not exceed Toxicity Characteristic Leaching Procedure limits and therefore

were not considered to be hazardous waste. Approximately 3,060 tons of excavated material was disposed at the Hillsboro Landfill (Table 4-1).

Due to the lateness of the season and onset of rain, soil in the northern containment cell was found to be too wet and liquid was released from the excavated sediment due to vibration during transport, requiring stabilization prior to disposal at the Hillsboro Landfill. As a result, AMCCO halted transport of the remaining excavated material to avoid landfill stabilization costs. Approximately 350 tons of stockpiled excavated sediment were deemed too wet for transport and had to be stored on site in a containment cell until dewatering could occur through infiltration and evaporation the following spring. After additional drying, the remaining excavated materials were disposed of at the Hillsboro Landfill in 2021.

4.5 Dike Restoration

Although not part of the cleanup remedy, dike restoration was required to protect the integrity of the remedy and ensure compliance with USACE standards. The flood wall located within the former main ship building was identified as being at risk of failure, which could have compromised both the RA and flood protection provided by the Clatsop County Diking District. Restoration activities were therefore integrated with the remedial construction.

4.5.1 Demolition and Subgrade Evaluation

On September 8, 2020, the construction team began by demolishing the flood wall within the former main ship building. Subgrade soils were scarified and evaluated under the oversight of a geotechnical engineer (NV5, Inc.). Preparation south of the ship building included removal of asphalt, concrete, and vegetation. Granular material from the subgrade was blended with dike fill as directed by the geotechnical engineer.

Upon approval of the subgrade, engineered fill was placed in 8-inch lifts, compacted with tracked equipment and a smooth drum roller, and verified for density using a Troxler 3430 nuclear density gauge. Lift surfaces were scarified between placements to ensure bonding. By September 10, 2020, a 3-foot embankment had been constructed to an elevation of +12 feet North American Vertical Datum 1988 (NAVD88), meeting USACE Section 408 interim authorization requirements.

4.5.2 Material Shortages and Interim Measures

On September 10, 2020, the Upland Contractor reported that the onsite fill stockpile was nearly exhausted. Two local backup sources of fine-grained material were identified, but both had excessively high moisture contents. Due to wildfire smoke limiting solar drying, the material could not be adequately conditioned.

After consultation with the diking district manager, AMCCO placed several uncertified lifts to an elevation of +13.5 feet NAVD88, equal to the surrounding dike height and the predicted 500-year flood elevation. To stabilize the embankment for winter, the uncertified lifts were capped with filter fabric and a 12-to-18-inch layer of crushed rock.

4.5.3 Completion and Final Certification

Work resumed on August 30, 2021, with removal of the uncertified lifts and placement of new compacted clay lifts sourced from previously approved material. Density testing confirmed compliance with project specifications, and water content was within acceptable ranges.

Final dike restoration was completed on September 2, 2021, achieving a certified elevation of +15.0 feet NAVD88. Allowing for predicted settlement, the final grade is expected to stabilize at approximately +14.33 feet NAVD88, above the 500-year flood elevation. The crest was finished with 6–8 inches of crushed rock to provide a durable access road.

USACE conducted a final inspection on September 23, 2021, and confirmed compliance with Section 408 Authorization requirements. A geotechnical summary report was issued to USACE on October 6, 2021 (MFA 2024), documenting that the dike restoration was completed in general accordance with project specifications and federal standards.

4.6 Site Grading and Cap

Site grading began in late August 2020 following completion of in-water work. The Upland Contractor first prepared the south yard, focusing on the south containment cell and southeast corner. Clean clay was placed in low spots, and a thin gravel layer was installed at the southeast corner along with Ultrablock concrete block walls for perimeter control.

In mid-October 2020, grading began in the north yard after the Former Burn Pit excavation. Subgrade preparation included sloping from the northeast to the northwest corner to facilitate stormwater runoff. The north property line setback was cleared, and the bottom of the north ditch was excavated. Over demarcation fabric, an 18-inch clean rock layer was installed to support a new Ultrablock wall set back 10 feet from the property line. Between the wall and property line, a 24-inch topsoil layer was placed and planted with shrubs. South yard grading was halted with the onset of wet weather and winterized with straw cover.

4.6.1 North Yard Capping

Work resumed in September 2021 with installation of topsoil along the new north Ultrablock wall and fence line. An 8-inch crushed rock base layer was placed over demarcation fabric for the north yard cap. Drainpipes were installed around the main building perimeter to address ponding identified during grading. Prior to cap placement, the yard was regraded for positive drainage to the stormwater pond (west) and east conveyance ditch.

By November 2021, the north yard cap was installed to the design thickness of 12 inches, and grit removal was substantially completed around site buildings. Excavated grit areas were backfilled with crushed rock.

4.6.2 South Yard Capping

In June 2022, grading and capping resumed in the south yard. The subgrade was graded to promote sheet flow to the east stormwater ditch. Perforated piping was installed beneath the cap to improve conveyance. Following installation of demarcation fabric, cap material consisting of 0.75 to 1.5-inch crushed rock was placed in a single 12-inch lift across the south yard, including the area between the dike and adjacent wooden docks. All grading and capping was completed by late August 2022.

In winter 2022, AMCCO installed a new power pole and conduit in the southeast quadrant. Disturbed areas were backfilled and surfaced with the same crushed rock used for upland capping to maintain uniformity.

4.6.3 Quality Control and Verification

Cap thickness was photo-documented during placement and compaction. A licensed surveyor collected topographic data, and an as-built capping plan was prepared to document final surface elevations. During a final site walk on October 20, 2022, MFA confirmed that gravel and soil cap limits complied with project plans and that installation methods protected existing vegetation.

4.7 Construction of Stormwater Facilities

Stormwater conveyance ditch and facility construction commenced in mid-September of 2021, beginning with the installation of two 18-inch culverts at the northern entrance and northeast building access crossings (Appendix A, Sheet C5.1). The off-site ditch outside the east property line was also excavated to 12 inches from the existing ditch bottom. The stormwater pond, which is in the northeast corner of the Site, was completed in October 2021. To facilitate north yard drainage, a total of seven stormwater trench drains that include four-inch perforated polyvinyl chloride piping wrapped in filter fabric running from the east part of the north yard to the storm pond were installed. All stormwater ditches were lined with crushed rock, according to the project specifications.

4.7.1 Stormwater Issues and Resolutions

An exception to the sediment removal work described in the ROD is a 150-foot section of the eastern stormwater ditch (Tarabochia ditch), located across the street from the AMCCO facility. Sediment removal in this ditch is difficult because of unstable side slopes, and a property fence located only a few feet from the ditch, requiring extra care to avoid undermining the fence.

The Remedial Investigation Report (MFA/GSI 2015) concludes that sediment in the eastern stormwater ditch is not expected to pose unacceptable ecological risks.

Clatsop County Public Works Department (the County) has an ongoing public stormwater system maintenance and cleaning program, in which the County comes through the Jeffers Garden area on a yearly basis and removes accumulated debris and sediment from all the stormwater ditches to maintain a hydraulically functioning drainage ditch system. As a result of this routine scraping of the ditch sediment, it is unlikely that the sediment that was originally sampled during the remedial investigation is still present in the bottom of the eastern stormwater ditch. MFA contacted the County and discussed that ditch sediment is brought to a dewatering facility, mixed with other sediment during the drying process, and then reused as fill for road repairs around the region.

As further described in the DEQ-approved baseline risk assessment (MFA 2015b) for the Site, no human health or ecological chemicals of concern were identified for the eastern stormwater ditch. The ditch is small and of low-quality habitat with little or no vegetative cover, is frequently inundated, and is therefore unattractive to potential receptors. Based on the analysis presented in the risk assessment and the County's ongoing maintenance, unacceptable risk under current or reasonable future scenarios is not expected and cleanup in addition to the ongoing maintenance activities is not warranted.

5 Final Inspection

5.1 Final Inspection and Site Walk

A final site walk for the project was conducted on October 20, 2022, after completing remediation work. MFA provided AMCCO with verbal notice of substantial completion at the conclusion of the final site inspection in coordination with the DEQ.

Based on the observations made during the final inspection, the engineer confirmed that remedial construction work completed at Site for the AMCCO RA was performed in accordance with all approved plans, specifications, and related documents, or in coordination with DEQ (MFA 2024).

6 Certification that Remedy is Operational and Functional

6.1 Certification Overview

The RA at the Site has been completed in accordance with the ROD, FDR, and subsequent agency approvals. The remedy is operational and functional based on the following determinations:

Performance Standards Achieved

- All upland and in-water hot spot soils and sediments identified in the ROD were excavated and disposed of at a permitted Subtitle D landfill. Excavation volumes met or exceeded planned quantities, ensuring removal of highly contaminated media.
- Leave-surface and verification sampling results confirmed that remaining soils and sediments generally meet the DEQ hot spot thresholds and that residual concentrations are effectively controlled by the implemented engineered remedies, including the upland soil cap, EMNR cover, and dike restoration. Analytical results indicated that the combined Marine Ways #1 and #2 sample met all sediment PRGs. At Marine Way #3, the leave-surface sample exceeded the sediment PRGs for copper and the ecological hot spot values for lead and total PCBs. Similarly, the North Dredge Area leave-surface sample exceeded the sediment PRGs for lead and the ecological hot spot values for total PCBs. These exceedances are limited in extent, and residual concentrations are effectively isolated and managed by the existing engineered controls, which continue to meet the performance standards identified in the ROD and SMP.

Construction Quality Verified

- Upland and in-water caps were installed to design specifications, with documented thicknesses (12-inch gravel cap in upland yards; 6-to-12-inch EMNR sand lifts in in-water

areas). Cap placement was verified through photographic logs, survey data, and as-built drawings (Appendix A).

- Dike restoration was completed to a certified elevation of +15.0 feet NAVD88 (with predicted settlement to +14.33 feet, above the 500-year flood elevation), meeting USACE Section 408 Authorization requirements. Final inspection by USACE (September 23, 2021) confirmed compliance.

Operational Controls In Place

- Stormwater conveyance features (trenches, ditches, and the stormwater pond) were constructed to manage site drainage consistent with design requirements.
- Long-term integrity of vegetative and engineered caps provides assurance that residual contaminants are isolated and protected from erosion or exposure.

Agency Concurrence

- DEQ provided oversight throughout construction and concurred with adjustments made to optimize environmental benefit (e.g., expanded Burn Pit excavation, selective exclusion of low-level copper soils stabilized beneath the dike crest road).
- MFA, as the engineer of record, verified that all remedial components were constructed in substantial compliance with design documents and project specifications.

6.2 Conclusion

Based on construction completion, inspection findings, sampling results, and agency concurrence, the AMCCO RA has met all performance standards. The remedy is operational and functional as of October 20, 2022, the date of final site inspection and verification. This certification affirms that the RA is protective of human health and the environment and fulfills the requirements of the DEQ-approved remedial design and EPA guidance for completion documentation.

7 Operation and Maintenance

In 2024, under contract with DEQ, MFA prepared the Performance Monitoring, Review & Contingency Plan (PMR&C) to outline the specific maintenance, monitoring, and corrective action procedures for the EMNR sand layer and MNR areas (see Appendix B). The PMR&C Plan established the framework for specific performance standards and the planned monitoring activities to demonstrate the effectiveness and reliability of the in-water sediment remedy implemented by the property owner in preventing or reducing human and ecological exposures to Site-related contaminants. Year 1 monitoring was completed in 2024–2025 and included visual observations, a bathymetric survey, and chemical monitoring. Visual observations and the bathymetric survey concluded that the EMNR sand layer is in good condition with no areas of significant sediment loss or deposition. Chemical monitoring was conducted to monitor the natural recovery of low levels of contamination in sediment. The chemical monitoring results did not detect concentrations of contaminants of concern above the PRGs. These findings demonstrate that the in-water sediment remedy remains effective and reliable in preventing or reducing human and ecological exposures to Site-related contaminants.

Based on the results of Year 1 monitoring, visual observations and bathymetric surveys will be completed annually consistent with the PMR&C Plan. Year 2 visual observations and the bathymetric survey should be completed in early spring of 2026. Chemical monitoring will be completed at least every 5 years, for 10 years, to demonstrate continued effectiveness. Based on the results presented in this report, MFA anticipates that contaminants of concern concentrations will continue to be below PRGs after 10 years and additional sampling will not be required. Year 5 chemical monitoring should be completed in early spring of 2028 and Year 10 chemical monitoring in early spring of 2033 (if required by DEQ). The results of annual monitoring events will be reported to DEQ.

Contingency monitoring may also be performed in the event of a significant change in the EMNR sand layer caused by flooding (i.e., a 100-year flood event) or seismic event (i.e., occurrence of an earthquake with a 72-year or greater recurrence interval).[2] Significant physical changes to the EMNR sand layer could expose contaminated sediments that could be harmful to human health and the environment (refer to Section 5 in Appendix B).

8 Summary of Project Costs

The initial project cost estimates for the AMCCO cleanup were presented in the ROD. The selected remedy combined Alternative 2A for in-water remediation (nearshore sediment excavation with EMNR, $967,000) with Alternative 3 for upland remediation (on-site consolidation and capping of hot spot soils and southern area soils, $1,249,000). The ROD also identified an additional $865,000 in disposal fees associated with off-site transportation and disposal of contaminated soil and debris, bringing the total estimated RA cost to $3,081,000 (DEQ 2017).

The remedial construction work was subsequently implemented under a Potentially Responsible Party (PRP)-led agreement, with AMCCO serving as the responsible party. As such, final bid prices and construction invoices were procured and managed directly by AMCCO, rather than by EPA or DEQ. MFA and supporting contractors oversaw construction quality assurance, design compliance, and regulatory coordination, but did not administer the construction contracts. Consequently, detailed final construction costs are not available to MFA or DEQ for reporting purposes.

Available documentation from the Certification Report indicates that the scope of work generally aligned with the ROD and design specifications, with modifications such as expanded excavation volumes at the former Burn Pit and stormwater and dike restoration adjustments (MFA 2024). While these modifications may have affected actual construction expenditures, detailed cost data remain unavailable.

Because the project was PRP-led and ultimately deferred to DEQ for long-term oversight, there were no EPA oversight costs associated with the remedy. The absence of federal oversight costs, combined with the direct contracting approach by the Site owner, limits the ability to provide a complete reconciliation of final versus estimated project costs.

In summary, the best available project cost estimate remains the $3,081,000 presented in the ROD, which included both in-water and upland remedial elements, as well as disposal fees. Final

[2] Seismic events as detected at Pacific Northwest Seismic Network stations in Warrenton, Oregon (https://www.pnsn.org/seismogram/current/ccso) or Astoria, Oregon (https://www.pnsn.org/seismogram/current/astor).

construction expenditures are understood to have been managed internally by AMCCO and are not publicly available for this report.

References

DEQ. 2003. *Risk-Based Decision Making for the Remediation of Contaminated Sites*. Land Quality Division, Oregon Department of Environmental Quality. Portland, OR. September.

DEQ. 2013. *Development of Background Metals Concentrations in Soil, Technical Report*. Cleanup Program, Land Quality Division, Oregon Department of Environmental Quality. Portland, OR. March.

DEQ. 2017. *Record of Decision, Selected Remedial Action for Astoria Marine Construction Company, Astoria, Oregon*. Prepared by Oregon Department of Environmental Quality. February.

DOJ. 2019. *Consent Judgement, Remedial Design and Remedial Action for Astoria Marine Construction Company, Astoria, Oregon*. Prepared by Oregon Department of Justice. March.

EPA. 1992. *Remedial Action Report Documentation for Operable Unit Completion.* U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response: Hazardous Site Control Division OS -220W. June.

GSI. 2016. *Technical Memorandum Supplemental Remedial Investigation Results for Astoria Marine Construction Company, Astoria, Oregon*. Prepared for Astoria Marine Construction Company. GSI Water Solutions, Inc., Portland, OR. August.

McDonnell, E. 2020. Telephone communication (re: former burn pit excavation analysis at AMCCO) with Cem Gokcora, Maul Foster & Alongi, Inc., Portland, OR. September 1.

MFA. 2015a. *Screening Level Human Health and Ecological Risk Assessment, Astoria Marine Construction Company Facility, Astoria, Oregon*. Prepared for Astoria Marine Construction Company and GSI Water Solutions, Inc. Maul Foster & Alongi, Inc.: Portland, OR. May 11.

MFA. 2015b. *Focused Baseline Human Health and Ecological Risk Assessment, Astoria Marine Construction Company Facility, Astoria, Oregon*. Prepared for Astoria Marine Construction Company and GSI Water Solutions, Inc. Maul Foster & Alongi, Inc.: Portland, OR. May 13.

MFA/GSI. 2015. *Remedial Investigation Report for Astoria Marine Construction Company facility, Astoria, Oregon*. Prepared for Astoria Marine Construction Company. Maul Foster & Alongi, Inc., Portland, OR, and GSI Water Solutions, Inc., Portland, OR. May.

MFA/GSI. 2016. *Feasibility Study Report for Astoria Marine Construction Company facility, Astoria, Oregon*. Prepared for Astoria Marine Construction Company. Maul Foster & Alongi, Inc., Portland, OR and GSI Water Solutions, Inc., Portland, OR. March.

MFA. 2020a. *Final Remedial Design Report, Astoria Marine Construction Company, ECSI No. 1898, Astoria, Oregon*. Prepared for Astoria Marine Construction Company. Maul Foster & Alongi, Inc.: Portland, OR. July 30.

MFA. 2020b. *AMCCO Demolition Update and Debris Pile Removal Request, Astoria, Oregon.* Prepared for Astoria Marine Construction Company. Maul Foster & Alongi, Inc.: Portland, OR. January 27.

MFA. 2020c. Cem Gokcora, Maul Foster & Alongi, Inc. *Former Burn Pit Excavation at AMCCO*. Email to Erin McDonnell, Oregon Department of Environmental Quality, September 25.

MFA. 2024. *AMCCO Remedial Action Construction Completion Report.* Prepared for Astoria Marine Construction Company. Maul Foster & Alongi, Inc., Portland, OR. January 25.

USDOI. 2014. Registration form. National Register of Historic Places http://www.nps.gov/nr/feature/places/pdfs/13001058.pdf (downloaded April 2014).

Limitations

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

Figures

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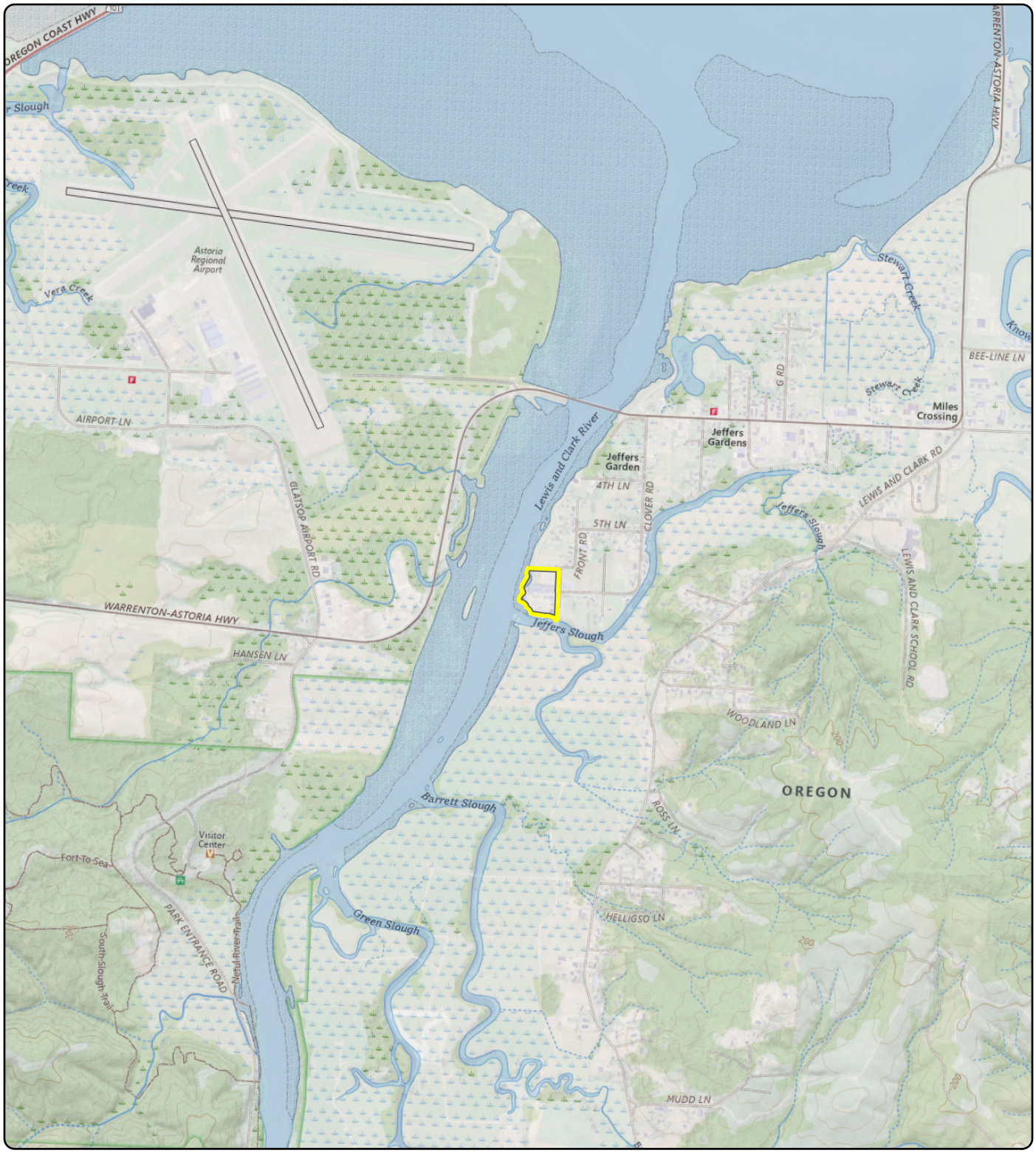

Notes
U.S. Geological Survey 7.5-minute topographic quadrangle (2020): Astoria.
Township 8 north, range 10 west, section 36.

Data Source
Site boundary obtained from Clatsop County parcel dataset.

Legend

Site

Figure 1-1
Site Location

Former Astoria Marine Construction Company
92134 Front Road
Astoria, OR

0 2,000
Feet

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Path: X:\O_MFA_Projects\M0785\29\001\Pro\M0785_29_001_003.aprx\Fig 1-1 Site location
Print Date: 4/25/2025
Reviewed By: smalonev
Produced By: lroberts
Project: M0785.29.001

FIGURE 1-2

Site Overview

Astoria Marine Construction Company (AMCCO) Supplemental Remedial Investigation

LEGEND

- Building
- Misc Structure
- Dock
- Railway
- Historical Feature
- AMCCO Upland Boundary
- Tax Lot
- Cement Dike
- Levee

NOTES:

- The locations of all features shown are approximate.
- Historical site features were identified using the 'Plant Arrangment' engineering drawing from July 1948 and from an aerial photo taken the same year.
- Current site features were refined on the basis of recent aerial photographs and observations from site walks. 'High' and 'low' water levels were delineated by GSI based on recent aerial photographs taken during an approximate high and low tide, respectively.

N

0 50 100 150

Feet

MAP NOTES:

Date: April 14, 2016
Data Sources: OR DEQ, Clatsop County, Air Photo by USDA 2014

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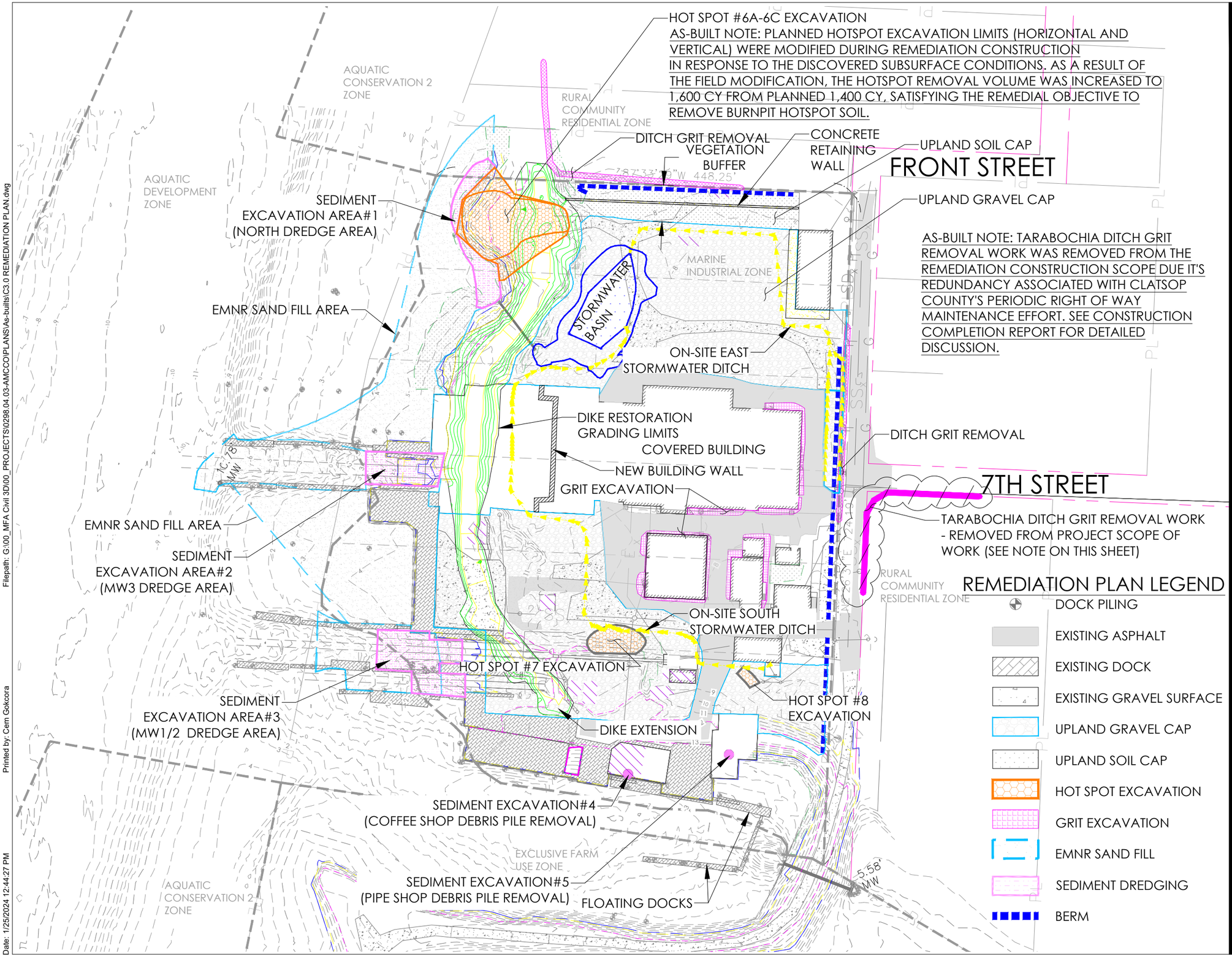
GSI Water Solutions, Inc.

Document Path: P:\Portland\453-Astoria_Marine\GIS\Project_mxds\Supplemental_RI_Report\Figure2_Site_Overview.mxd



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0 100' 200'

NOTE: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY.

Figure 1-3 Master Remediation Plan

AMCCO Remediation
Astoria, OR

Filepath: G:\100_MFA Civil 3D\00_PROJECTS\0298.04.03-AMCCO\PLANS\As-builts\C3.0 REMEDIATION PLAN.dwg
Printed by: Cem Gokcora
Date: 1/25/2024 12:44:27 PM

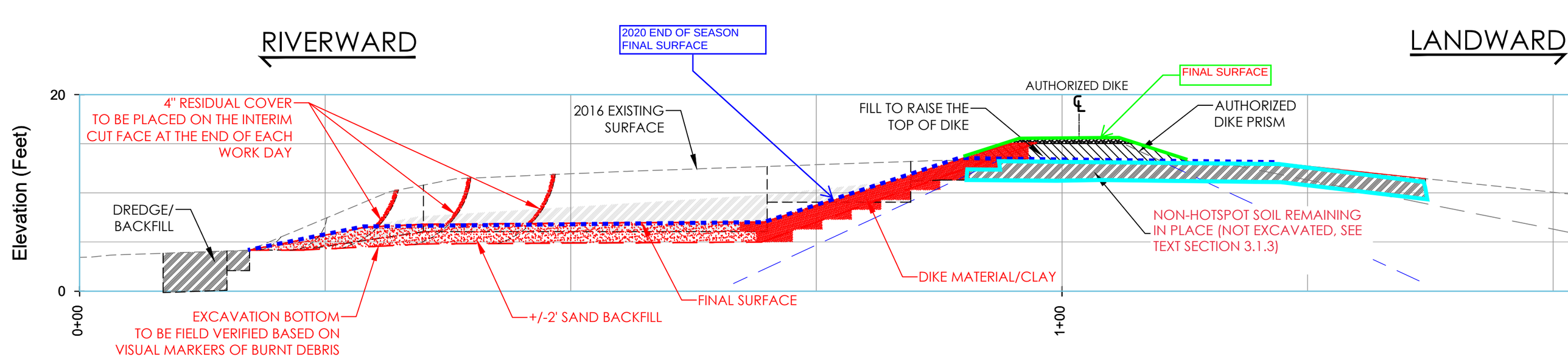

FIGURE 4-1 BURN PIT EXCAVATION DETAIL

H:1"=10', V:1"=10'

FIGURE 4-2

Burn Pit

Area to be Excavated

Astoria Marine Construction Company (AMCCO) Remedial Design/Remedial Action Work Plan

LEGEND

Planned Hot Spot/Source Control Excavation Area

- 0-2' bgs
- 0-4' bgs
- 0-7' bgs

All Other Features

- AMCCO Upland Boundary
- Surface Drainage Ditch

Revised 0-2' Excavation Extent (Proposed)

0-4' Excavation also required

NOTES:

- Excavation in this area is required due to the Arsenic hot spot.
- Excavation also addresses arsenic, copper and lead concentrations above site-specific source control concentrations.

N

0 20 40

Feet

MAP NOTES:

Date: May 31, 2016

Data Source: Aerial Phot from NAIP 2014

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Document Path: P:\Portland\453-Astoria_Marine\GIS\Project_mxds\RD_RA\Version2\Figure10_Total_Excavation_Area.mxd

Figure 4-3
Burn Pit
Copper Source Control Screening Results in Surface Soil, 0-1' bgs

Astoria Marine Construction Company (AMCCO)
Remedial Design/Remedial Action Work Plan

LEGEND

Planned Excavation to Address
- Arsenic Hot Spot/Source Control 0-2' bgs (See Figures 4a and 5a)
- Copper Source Control 0-2' bgs

Soil Sample
- Supplemental RI
- Phase 2 RI
- Phase 1 RI
- EPA

Copper Concentration (mg/kg)
- 0-149
- >149, Site Specific Source Control Concentration

All Other Features
- AMCCO Upland Boundary
- Surface Drainage Ditch
- Revised 0-2' Excavation Extent (Proposed)

NOTES:
- Excavation in this area is required due to the Arsenic hot spot/source control.
- Site specific source control concentrations are based on Preliminary Sediment Remediation Goals presented in DEQ's April 2016 Staff Report.
- Concentrations outside the excavation area represent residual soil concentrations.

N

1.00 in
0 20 40
Feet

MAP NOTES:
Date: June 1, 2016
Data Source: Aerial Phot from NAIP 2014

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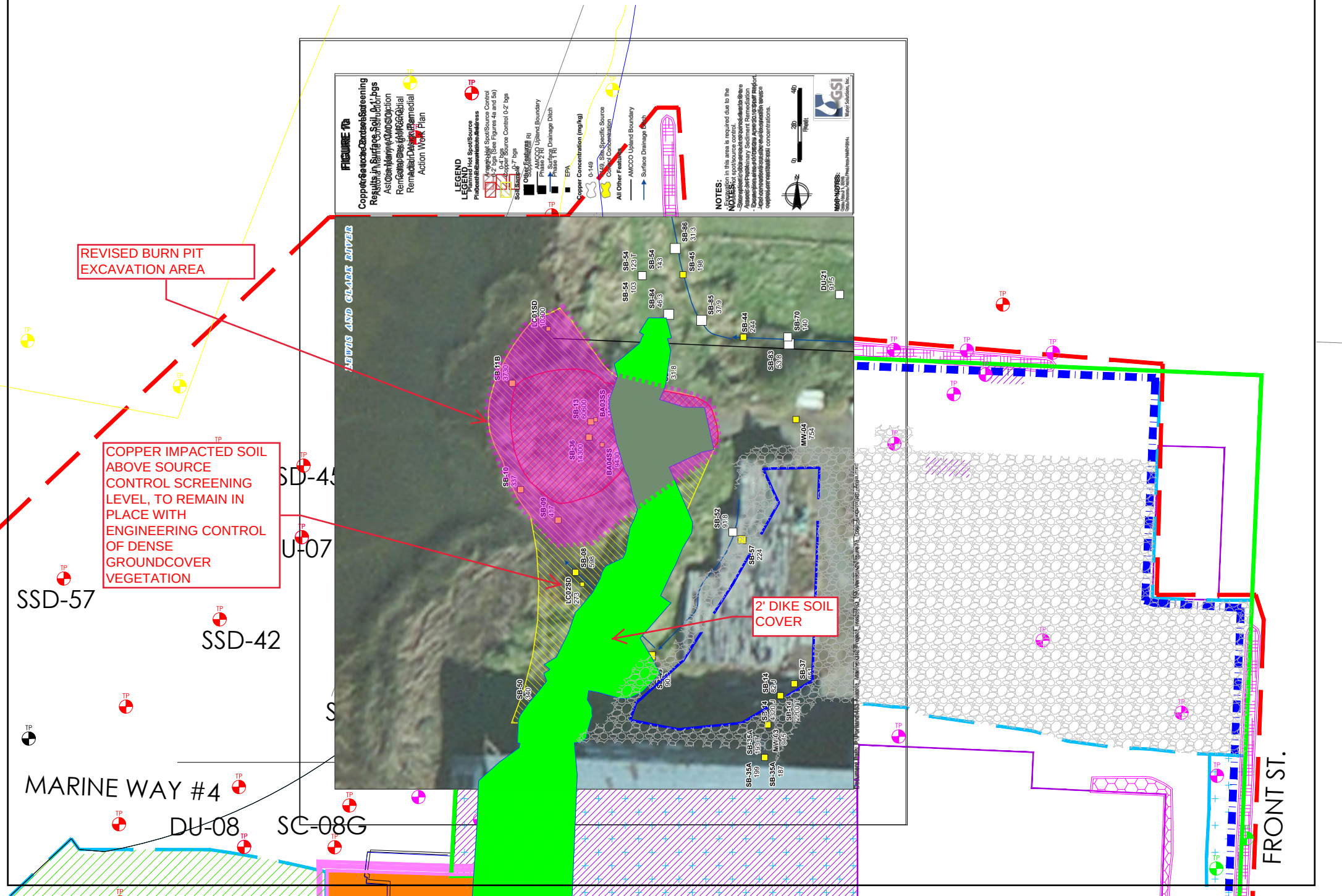
Document Path: P:\Portland\453-Astoria_Marine\GIS\Project_mxds\RD_RA\Version2\Figure7a_Copper_0-1_SC.mxd

FIGURE 4-4
BURN PIT RI FIGURE SUPERIMPOSED ON PROPOSED DIKE LINEWORK



Tables

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Table 3-1
Analytical Results for Sand
AMCCO

Sample Name	Sediment Fill Criteria[1]	CLSAND-2002100-01--04	SAND 1	AMCCO ROCK CAP
Collection Date		2/10/2020	7/21/2020	10/1/2020
Organotins (ug/kg)				
Monobutyltin	540	1.5 U	1.7 U	--
Dibutyltin	910	0.77 U	0.89 U	--
Tri-n-butyltin	47	1.6 U	1.8 U	--
Tetrabutyltin	97	0.78 U	0.91 U	--
Total Petroleum Hydocarbons (mg/kg)				
Diesel Range Organics	340	9.82 U	25 U	--
Residual Oil Range Organics	3,600	19.6 U	50 U	--
Metals (mg/kg)				
Arsenic	8.18	3.03	2.38	1.95
Barium	NV	--	--	35.4
Cadmium	0.658	0.113 U	0.221 U	1.08 U
Chromium	30	8.09	16	6.26
Copper	27.6	3.08	5.26	--
Lead	15.5	1.4	1.76	2.77
Mercury	0.2	0.0453 U	0.0884 U	0.086 U
Nickel	20	7.2	12.4	--
Selenium	0.4	0.566 U	1.1 U	1.08 U
Silver	0.4	0.113 U	0.221 U	1.08 U
Zinc	97.2	18.9	30.7	--
Pesticides (ug/kg)				
4,4'-DDD	4.88	0.985 U	1.02 U	--
4,4'-DDE	3.16	0.985 U	1.02 U	--
4,4'-DDT	4.16	0.985 U	1.02 U	--
Dieldrin	1.9	0.985 U	1.02 U	--
Endrin ketone	8.5	0.985 U	1.02 U	--
PCBs (ug/kg)				
Aroclor 1016	NV	2.07 U	4.05 U	--
Aroclor 1221	NV	2.07 U	4.05 U	--
Aroclor 1232	NV	2.07 U	4.05 U	--
Aroclor 1242	NV	2.07 U	4.05 U	--
Aroclor 1248	NV	2.07 U	4.05 U	--
Aroclor 1254	NV	2.07 U	4.05 U	--
Aroclor 1260	NV	2.07 U	4.05 U	--
Total PCBs[a]	5.31	2.07 U	4.05 U	--
SVOCs (ug/kg)				
1-Methylnaphthalene	NV	2.75 U	5.55 U	--
2-Methylnaphthalene	NV	2.75 U	5.55 U	--
3- & 4-Methylphenol (m,p-Cresol)	100	3.43 U	6.94 U	--
Acenaphthene	NV	1.37 U	2.78 U	--
Acenaphthylene	NV	1.37 U	2.78 U	--
Anthracene	NV	1.37 U	2.78 U	--
Benzo(a)anthracene	NV	1.37 U	2.78 U	--
Benzo(a)pyrene	NV	2.06 U	4.16 U	--
Benzo(b)fluoranthene	NV	2.06 U	4.16 U	--
Benzo(ghi)perylene	NV	1.37 U	2.78 U	--
Benzo(k)fluoranthene	NV	2.06 U	4.16 U	--
Benzoic acid	65	172 U	347 U	--
Bis(2-ethylhexyl)phthalate	500	20.6 U	41.6 U	--

Table 3-1
Analytical Results for Sand
AMCCO

Sample Name	Sediment Fill Criteria[1]	CLSAND-2002100-01--04	SAND 1	AMCCO ROCK CAP
Collection Date		2/10/2020	7/21/2020	10/1/2020
Carbazole	140	2.06 U	4.16 U	--
Chrysene	NV	1.37 U	2.78 U	--
Dibenzo(a,h)anthracene	NV	1.37 U	2.78 U	--
Dibenzofuran	200	1.37 U	2.78 U	--
Di-n-butyl phthalate	110	13.7 U	27.8 U	--
Di-n-octyl phthalate	39	13.7 U	27.8 U	--
Fluoranthene	NV	1.37 U	2.78 U	--
Fluorene	NV	1.37 U	2.78 U	--
Indeno(1,2,3-cd)pyrene	NV	1.37 U	2.78 U	--
Naphthalene	NV	2.75 U	5.55 U	--
Pentachlorophenol	17	13.7 U	27.8 U	--
Phenanthrene	NV	1.37 U	2.78 U	--
Phenol	48	2.75 U	5.55 U	--
Pyrene	NV	1.37 U	2.78 U	--
Total PAH[b]	1,610	2.75 U	5.55 U	--
Dioxins (pg/g)				
1,2,3,4,6,7,8-HpCDD	NV	0.517 J	0.354 UJ	--
1,2,3,4,6,7,8-HpCDF	NV	0.388 UJK	0.9 UJ	--
1,2,3,4,7,8,9-HpCDF	NV	0.156 U	0.152 U	--
1,2,3,4,7,8-HxCDD	NV	0.16 U	0.117 U	--
1,2,3,4,7,8-HxCDF	NV	0.147 UJK	0.471 UJ	--
1,2,3,6,7,8-HxCDD	NV	0.15 U	0.116 U	--
1,2,3,6,7,8-HxCDF	NV	0.123 UJK	0.188 UJ	--
1,2,3,7,8,9-HxCDD	NV	0.157 U	0.139 UJK	--
1,2,3,7,8,9-HxCDF	NV	0.13 U	0.151 U	--
1,2,3,7,8-PeCDD	0.304	0.175 U	0.13 U	--
1,2,3,7,8-PeCDF	NV	0.151 U	0.214 UJ	--
2,3,4,6,7,8-HxCDF	NV	0.1 U	0.133 UJ	--
2,3,4,7,8-PeCDF	0.245	0.157 U	0.133 UJ	--
2,3,7,8-TCDD	0.295	0.266 U	0.116 U	--
2,3,7,8-TCDF	NV	0.197 U	0.263 UJ	--
OCDD	NV	4.22 J	1.06 UJ	--
OCDF	NV	0.363 J	0.255 UJ	--
Total HpCDDs	NV	1 J	0.623 UJ	--
Total HpCDFs	NV	0.388 UJK	0.9 UJ	--
Total HxCDDs	NV	0.245 J	0.675 UJ	--
Total HxCDFs	NV	0.519 UJK	1.32 UJ	--
Total PeCDDs	NV	0.463 J	0.166 UJK	--
Total PeCDFs	NV	1.02 UJK	1.24 UJ	--
Total TCDDs	NV	0.266 U	0.116 U	--
Total TCDFs	NV	0.197 U	1.25 UJ	--
Total Dioxin TEQ (ND=0.5)	1.47	0.314 J	ND	--

Table 3-1
Analytical Results for Sand
AMCCO

NOTES:
-- = not analyzed.
EMPC = estimated maximum potential concentration.
J = estimated value.
mg/kg = milligrams per kilogram.
ND = not detected.
NV = no value.
PAH = polyaromatic hydrocarbons.
PCB = polychlorinated biphenyls.
pg/g = picograms per gram.
SVOC = semivolatile organic compound.
TEQ = toxic equivalency.
U = Result is non-detect to method detection limit or reporting limit.
ug/kg = micrograms per kilogram.
UJ = result is non-detect and estimated.
UJK = Result is non-detect to estimated detection limit, is an EMPC, and is an estimated value.
[a] Total PCB is the sum of Aroclors; if all analytes are non-detect, the highest method reporting limit
[b]Total PAH is the sum of 2-methylnaphthalene, naphthalene, acenaphthene, acenaphthylene, anthracene, phenanthrene, fluorene, fluoranthene, pyrene, chrysene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene; if all analytes are non-detect, the highest method detection limit is reported.
REFERENCE:
[1] Appendix A and B Screening Level Human Health and Ecological Risk Assessment, Astoria Marine Construction Company Facility; Maul Foster Alongi (2015).

Table 3-2
Analytical Results for Upland and Dike Import Materials

Sample ID	DEQ Clean Fill[1]	DIKE PILE NE	DIKE PILE SW	CUSTOMS DIKE PILE	CROWN CAMP DIKE PILE	TOP SOIL	ROCK CAP	ALTERNATIVE ROCK CAP MATERIAL
Date Collection		7/29/2020	7/29/2020	9/16/2020	9/16/2020	7/29/2020	10/1/2020	9/13/2021
Sample Depth (ft bgs)		0-0.5	0-0.5	2-4	2-4	0-0.5	0-0.5	0-0.5
TPH (mg/kg)								
Diesel Range Organics	1,100	25 U	25 U	25 U	28 U	25 U	--	--
Oil Range Organics	1,100[a]	50.5	78.6	76.9	56.1 U	461	--	--
Metals (mg/kg)								
Arsenic	12	8.53	9.89	5.75	8.91	5.39	1.95	1.76
Barium	840	65.9	80.2	78.6	88.1	250	35.4	41.3
Cadmium	0.54	0.227 U	0.229 U	0.276 U	0.31 U	0.765	1.08 U	0.200 U
Chromium	240	40	48.8	31.1	33.6	18.3	6.26	10.4
Lead	34	10.1	11.1	12	9.39	34	2.77	2.10
Mercury	0.11	0.0907 U	0.0916 U	0.11 U	0.12 U	0.101	0.086 U	0.0800 UJ
Selenium	1.5	1.13 U	1.14 U	1.38 U	1.53 U	1.17 U	1.08 U	1.00 U
Silver	0.41	0.227 U	0.229 U	0.276 U	0.31 U	0.235 U	1.08 U	0.200 U
Organochlorine Pesticides (ug/kg)								
4,4'-DDD	6.3	--	--	--	--	2.16 U	--	--
4,4'-DDE	10	--	--	--	--	7.22 U	--	--
4,4'-DDT	10	--	--	--	--	21 U	--	--
Dieldrin	4.5	--	--	--	--	2.8 U	--	--
Endrin ketone	NV	--	--	--	--	10.6 U	--	--
Herbicides (ug/kg)								
2,2-Dichloropropionic acid (Dalapon)	7,200	--	--	--	--	450 U	--	--
2,4,5-T	4,100	--	--	--	--	18 U	--	--
2,4-D	2,300	--	--	--	--	180 U	--	--
2,4-DB	25,000	--	--	--	--	180 U	--	--
Dicamba	9,000	--	--	--	--	18 U	--	--
Dichlorprop	NV	--	--	--	--	180 U	--	--
Dinoseb	7,800	--	--	--	--	180 U	--	--
MCPA	97	--	--	--	--	36,000 U	--	--
MCPP	280	--	--	--	--	18,000 U	--	--
Silvex	3,700	--	--	--	--	18 U	--	--

Table 3-2
Analytical Results for Upland and Dike Import Materials

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Sample ID	DEQ Clean Fill[1]	DIKE PILE NE	DIKE PILE SW	CUSTOMS DIKE PILE	CROWN CAMP DIKE PILE	TOP SOIL	ROCK CAP	ALTERNATIVE ROCK CAP MATERIAL
Date Collection		7/29/2020	7/29/2020	9/16/2020	9/16/2020	7/29/2020	10/1/2020	9/13/2021
Sample Depth (ft bgs)		0-0.5	0-0.5	2-4	2-4	0-0.5	0-0.5	0-0.5
PAHs (ug/kg)								
1-Methylnaphthalene	360	10.7 U	10.3 U	12.9 U	14.1 U	59.5	--	--
2-Methylnaphthalene	11,000	10.7 U	10.3 U	12.9 U	14.1 U	95.3	--	--
Acenaphthene	250	10.7 U	10.3 U	12.9 U	14.1 U	104	--	--
Acenaphthylene	120,000	10.7 U	10.3 U	12.9 U	14.1 U	16.1	--	--
Anthracene	6,800	10.7 U	10.3 U	12.9 U	14.1 U	20.5	--	--
Benzo(a)anthracene	730	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Benzo(a)pyrene	110	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Benzo(b)fluoranthene	1,100	10.7 U	10.3 U	12.9 U	14.1 U	15.3	--	--
Benzo(ghi)perylene	25,000	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Benzo(k)fluoranthene	11,000	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Chrysene	3,100	10.7 U	10.3 U	12.9 U	14.1 U	19.8	--	--
Dibenzo(a,h)anthracene	110	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Dibenzofuran	2	10.7 U	10.3 U	12.9 U	14.1 U	56.1	--	--
Fluoranthene	10,000	10.7 U	10.3 U	12.9 U	14.1 U	79.6	--	--
Fluorene	3,700	10.7 U	10.3 U	12.9 U	14.1 U	68	--	--
Indeno(1,2,3-cd)pyrene	1,100	10.7 U	10.3 U	12.9 U	14.1 U	10.7 U	--	--
Naphthalene	77	10.7 U	10.3 U	12.9 U	14.1 U	219	--	--
Phenanthrene	5,500	10.7 U	10.3 U	12.9 U	14.1 U	143	--	--
Pyrene	10,000	10.7 U	10.3 U	12.9 U	14.1 U	68.7	--	--
cPAH TEQ[2]	110	ND	ND	ND	ND	13.4	--	--

Table 3-2
Analytical Results for Upland and Dike Import Materials

NOTES:

Data has not been validated.

Shading (color key below) indicates values that exceed screening criteria; non-detects ("U" or "UJ") were not compared with screening criteria.

Clean Fill Exceedance

-- = not analyzed.

cPAH TEQ = carcinogenic PAH toxic equivalent.

DEQ = Oregon Department of Environmental Quality.

EPA = U.S. Environtmental Protection Agency.

ft bgs = feet below ground surface.

ID = identification.

mg/kg = milligrams per kilogram.

ND = not detected.

NV = no value.

PAH = polycyclic aromatic hydrocarbon.

TEQ = toxic equivalent.

TPH = total petroleum hydrocarbons.

U = Result is non-detect to method detection limit or reporting limit.

UJ = result is non-detect and estimated.

ug/kg = micrograms per kilogram.

[a] Value is for heating oil, since generic residual-range hydrocarbon values are not available.

REFERENCES:

[1] DEQ Clean Fill Determinations. Table 1 (Metals from Coast Range) and Table 2. 2019.

[2] cPAH TEQ values are based on toxic equivalence factors from EPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. 1993. (EPA/600/R-93/089).

Table 3-3
Leave Surface Analytical Results for AMCCO Sediment Dredge Areas
AMCCO

Sample Name	Site Specific PRG	Ecological Sediment Hot Spot Level	DREDGE AREA NORTH	MARINE WAY 1/2	MARINE WAY 3
Collection Date			7/22/2020	8/31/2020	8/24/2020
Collection Depth (ft bgs)			0.16-0.33	0.16-0.33	0.16-0.33
TCLP Metals (mg/L)					
Chromium	NV	NV	--	0.1 U	--
Lead	NV	NV	--	0.05 U	--
Mercury	NV	NV	--	0.007 U	--
Metals (mg/kg)					
Antimony	64	640	1.82 U	--	1.5
Arsenic	33	330	13.1	8.87	6.98
Barium	NV	NV	--	76.6	--
Cadmium	4.98	49.8	1.15	0.387 U	0.649
Chromium	111	1,110	42.9 J	22.9	31.2
Copper	149	1,490	130		702 J
Lead	15.5	155	66.5	11.6	202
Mercury	NV	NV	--	0.155 U	--
Nickel	48.6	486	28.8	--	12.6
Selenium	NV	NV	--	1.93 U	--
Silver	5	50	0.364 U	0.387 U	0.204 U
Zinc	459	4,590	231	--	264 J
PCBs (ug/kg)					
Aroclor 1016	NV	NV	17.8 U	17.8 U	197 U
Aroclor 1221	NV	NV	17.8 U	28.4 U	197 U
Aroclor 1232	NV	NV	17.8 U	17.8 U	197 U
Aroclor 1242	NV	NV	43.2 J	17.8 U	197 U
Aroclor 1248	NV	NV	17.8 U	17.8 U	197 U
Aroclor 1254	NV	NV	165 J	17.8 U	4640 J
Aroclor 1260	NV	NV	23.6 J	17.8 U	764 J
Total PCBs[(a)]	5.31	53.1	231.8 J	ND	5,404 J

NOTES:

Shading (color key below) indicates values that exceed screening criteria; non-detects ("U") were not compared with screening criteria.

PRG Level

Ecological Sediment Hot Spot Level and PRG Level

-- = not analyzed.

ft bgs = feet below ground surface.

J = estimated value.

mg/kg = milligrams per kilogram.

ND = non-detect.

NV = no value.

PCB = polychlorinated biphenyls.

PEC= probable effects concentration.

PH= Portland Harbor.

PRG= Preliminary Remediation Goal.

U = Result is non-detect.

ug/kg = micrograms per kilogram.

[(a)]Total PCB is the sum of detected Aroclors.

Table 3-4
Leave Surface Analytical Results for Excavation Areas 7 and 8
AMCCO

Sample Name	Soil PRG	EXCAVATION AREA #7	EXCAVATION AREA #8
Collection Date		9/4/2020	9/4/2020
Collection Depth (ft bgs)		0.16-0.33	0.16-0.33
TPH (mg/kg)			
Diesel Range Organics	4,600	1,370	168
Oil Range Organics	4,600[a]	2,600	734
Total Metals (mg/kg)			
Antimony	NV	18.6	5.19
Arsenic	12	20	9.21
Cadmium	NV	1.37	1.46
Chromium	NV	217	194
Copper	250	861	383
Lead	250	1,210	159
Nickel	160	71	25.5
Zinc	250	1,120	330
PCBs (ug/kg)			
Aroclor 1016	NV	19 U	16.5 U
Aroclor 1221	NV	19 U	16.5 U
Aroclor 1232	NV	19 U	16.5 U
Aroclor 1242	NV	101 J	16.5 U
Aroclor 1248	NV	19 U	16.5 U
Aroclor 1254	NV	872 J	16.5 U
Aroclor 1260	NV	197 J	16.5 U
Total PCBs[b]	560	1,170 J	16.5 U

Table 3-4
Leave Surface Analytical Results for Excavation Areas 7 and 8
AMCCO

Sample Name	Soil PRG	EXCAVATION AREA #7	EXCAVATION AREA #8
Collection Date		9/4/2020	9/4/2020
Collection Depth (ft bgs)		0.16-0.33	0.16-0.33
Dioxin Furans (pg/g)			
1,2,3,4,6,7,8-HpCDD	NV	2,450	341
1,2,3,4,6,7,8-HpCDF	NV	518	93.8
1,2,3,4,7,8,9-HpCDF	NV	27.8	4.69
1,2,3,4,7,8-HxCDD	NV	19.1 J	3.71 J
1,2,3,4,7,8-HxCDF	NV	26.2	5.62
1,2,3,6,7,8-HxCDD	NV	72.1	15.9
1,2,3,6,7,8-HxCDF	NV	21.1 J	8.6
1,2,3,7,8,9-HxCDD	NV	30.4	8.69
1,2,3,7,8,9-HxCDF	NV	5.11 J	2.14 J
1,2,3,7,8-PeCDD	NV	21 J	4.31 J
1,2,3,7,8-PeCDF	NV	23.1 J	2.88 J
2,3,4,6,7,8-HxCDF	NV	27.3	13
2,3,4,7,8-PeCDF	NV	37.3	23.2
2,3,7,8-TCDD	NV	6.8	4.18
2,3,7,8-TCDF	NV	48.3	3.25
OCDD	NV	27,000 J	3,290
OCDF	NV	2,810	313
Total HpCDDs	NV	4,160	697
Total HpCDFs	NV	2,200 J	304 J
Total HxCDDs	NV	501 J	144 J
Total HxCDFs	NV	551 UJK	204 UJK
Total PeCDDs	NV	384 UJK	53.5 J
Total PeCDFs	NV	422 J	404 J
Total TeCDFs	NV	1,010 UJK	219 UJK
Total TCDDs	NV	449	51.4 UJK
Dioxin/Furan TEQ[(c)(1)]	15	104 J	27.1 J

Table 3-4
Leave Surface Analytical Results for Excavation Areas 7 and 8
AMCCO

Notes

Shading (color key below) indicates values that exceed screening criteria.

Soil, PRG

-- = not analyzed.

EMPC = estimated maximum potential concentration.

ft bgs = feet below ground surface.

J = result is an estimated value.

mg/kg = milligrams per kilogram.

NV = no value.

PCB = polychlorinated biphenyls.

PRG = preliminary remediation goal.

pg/g = picogram per gram.

U = result is non-detect to reporting limit.

ug/kg = micrograms per kilogram.

UJK = analyte was not detected, the limit reported is estimated and is an EMPC.

[a] Value is for generic diesel/heating oil, since generic residual-range hydrocarbon values are not available.

[b]Total PCBs is the sum of PCB aroclors. Non-detect results are summed as zero. If all analytes are non-detect, the highest reporting limit is used.

[c]Dioxin/furan TEQs calculated as the sum of each detected congener concentration multiplied by the corresponding TEF value. 2005 World Health Organization consensus TEF values for mammals are used (Van den Berg et al., 2006).

Reference

[1]Van den Berg, M. et al. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. Toxicological Sciences. 93 No. 2:223–241.

Table 3-5
Leave Surface Analytical Results for Burn Pit
AMCCO

Sample Name	Sediment PRGs	Basis	Soil PRGs	Basis	EXCAVATION AREA #6 LEAVE SURFACE 1	EXCAVATION AREA #6 LEAVE SURFACE 2	EXCAVATION AREA #6 LEAVE SURFACE 3
Collection Date					10/8/2020	10/8/2020	10/8/2020
Collection Depth (ft bgs)					2	2	2
TPH (mg/kg)							
Diesel Range Organics	NV	--	NV	--	51.6 U	52 U	51.6 U
Oil Range Organics	NV	--	NV	--	3,750	3,380	3,990
Diesel + Oil[a]	NV	--	46,000	Construction Soil RBC[4]	3,776	3,406	4,016
Total Metals (mg/kg)							
Arsenic	33	Probable Effects Concentration[1]	12	Oregon Coast Background[3]	32.3	32.6	31.3
Barium	NV	--	NV	--	263	263	240
Cadmium	4.98	Probable Effects Concentration[1]	NV	--	3.93	3.69	3.82
Chromium	111	Probable Effects Concentration[1]	NV	--	155	163	153
Lead	15.5	Probable Effects Concentration[1]	250	DEQ Soil Plant Screening Level (populations)[5]	3,600	1,860	3,500
Mercury	NV	--	NV	--	0.697	0.713	0.666
Selenium	NV	--	NV	--	0.609 J	0.717 J	0.701 J
Silver	5	Portland Harbor Joint Source Control[2]	NV	--	1.79	1.73	2.43
PCBs (ug/kg)							
Aroclor 1016	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1221	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1232	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1242	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1248	NV	--	NV	--	5.01 U	5.11 U	4.86 U
Aroclor 1254	NV	--	NV	--	105 J	99.8 J	84.8 J
Aroclor 1260	NV	--	NV	--	144 J	121 J	110 J
Total PCBs[b]	5.31	Site-Specific Ecological Bioaccumulation Model[1]	560	Occupational Soil RBC (milk ingestion pathway)[4]	249 J	220.8 J	194.8 J

Table 3-5
Leave Surface Analytical Results for Burn Pit
AMCCO

Notes

Shading (color key below) indicates values that exceed screening criteria.

Sediment PRGs

Soil PRGs

Sediment and Soil PRGs

'-- = not analyzed.

ft bgs = feet below ground surface.

J = estimated value.

mg/kg = milligrams per kilogram.

NV = no value.

PCB = polychlorinated biphenyls.

PRG = preliminary remediation goals.

U = result is non-detect to reporting limit.

ug/kg = micrograms per kilogram.

[a] Diesel + Oil is the sum of diesel range organics and oil range organics. Non-detects are summed at one half the reporting limit.

[b]Total PCBs is the sum of PCB aroclors. Non-detect results are summed as zero.

References

[1]Maul Foster & Alongi, Inc. Focused baseline human health and ecological risk assessment, Astoria Marine Construction Company facility, Astoria, Oregon. [facts of publication]. May 13, 2015.

[2]NOAA. Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages.

[3]Development of Oregon Background Metals Concentrations in Soil, Technical Report, State of Oregon DEQ, March 2013.

[4]Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites, Oregon Department of Environmental Quality, September 2003.

[5]Guidance for Ecological Risk Assessment: Levels I, II, III, IV, Final, Oregon Department of Environmental Quality, March 2001.

Table 4-1
Hillsboro Landfill Waste Disposal Totals
AMCCO

WM Waste Profile	Waste Source	Accepted as	Disposal Timeline	Total Quantity (TON)
133315	North Dredge Area and MW#1-2 Dredged Sediment, Coffee Shop Debris Pile	Alternate Daily Cover	8/19/2020-9/2/2020	657.62
133937	MW#3 Dredged Sediment, Pipe Shop Debris Pile, Upland Hot Spot 7&8	Direct Landfill /Nonhazardous	9/15/2020-9/29/2020	686.57
134181	Burn Pit, Grit Excavation	Direct Landfill/Non-hazardous	11/4/2020-11/24/2020 7/8/2021-7/20/2021	1718.04
Total				**3062.23**