

30% Remedial Design Basis of Design Report

Appendix M

Preliminary (30%) Remedial Design

Opinion of Probable Cost

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## ATTACHMENT

Attachment M.1	Detailed Cost Estimate Workbook
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## ABBREVIATIONS

AC	activated carbon
AST	area-specific technology
BODR	<i>Basis of Design Report</i>
contractor	Remedial Action Contractor
CIL	chemical isolation layer
cy	cubic yard
cy/day	cubic yard per day
ENR	enhanced natural recovery
EPA	U.S. Environmental Protection Agency
FNC	Federal Navigation Channel
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
MLLW	mean lower low water
PCB	polychlorinated biphenyl
QA	quality assurance
RAA	remedial action area
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RMC	residuals management cover
SMA	sediment management area
TBD	to be determined
TSCA	Toxic Substances Control Act

# 1 Introduction

This appendix presents the Preliminary (30%) Remedial Design (RD) Opinion of Probable Cost and associated cost assumptions for the sediment remedy for the middle reach (River Miles 1.6 to 3.0) of the Lower Duwamish Waterway (LDW) Superfund Site in King County, Washington. The design process is presented in the *Remedial Design Work Plan for the Lower Duwamish Waterway Middle Reach* (Anchor QEA and Windward 2022) for the remedy selected in U.S. Environmental Protection Agency's (EPA's) November 2014 *Record of Decision* (EPA 2014). This Preliminary (30%) RD Opinion of Probable Cost was prepared in support of the Preliminary (30%) RD *Basis of Design Report* (BODR), based on the design information provided on the Preliminary (30%) Drawings (Volume III).

This Preliminary (30%) RD Opinion of Probable Cost evaluation was prepared on behalf of the City of Seattle, King County, and The Boeing Company, collectively referred to as the Lower Duwamish Waterway Group (LDWG).

Based on the BODR's design criteria and other key elements for implementing the middle reach sediment remedy, this appendix outlines the basis and rationale for the Preliminary (30%) RD Opinion of Probable Cost and includes the following supporting information:

- Section 2: Sources of Cost Information and Costing Approach
- Section 3: Direct Construction, Indirect Construction, and Additional Construction Oversight Tasks
- Section 4: Costing Assumptions Used for Preliminary (30%) Remedial Design
- Section 5: Dredge and Material Placement Quantities Summary
- Section 6: Costs Summary

Attachment M.1 contains the detailed cost estimate workbook for the Preliminary (30%) RD Opinion of Probable Cost, organized as follows:

- Attachment M.1.1: Summary Preliminary (30%) RD Opinion of Probable Cost
- Attachment M.1.2: Detailed Preliminary (30%) RD Opinion of Probable Cost
- Attachment M.1.3: Detailed Notes
- Attachment M.1.4: LDW Middle Reach Detailed Quantities and Notes
- Attachment M.1.5: LDW Upper Reach SMA 10 Detailed Quantities and Notes
- Attachment M.1.6: LDW Middle Reach Production Rates and Durations
- Attachment M.1.7: LDW Upper Reach SMA 10 Production Rates and Durations
- Attachment M.1.8: Detailed Structural Work Costs

## 2 Sources of Cost Information and Costing Approach

The development of the Preliminary (30%) RD Opinion of Probable Cost was based on a multi-step process to derive site-specific unit costs and lump sum prices for the middle reach sediment remedy; this process consisted of using both parametric and bottom-up costing approaches.

Parametric costing uses historical cost data to assign a dollar value to certain project costs. Parametric costing applied to this Opinion of Probable Cost consisted of reviewing historical unit costs for similar sediment remediation and/or dredging projects completed locally and regionally, based on their relevance and applicability to the middle reach (i.e., similar quantities and/or remediation conditions).

In bottom-up costing, the large project is broken down into a number of smaller components, and costs are specifically derived for each of these smaller work components. Bottom-up costing applied to this Opinion of Probable Cost was developed by estimating labor, equipment, and other ancillary add-ons for each construction activity based on engineering cost guidance (e.g., RS Means) and past project experience.

By comparing parametric cost information with bottom-up costs, along with engineering best professional judgment, "mid-range" unit costs and "mid-range" lump sums were then derived.

In addition, a three-point estimating approach was applied to provide a costing range around the "mid-range" (or "most likely") cost scenario. In three-point estimating, three separate cost scenarios for the costs associated with the project were generated. The first point represents an "optimistic" or "lower" cost scenario (assumed to have a 10% decrease in unit costs relative to the "mid-range" unit costs). The second point represents a "conservative" or "upper" cost scenario (assumed to have a 20% increase in unit costs relative to the "mid-range" unit costs). The "mid-range" (or "most likely") cost scenario represents the third point. To support the Preliminary (30%) RD Opinion of Probable Cost, several sources of information were reviewed, including the following:

- Contractors' bid costs and engineers' construction cost estimates for similar sediment remediation and/or dredging projects completed locally within the past 10 years (in the Seattle area) and regionally (in the Pacific Northwest), as well as knowledge of construction activities and challenges identified during construction oversight. The following project costs were reviewed:
  - LDW Upper Reach Superfund Site Cleanup (Seattle, Washington, 2024)
  - Port of Seattle Maintenance Dredging (Seattle, Washington, 2025)
  - Port of Seattle Terminal 25 South Site Cleanup – Engineering Evaluation and Cost Analysis (Seattle, Washington, 2025)
  - I&J Waterway Sediment Cleanup Unit 1 (Bellingham, Washington, 2024)

- Fairhaven Marine Industrial Park Improvement Project – Phase 1 (Bellingham, Washington, 2024)
  - Bellingham Shipping Terminal Marine Infrastructure and Dredging (Bellingham, Washington, 2023)
  - J.A. Jack & Sons, Inc., and Lehigh Hanson Berths Maintenance Dredging (Seattle, Washington, 2019,
  - Glacier Northwest, Inc., Terminal Maintenance Dredging (Seattle, Washington, 2016)
  - Port of Seattle Terminal 18 Maintenance Dredging (Seattle, Washington, 2015)
  - Port Gamble Bay Sediment Cleanup Project (Port Gamble, Washington, 2015)
  - Whatcom Waterway Phase 1 Sediment Cleanup (Bellingham, Washington, 2015)
  - Anchor QEA’s engineering best professional judgment based on past experience with similar remedial actions and associated pricing, as well as project-specific considerations that influence key cost factors (e.g., production rates)
- Engineering cost guidance (RS Means)
  - Vendor/suppliers quotes for clean placement materials and amendment to be imported

Some of the above-referenced projects were recently constructed, while others were completed approximately 10 years ago. The age of the reference project bid cost data was considered when reviewing historical sediment remediation costs (i.e., unit costs were adjusted<sup>1</sup> for standard inflation to present-day U.S. dollars [2025] for comparison to current costing of the middle reach sediment remedy).

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<sup>1</sup> For escalation purposes to 2025 US dollars, Consumer Price Index historical inflation rates (based on the Bureau of Labor Statistics [<https://www.bls.gov/cpi/home.htm>] of the U.S. Department of Labor) were used.

### 3 Direct Construction, Indirect Construction, and Additional Construction Oversight Tasks

This section describes the activities used to develop costs for direct construction (Section 3.1), indirect construction (Section 3.2), and additional construction oversight (Section 3.3) tasks for the LDW middle reach remedy. Additional detailed descriptions of these tasks are provided in the detailed cost estimate workbook, Attachment M.1 (see Attachment M.1.3).

#### 3.1 Direct Construction Tasks

Direct construction tasks include all construction activities anticipated to be conducted by the Remedial Action Contractor (contractor). The following direct construction tasks are included in this Preliminary (30%) RD Opinion of Probable Cost:

- **Mobilization and demobilization of in-water/upland equipment** include the costs associated with mobilizing and demobilizing personnel and in-water/upland equipment; contractor work plan development and various pre-construction submittals; post-construction submittals (including the construction summary report for each construction season); and procedural costs. Additional contractor-related health and safety, quality control, and project management costs were not separately estimated because they are assumed to be included under the lump sum for mobilization/demobilization costs by the contractor. In addition, special bonding and insurance are assumed to be included under this task.
- **Mobilization and demobilization of specialized equipment** include the costs for specific equipment used during structural work (e.g., pile driving and derelict structure demolition).
- **Site preparation** includes the costs associated with preparing the shorelines and banks for cleanup work (clearing and grubbing of top of banks and adjacent upland areas prior to excavation) and preparation, setup, operation, and maintenance of the upland staging area.<sup>2</sup>
- **Surveys** include the costs for contractor pre- and post-construction bathymetric and topographic surveys for each construction season, plus daily progress, post-dredge, and post-material placement bathymetric/topographic surveys and as-built surveys at the end of the middle reach project construction.

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<sup>2</sup>An upland staging area for contractor use (equipment staging; on-site trailer offices for contractor, Owner, and construction management teams' use; and other temporary facilities) is included for costing purposes in this Preliminary (30%) RD Opinion of Probable Cost; however, currently no upland space has been identified adjacent or in the vicinity of the LDW middle reach for contractor use. In addition, and as described in Section 9.2.1.1 of the BODR, it is assumed that the selected contractor for the LDW middle reach project will use an established commercial transload facility in close proximity (Duwamish Reload Facility, operated by Waste Management) that could readily be used for offloading dredged material from barges and onloading to trucks or railcars for transportation to a Subtitle D disposal facility. Therefore, no costs have been included in this Opinion of Probable Cost for developing a project-specific transload facility.

- **Structural work** includes the costs for the installation and removal of a temporary double-walled cofferdam and a temporary shoring wall (Remedial Action Areas [RAA] 24B through 24D); rerouting installation of outfalls OF27 and OF28 (RAAs 24B through 24D), monthly bypass operation, and removal; active pile pulling and replacement with steel pipe piles; removal and disposal of a submerged barge (RAA 14); and demolition and disposal of derelict structures (RAAs 24B through 24D and RAA 8F).<sup>3</sup>
- **Dredging and excavation** activities include costs for dredging, excavation in the dry (specific to RAA 24B through 24D), contingency re-dredging, and in-water barge transportation of contaminated sediments and small dredged debris (considered incidental to dredging).
- **Removal and disposal of identified debris** includes the costs for all large debris (defined as concrete rubble/blocks, wood debris, broken piling, logs, tires, cables, etc.) greater than 1 cubic foot.
- **Transloading, upland transportation, and disposal of bulk sediments at off-site Subtitle D disposal facility** activities include costs for transloading material that is not Toxic Substances Control Act (TSCA) waste or meets Resource Conservation and Recovery Act (RCRA) nonhazardous characteristics (i.e., Subtitle D level, including dredged sediment, small dredged debris, identified debris, and contaminated riprap) at a commercial transload facility (assumed to be located within the LDW) and then transporting them (via rail) to a permitted Subtitle D landfill for final disposal.
- **Containerization and stabilization** activities include costs for the segregation and direct load into containers of sediment materials that meet hazardous characteristics (Subtitle C level, including dredged sediment classified as TSCA waste or RCRA characteristic hazardous waste),<sup>4</sup> including sediments removed from within RAAs 19 and 24B through 24D and portions of RAAs 21A and 31B through 31D. In addition, pre-treatment (stabilization) of a portion of the RAA 24B through 24D excavated material is assumed to be required prior to upland transportation and off-site disposal.
- **Transfer, upland transportation, and disposal of containerized sediments at off-site Subtitle C disposal facility** activities include costs for transferring (via truck) containerized sediment materials that meet Subtitle C-level characteristics to an intermodal facility (assumed to be located in south Seattle) and then transporting them (via rail) to a permitted Subtitle C landfill for final disposal.

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<sup>3</sup> In certain locations of the LDW middle reach sediment remedy, building demolition will be required to be completed prior to in-water construction (for instance, structure demolition at RAA 31C will be performed by the owner). These upland-related costs are not accounted for in this Preliminary (30%) RD Opinion of Probable Cost.

<sup>4</sup> Per Section 9.2.3.2 of the BODR, dredged and excavated materials that classify as hazardous waste under RCRA will be disposed of in a RCRA-permitted hazardous waste landfill and polychlorinated biphenyl (PCB) remediation waste (defined as total PCB concentrations equal to or greater than 50 milligrams per kilogram dry weight) will be disposed of in a RCRA-permitted hazardous waste landfill or a TSCA-authorized disposal facility.

- **RAA-specific equipment decontamination** activities include specific costs for use of water for decontamination purposes of the dredging/excavation equipment when transitioning from removal of hazardous material to removal of nonhazardous material (applicable to RAAs 19 and 24B through 24D and portions of RAAs 21A and 31B through 31D).
- **On-barge dredge return water management and treatment** include daily costs for dewatering activities of sediments removed from within RAA 19 and portions of RAAs 21A and 31B through 31D.
- **Material placement** activities include costs for material procurement, material transport to the site, and placement of backfill, residuals management cover (RMC), enhanced natural recovery (ENR), amended ENR, engineered capping materials, habitat substrate material, and activated carbon (AC).
- **Environmental controls** include costs for environmental protection during construction by providing an allowance for controls and best management practices.

Habitat enhancement elements have not been defined at Preliminary (30%) RD; therefore, costs for planting preparation, landscaping, and maintenance in localized areas of the site will be determined at Intermediate (60%) RD.

### 3.2 Indirect Construction Tasks

Indirect construction tasks include additional activities to provide quality assurance (QA) that are necessary to the project but are performed by parties other than the contractor. The following indirect construction tasks have been included in this Preliminary (30%) RD Opinion of Probable Cost:

- **Project management** activities include costs for professional services, such as planning and reporting (e.g., weekly and/or monthly status reports during construction activities), community relations support during construction, health and safety reviews/checks, and bid/contract administration. In addition, costs for budget tracking, invoicing, and reporting—along with schedule, staff, and agency management—are accounted for in the project management task. Furthermore, project team communications, client/agency meetings and meeting materials, web sharing, and document management are also included.
- **Engineering support service** activities include costs for services typically provided from the office, such as design interpretation, contingency action decision coordination, change order negotiation support, and construction completion and closeout reports preparation.
- **Construction QA** costs, which include the following activities (as described in the *Construction Quality Assurance Plan*; see Volume II):
  - **Construction management** involves providing oversight of the contractor’s implementation of the sediment remedy. It typically refers to in-field oversight of the contractor’s work and includes construction inspection, progress tracking and reporting, reviewing progress payment requests, reviewing contractor submittals and work plans,

addressing contractor requests for information and change order requests, leading adaptive design changes, and communicating with the Owner, Engineer of Record, and the EPA. It also includes monitoring and inspection for structural stability when dredging adjacent to existing structures. Note that the construction management effort will comprise various inspection specialties (e.g., structural and geotechnical) overseeing different construction activities, and labor for these specialties is already accounted for in this cost line item.

- **Environmental compliance monitoring** includes activities during construction, such as confirmatory sediment sampling and contingency action determination, water quality monitoring, air/noise/light monitoring, and inadvertent discovery monitoring.
- **Site access agreements, business interruption, and temporary leases** include costs for leases, if needed, and coordination costs associated with construction site access (e.g., directed barge or vessel temporary relocations, business interruption, and Tribal fishing interaction agreements).
- **Community outreach and communications** include planning-level costs for actions that will be used to engage with community members during construction activities related to the cleanup of the middle reach.

### 3.3 Additional Construction Oversight Tasks

Additional construction oversight tasks include supplemental activities conducted by EPA to provide QA during construction.

## 4 Costing Assumptions Used for the Preliminary (30%) Remedial Design

The Preliminary (30%) RD criteria in the BODR form the basis for development of the Opinion of Probable Cost for the LDW middle reach remedy. General and specific RD costing assumptions are summarized in this section. Further details are contained in the Drawings (Volume III) and in the detailed cost estimate workbook (Attachment M.1).

Note that the criteria for development of the Opinion of Probable Cost for the LDW upper reach SMA 10 remedy are based on the preliminary design drawings developed during the LDW upper reach Preliminary (30%) RD (see Appendix B); SMA 10 design criteria will be refined as it is incorporated into the LDW middle reach design as part of Intermediate (60%) RD.

### 4.1 General Costing Assumptions

The following are general assumptions used in the Preliminary (30%) RD Opinion of Probable Cost:

- Construction Seasons: In-water construction activities for the LDW middle reach will occur during fish windows designated for the LDW (generally from October 1 through February 15, equivalent to 138 calendar days).<sup>5</sup> The contractor may not be able to conduct work during Tribal fishing activities and other events that impact its access to the work area. It is estimated that remedial construction for the LDW middle reach could potentially span between 6 and 10<sup>6</sup> construction seasons, but for costing purposes only, the Preliminary (30%) Opinion of Probable Cost uses 10 construction seasons as the most conservative scenario, in alignment with the currently commercially available daily transloading throughput capacity and dredged material transportation and disposal rates.
  - As an exception, it is assumed that removal of contaminated sediment at RAAs 24B through 24D will be conducted as excavation in the dry (facilitated by a temporary double-wall cofferdam installation). Therefore, it is assumed that this work can occur year-round, but preferably in low-precipitation months.
- Transloading Assumption: As described in Section 9.2.1.1 of the BODR, the Duwamish Reload Facility, operated by Waste Management, is the only commercial transload facility currently located on the LDW or within the Puget Sound. As of October 2025, Waste Management has communicated an operational throughput capacity of 1,500 tons daily (equivalent to approximately 1,000 cubic yards [cy] per day) for offloading, dewater, and stockpile sediments. Therefore, while a dredging contractor could potentially dredge at a higher production rate and operate multiple sets of equipment to conduct concurrent dredging in

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<sup>5</sup> Equivalent to an effective 111 days per construction season, excluding 10 Sundays and seven holidays.

<sup>6</sup> The lower end of this estimate relies on overcoming challenges related to limited transloading capacity and other factors discussed in BODR Section 12.2.

multiple locations within the site, the dredging production rates in this Preliminary (30%) RD Opinion of Probable Cost are assumed to be limited by the existing transload daily capacity for the single commercial facility.<sup>7</sup>

- Dredging Production Rates: As explained above, dredging production rates (i.e., the volume of in situ dredged material removed on an hourly or daily basis) are assumed to be limited by the daily throughput capacity at the existing LDW commercial transload facility and rail transport rate of dredged material for final landfill disposal. In addition, dredging production rates will vary based on the contractor’s selected equipment and personnel experience, sediment physical characteristics, site constraints, (such as tidally restricted access, nearby vessel traffic, presence of structures, and steep slopes), and weather conditions. Specific production rates for the various dredging scenarios have been assumed for each RAA (or subarea[s] of the RAAs) as summarized in Table M4-1.

**Table M4-1  
Assumed Dredging Production Rates**

Dredging Scenario	Assumed Dredging Production Rate (cy/day)	Assumptions
<b>Open-Water Dredging</b>	990	Applied to unobstructed, open-water areas (e.g., the LDW middle reach FNC) and below -5 feet MLLW
<b>Nearshore/Slope/Slow Dredging</b>	580	Applied to nearshore areas above -5 feet MLLW, steep slopes, or where dredging may be slow (due to shallow depths)
<b>Restricted Access Dredging</b>	330	Applied when conducting work adjacent to overwater structures (e.g., piers, bridges, and bulkheads) or where obstructions limit equipment access and require the use of flexifloat equipment
<b>Tidally Restricted Dredging</b>	180	Based on a reduced 4-hour work shift per day to accommodate tidal windows. Applied specifically to RAAs 6, 9A to 9D, 9F, 9I, 20B and 20C, where equipment access may be limited by tidal conditions.
<b>Land-Based Excavation</b>	500	Applied to shorelines or bank excavation work conducted from the land
<b>Contingency Re-Dredging</b>	580	Applied to a portion of the total dredge area to manage generated residuals and address missed inventory (see specific assumptions in Section 4.2)

Notes:

cy/day: cubic yard per day

FNC: federal navigation channel

LDW: Lower Duwamish Waterway

MLLW: mean lower low water

RAA: remedial action area

<sup>7</sup> As discussed in BODR Section 12, LDWG is currently exploring the feasibility that a new transload facility may be developed and available by the time the LDW middle reach remedial action starts. LDWG will continue to assess the feasibility that private parties or ports may develop a new facility, or that LDWG may partner with third parties to secure additional transloading capacity. The LDW middle reach cost estimate and construction duration will be updated during 60%, 90%, and 100% RD as more information as to transloading capacity is obtained. An increase in transloading capacity in the region will help reduce the overall construction duration and costs.

- Placement Production Rates: Material placement production rates (i.e., the volume of clean material placed on a hourly or daily basis) will vary based on the contractor’s selection of equipment, water depth, material types and physical characteristics (e.g., sand, gravel, and armor), site constraints (such as tidally restricted access, nearby vessel traffic, presence of structures, and steep slopes), and weather conditions. Specific production rates for the various placement scenarios have been assumed for each RAA (or subarea[s] of the RAAs) as summarized in Table M4-2.

**Table M4-2  
Assumed Placement Production Rates**

Placement Scenario	Assumed Placement Production Rate (cy/day)	Assumptions
<b>Open-Water Placement</b>	960 for RMC	Applied to unobstructed, open-water areas (e.g., the LDW middle reach FNC) and below -5 feet MLLW; for RMC, backfill, and capping applications
	790 for Backfill and Cap Chemical Isolation Layer	
	770 for Cap Filter Layer	
	730 for Cap Armor Layer	
<b>Nearshore/Slope/Slow Placement</b>	610 for Backfill, RMC, and Amended ENR	Applied to nearshore areas above -5 feet MLLW, steep slopes, or where placement may be slow (due to shallow depths); for RMC, ENR, amended ENR, backfill, and capping applications
	550 for Cap Chemical Isolation Layer	
	540 for Cap Filter Layer	
	510 for Cap Armor Layer	
<b>Restricted Access Placement</b>	440 for Backfill, RMC, and ENR	Applied when conducting work adjacent to overwater structures (e.g., piers, bridges, and bulkheads), or where obstructions limit equipment access and require the use of flexifloat equipment; for RMC, ENR, backfill, and capping applications
	410 for Cap Chemical Isolation Layer and Cap Filter Layer	
	390 for Cap Armor Layer	
<b>Restricted Access – Underpier</b>	120 for RMC, ENR, and Amended ENR	Applied to RAAs located beneath piers or dock structures where placement requires the use of telebelt equipment; for RMC, ENR, and amended ENR applications
<b>Tidally Restricted Placement</b>	150 for Backfill, RMC, Amended ENR, and Capping	Based on a reduced 4-hour work shift per day to accommodate tidal windows. Applied specifically to RAAs 5A, 6, 9A–9D, 9F, 9I, 9L, 9M, 20A through 20C, where equipment access may be limited by tidal conditions; for RMC, backfill, amended ENR, and capping applications.
<b>Land-Based Placement</b>	500 for RMC, ENR, and Backfill	Applied to shorelines or bank excavation work conducted from the land; for RMC, ENR, and backfill applications

Notes:

cy/day: cubic yard per day

ENR: enhanced natural recovery

FNC: federal navigation channel

LDW: Lower Duwamish Waterway

MLLW: mean lower low water

RAA: remedial action area

RMC: residuals management cover

- **Daily Work Schedule:** It is assumed for this Preliminary (30%) RD Opinion of Probable Cost that work will be performed in one 10-hour shift per day, 6 days per week, during the following work hours: 7:00 a.m. to 7:00 p.m. on weekdays and 9:00 a.m. to 7:00 p.m. on Saturdays. In-water work during the nighttime or on Sundays and legal holidays may be required to conduct intertidal remedial actions<sup>8</sup> or bank excavation activities due to the timing of low tides or to do occasional work proposed by the contractor to meet the construction schedule and support progress of activities within the in-water work window. Note that, for costing purposes only, general project conditions (such as work conducted during standard work hours) have been assumed in this Preliminary (30%) RD Opinion of Probable Cost to reflect the most representative daily contractor operations conducted during the winter season; actual work hour limits will be established in the project Specifications.
- **Sales Tax:** Sales tax for the LDW middle reach is included at 10.35% to account for Washington State (6.5%) and the City of Seattle (3.85%) taxes.
  - As an exception, the LDW upper reach Sediment Management Area (SMA) 10, an area deferred for design and construction to a later stage in the overall Superfund site cleanup due to EPA’s determination that sources were not sufficiently controlled (see Section 2.2.4 of the BODR), falls into the Tukwila jurisdiction. For the purposes of costing the implementation of SMA 10, sales tax is included at 10.2% to account for Washington State (6.5%) and the City of Tukwila (3.7%).
- **Contingency:** A 30% project contingency is applied to total direct construction, indirect construction, and additional construction oversight costs, based on consideration of potential cost uncertainty associated with the level of information currently available and engineering best professional judgment. Due to the nature of the project (i.e., environmental sediment remediation), additional factors that cannot be forecasted at this time—such as scope unknowns (i.e., significant changes in site conditions or quantities), price uncertainty (i.e., varying market conditions, increasing inflation, fuel and labor changes), or any other unforeseen circumstances (i.e., additional design requirements)—may influence contractor bidding prices and impact the final project costs outside, in excess, or below this contingency.
  - Additionally, a separate contingency of 50% was included for specific structural work items (double-wall cofferdam and shoring wall installation and removal) because these costs could largely vary based on new geotechnical data informing quantities.

All costs in this Preliminary (30%) RD Opinion of Probable Cost are presented in present-day U.S. dollars (i.e., 2025).

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<sup>8</sup> It is anticipated that for RAAs 6, 9A through 9D, 9F, 9I, and 20A through C, equipment access may be limited by tidal conditions. At these locations, a 4-hour shift per day was assumed for costing purposes.

## 4.2 Specific Remedial Design Costing Assumptions

The following specific RD assumptions are incorporated into the Preliminary (30%) RD Opinion of Probable Cost:

- Required Dredging/Excavation:
  - Required cut thicknesses or elevations for the RAAs and associated side-slopes, as shown on the Drawings (Volume III)
  - Overdredge allowance of 1 foot in excess of the required cut thickness or elevation within the dredge footprint and associated side-slopes. Variations in overdredge allowance thickness are prescribed at select RAA locations (e.g., RAAs 6, 8A, 20B, 21C, 29, and 35A), as shown on the Drawings (Volume III).
  - The dredge volume for each elevation-based RAA was calculated by developing a TIN surface model in AutoCAD Civil3D, based on the design dredge plan on the Drawings (Volume III).
  - For RAAs with thickness-based dredging, the dredge volume was calculated by multiplying the dredge footprint area by the required cut thickness and the specified overdredge allowance.
  - Side-slope dredge volumes for elevation and thickness-based dredging were calculated using 2D perimeters for each RAA, measured by AutoCAD Civil3D software; these perimeters were multiplied by the surface area of the dredge design, measured using Drawing (Volume III) cross sections.
  - The overdredge volume was calculated by multiplying the dredge footprint area and side-slope 2D surface areas by the specified overdredge requirement.
  - Removal of contaminated sediments within RAAs 24B through 24D is assumed to be conducted in the dry.
    - Dredging around existing structures considers horizontal dredge offset requirements based on adjacent required sediment dredge elevations/thickness cuts and associated short- and long-term structure stability (see Section 8.2.1 of the BODR).
    - Other unique, site-specific dredging considerations for each RAA, beyond the general requirements, are discussed in Section 5.6 of the BODR.
- Contingency Re-Dredging: Consists of one additional dredging pass conducted over a portion of the total dredge footprint with the following assumptions:
  - 15% of the total dredge area to be re-dredged to a total 1-foot thickness (including a 6-inch overdredge allowance) to address generated residuals that have concentrations elevated above RMC placement criteria

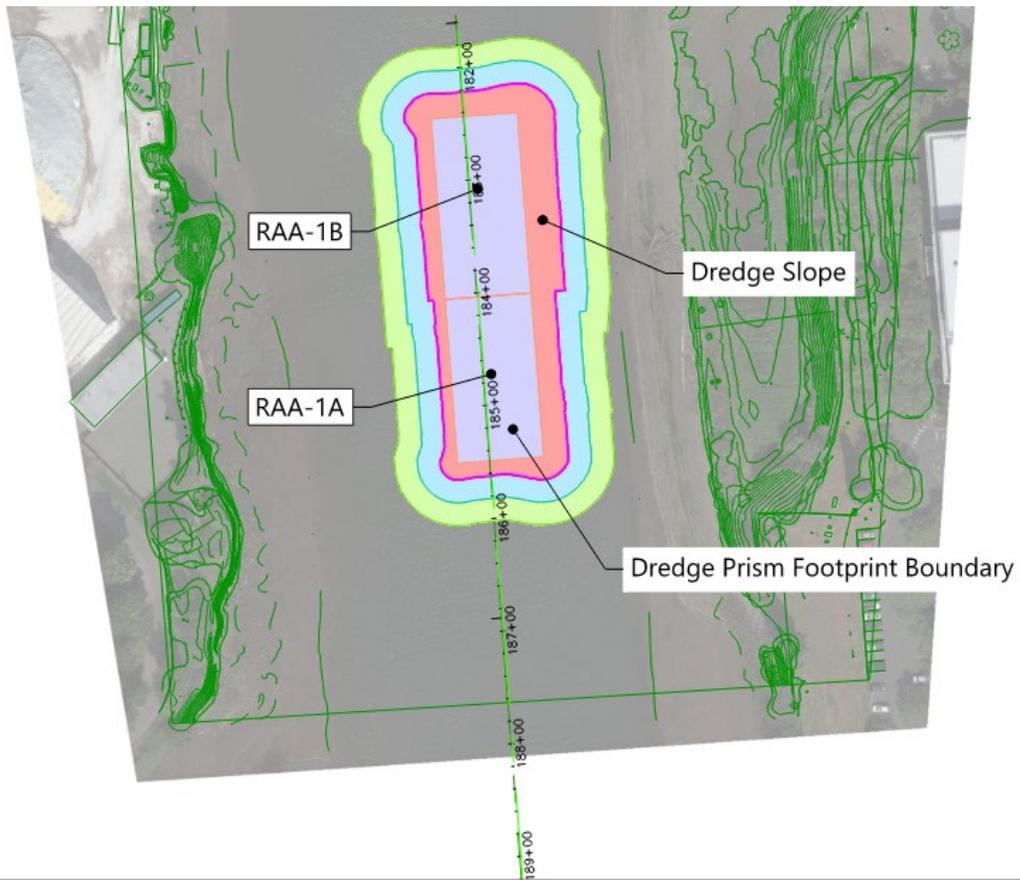
- An additional 20% of the total dredge area (excluding any partial dredge and cap footprints) to be re-dredged to a total 2.5-foot thickness (including a 6-inch overdredge allowance) to remove missed inventory
- Identified Debris: An estimated 1,600 tons of larger debris are assumed for this Opinion of Probable Cost for discrete and separate removal and disposal, based on visual aerial observations, shoreline photograph inventory, and measurements derived from ArcGIS LDW web map imagery of the LDW middle reach shorelines/banks. Generally, identified debris includes concrete rubble/blocks, wood debris, broken piling, logs, tires, and cables, as shown on the Drawings (Volume III) and is generally larger than 12 inches in size. For this Opinion of Probable Cost, buried and smaller debris is considered incidental dredged debris, and its removal, transportation, and disposal are accounted for in the total dredged volume.
  - It is assumed that the identified debris removed from RAAs 24B through 24D (approximately 90 tons) will be segregated from the total identified debris and transported via truck to the transload facility.
- Transloading, Upland Transportation, and Disposal of Bulk Sediments at Off-Site Subtitle D Disposal Facility: For costing purposes, it is assumed that sediment material that is not TSCA waste or meets RCRA nonhazardous characteristics will be transloaded, transported (via rail), and disposed of at a permitted Subtitle D landfill, assumed to be located in Arlington, Oregon.
- Containerization and Stabilization: Sediment material that is TSCA waste or is RCRA characteristic hazardous waste (including sediments removed from within RAAs 19 and 24B through 24D and portions of RAAs 21A and 31B through 31D [see BODR Figure 10-1]) will be required to be containerized for transportation and off-site disposal. For costing purposes, it is assumed that a portion of the RAAs 24B through 24D excavated material (which contains TSCA waste and mercury-driven RCRA hazardous waste) will require pre-treatment (i.e., stabilization) with cement at 10% by weight prior to upland transportation and off-site disposal.
- Transfer, Upland Transportation, and Disposal of Containerized Sediment at Off-Site Subtitle C Disposal Facility: For costing purposes, it is assumed that containerized sediment material that meets hazardous characteristics will be transferred (via truck), transported (via rail), and disposed of at a permitted Subtitle C landfill, assumed to be located in Arlington, Oregon.
- RAA-Specific Equipment Decontamination: The equipment decontamination costs for RAAs 19, 21A, 24B through 24D, and 31 (see BODR Figure 10-1) are calculated for 11 events, which are equivalent to the discrete areas of TSCA waste or TSCA waste mixed with mercury-driven RCRA hazardous wastes removed within these RAAs, requiring segregation of material and, therefore, equipment decontamination.
- Directed Standby Time: Paid standby time is assumed for costing purposes to be 70 days total over the 10 construction seasons. Directed standby compensates the contractor for

temporarily suspending the contractor's in-water work when LDWG's construction management team directs the contractor to temporarily stop in-water work. Potential reasons for directed standby may include additional unaccounted for Tribal fishing activities during the in-water work window and other waterway use priorities not addressed in the Specifications.

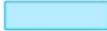
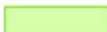
- Structural Work: This item includes the costs for the following: 1) removal, offloading, upland transportation, and disposal of nine dolphin pile clusters, 18 creosote timber piles, and eight mooring steel dolphins and replacement of 28 steel pipe piles and of seven steel dolphins; 2) temporary installation and removal of the double-walled cofferdam and shoring wall at RAAs 24B through 24D; 3) temporary rerouting of outfalls OF27 and OF28, monthly bypass operation, and removal at RAAs 24B through 24C; 4) removal and disposal of submerged barge at RAA 14; and 5) demolition and disposal of an estimated 53 tons of derelict structures at RAAs 24B through D and 8F through 8G.
- Placement of Backfill:
  - Backfill is intended to restore, for habitat purposes, the sediment bed to pre-construction elevations and to flatten temporary steeper dredge cuts.
  - All dredge areas located outside of the federal navigation channel (FNC) and above elevation -10 feet mean lower low water (MLLW) are assumed to be backfilled and integrated with habitat material placement in intertidal areas as appropriate, as shown on the Drawings (Volume III; see also Section 9.1.6 of the BODR). Two notable exceptions are RAAs 31B and 31C, where post-remedy elevations are controlled by the deep dredging cut in the FNC/RAA 30D and it is not feasible to restore pre-construction elevations without significant encroachment into the FNC.
  - For RAAs backfilled to grade, the backfill volume was assumed to be equivalent to the dredge volume based on backfill design placement elevations and grades, as well as the final dredge surface to be backfilled (starting at the overdredge allowance surface). The backfill volume also accounts for the upper end of the vertical placement tolerance (6 inches).
  - The side-slope backfill volumes were calculated using 2D perimeters for each RAA, measured by AutoCAD Civil3D software. These perimeters were multiplied by the surface area of the backfill design placement, measured using Drawing (Volume III) cross sections.
  - For costing purposes, backfill material is assumed to conform to a gravelly sand placed in sloped dredge surfaces and flat dredge surfaces (see Section 9.5.1 of the BODR).
- Placement of Required RMC:
  - RMC is assumed to be placed over 100% of the dredge areas that are not backfilled or capped after dredging and in specific RAAs (as shown on the Drawings [Volume III]).

- The RMC placement footprint includes dredge cut side-slope areas (top to toe of dredge cut daylight).
- For costing purposes, the following is assumed:
  - Over the dredge flat areas within the dredge RAAs (not backfilled nor capped), RMC is assumed to be placed at a 9-inch targeted placement thickness, plus the upper end of the vertical placement tolerance.
  - On the dredge cut side-slopes (top to toe of dredge cut daylight), RMC is assumed to be placed at a 24-inch targeted placement thickness, plus the upper end of the vertical placement tolerance (see Section 9.1.5.2 of the BODR).
  - Required RMC material is assumed to conform to a medium-to-coarse-grained sand (see Section 9.5.1 of the BODR).
- Placement of Inner and Outer-Perimeter RMC:
  - The perimeter RMC placement surrounding the dredge areas consists of two buffer areas: the inner and the outer-perimeter RMC, which generally are each 20 feet wide in the upstream, cross-channel, and downstream directions (see Exhibit M4-1).
  - Inner perimeter RMC will be automatically placed surrounding the dredge area (from top of dredge cut daylight), without the need for perimeter sampling.
  - Outer-perimeter RMC consists of RMC placed within an assumed 25% of the perimeter outside and surrounding the inner RMC perimeter. Outer-perimeter RMC placement is contingent on sediment sampling results within the outer perimeter to determine whether there is a need for RMC placement in the outer perimeter.
  - For costing purposes, the following is assumed:
    - At Preliminary (30%) RD, the Drawings (Volume III) do not show the inner and outer-perimeter RMC. Estimates of the inner- and outer-perimeter RMC surface areas were measured using BlueBeam Revu and volumes have been included in this Opinion of Probable Cost.
    - Both inner- and outer-perimeter RMCs are assumed to be placed at a 9-inch targeted placement thickness, plus the upper end of the vertical placement tolerance.
    - Inner- and outer-perimeter RMC material is assumed to conform to a medium-to-coarse-grained sand (see Section 9.5.1 of the BODR).

**Exhibit M4-1**  
**Example of Inner- and Outer-Perimeter Residual Materials Cover Placement**



**LEGEND:**

	Dredge Prism Footprint Boundary		Dredge Slope
	Estimated Dredge Prism Daylight Boundary		Required Inner RMC Perimeter
			Contingent Outer RMC Perimeter (Sample-Based)

Notes:

RAA: remedial action area  
RMC: residuals management cover

- Placement of ENR:
  - ENR will be placed in RAAs 8H, 21B, 23B, 24A, 25, 27B, 27D, 28, 31A, 32, 33, and 35B (as shown on the Drawings [Volume III]). The ENR quantity assumes a placement footprint that includes a 10-foot buffer around the planned ENR placement area as shown on the Drawings (Volume III).

- For costing purposes, ENR is assumed to be placed at a 9-inch targeted placement thickness, plus the upper end of the vertical placement tolerance.
- For costing purposes, ENR material is assumed to conform to a medium-to-coarse-grained sand (see Section 9.5.1 of the BODR).
- Placement of Amended ENR (Area-Specific Technology [AST] B):
  - Amended ENR (i.e., ENR with activated carbon) will be applied to dredge offset areas in RAAs 5A, 8C, 8G, 9L, 9M, and 20A (as shown on the Drawings [Volume III]), where placement under structures or within dredge offsets is required and the ENR upper limit is exceeded (see Section 10.6.1 of the BODR). Additionally, material will be placed on the riprap in RAA 20A to address interstitial sediment.
  - For costing purposes, the amended ENR material is assumed to include amendment (uniform blending) with AC at a 2% dose (by dry weight; see Section 9.6.1 of the BODR and Appendix L).
  - For costing purposes, amended cover is assumed to be placed at a 9-inch targeted placement thickness, plus the upper end of the vertical placement tolerance.
  - For costing purposes, amended cover material is assumed to conform to gravelly sand mixed with AC (see Section 9.5.1 of the BODR).
- Placement of Standard Engineered Caps:
  - As described in Section 9.3 of the BODR, standard engineered caps are assumed to be placed in RAAs 1B, 9J, 14, 15B, 22, 23A, 30A<sup>9</sup>, 30B, 30D, 30E, 30F, 31B, and 31C (as shown on the Drawings [Volume III]) after partial dredging.
  - For costing purposes, the standard engineered caps are assumed to consist of three layers:
    - Chemical Isolation layer (conforming to gravelly sand material, with 6-inch minimum thickness plus a 6-inch maximum overplacement allowance)
    - Filter layer (conforming to sandy gravel material, with 6-inch minimum thickness plus a 6-inch maximum overplacement allowance)
    - Erosion protection layer (conforming to quarry spalls, with a 12-inch minimum thickness plus a 6-inch maximum overplacement allowance)
- Placement of Modified Engineered Caps:
  - As described in Section 9.3 of the BODR, modified engineered caps are assumed to be placed in potential habitat areas (at -10 feet MLLW or at higher elevations) in RAAs 5B, 8B, 9A, 9D, 20C, 24I, 26, and 31D (as shown on the Drawings [Volume III]).
  - For costing purposes, the modified engineered caps are assumed to consist of three layers:

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<sup>9</sup> The standard engineered cap at RAA 30A will be placed on existing grade.

- Chemical isolation layer (conforming to gravelly sand material, with 6-inch minimum thickness plus a 6-inch maximum overplacement allowance)
  - Exceptions are RAAs 8B and 24I, where the chemical isolation layers are assumed to be a 24-inch and a 12-inch minimum thicknesses, respectively (plus a 6-inch maximum overplacement allowance).
- Erosion protection layer (conforming to sandy gravel, with a 6-inch minimum thickness plus a 6-inch maximum overplacement allowance)
- Habitat layer (conforming to sandy gravel material, with 18-inch minimum thickness plus a 6-inch maximum overplacement allowance)
- The chemical isolation layer includes specific AC amendment depending on location, as follows:
  - RAAs 5B, 9A, and 9D: For costing purposes, assumed to be a uniform blend with AC at 1% dosage (by dry weight)
  - RAA 8B: For costing purposes, assumed to be a uniform blend with AC at 10% dosage (by dry weight)
  - RAAs 20C, 24I, and 31D: No AC amendment needed
  - RAA 26: For costing purposes, assumed to be a uniform blend with AC at 5% dosage (by dry weight)
- Placement of Utility Crossing Cover (AST D)
  - As described in Section 9.6.3 of the BODR, utility crossing covers will be applied at RAAs 9K and 30C, the two submarine utility crossing locations in the LDW middle reach, where dredging cannot be conducted to the full vertical extent of contamination because of proximity to the buried utility.
  - For costing purposes, the utility crossing cover is assumed to consist of a sandy gravel layer
- Project Management: This cost is assumed on an annual basis for project management activities for the total construction duration, including additional time needed before and after each construction season.
- Engineering Support Services: This cost is assumed on a construction season basis for the total construction duration and additional time needed for engineering support before and after each construction season.
- Construction QA:
  - Construction Management: This cost is assumed on a monthly basis for the total construction duration and additional time needed for construction management before and after each construction season.
  - Environmental Compliance Monitoring: This includes a lump sum for costs for equipment, labor, analytical, and data validation for sediment and water quality

sampling, as well as air/noise/light monitoring and inadvertent discovery monitoring, incurred during construction.

- Site Access Agreements, Business Interruption, and Temporary Leases: This is assumed to include allowances for Tribal fishing interaction agreements, business interruption, and directed barge or vessel temporary relocations. It is not anticipated that special leases will be required. This cost is assumed on a construction season basis.
- Community Outreach and Communications: This planning-level cost includes actions for each construction season that will be used to engage with community members during construction activities related to the cleanup of the middle reach.
- EPA Construction Oversight: This cost is assumed on a construction season basis for the total construction duration, including additional time needed before and after each construction season.

## 5 Dredge and Material Placement Quantities Summary

The Preliminary (30%) RD dredging and material placement quantities for the LDW middle reach are summarized in Tables M5-1 and M5-2, respectively. In addition, these tables present the quantities for dredging and material placement for the LDW upper reach SMA 10, consistent with the preliminary design drawings developed during the LDW upper reach Preliminary (30%) RD (see Appendix B of the BODR); SMA 10 quantities will be refined as it is incorporated into the LDW middle reach design as part of Intermediate (60%) RD.

**Table M5-1  
Summary of Preliminary (30%) Remedial Design Dredging Quantities**

Description	LDW Middle Reach Volumes (cy)	LDW Upper Reach – SMA 10 Volumes (cy) <sup>1</sup>
Required Dredge Volume	409,800	12,100
Overdredge Allowance Volume	53,400	2,400
Contingency Re-Dredging Volume	13,500	800
<b>Total Dredge Volume</b>	<b>476,700</b>	<b>15,300</b>

Notes:

Total dredge volume includes the following: 1) required dredge volume, including associated external side-slope volumes (no transition slopes [between RAAs] have been yet developed or accounted for), as shown on the Drawings (Volume III); 2) 1-foot overdredge allowance on the entire dredge footprint (with the exceptions as noted in Section 4.2); and 3) contingency re-dredging volume. Total dredge volume includes required dredge and required excavation volumes.

Volumes are rounded to the nearest hundred. See the detailed cost estimate workbook, Attachment M.1 (Attachment M.1.4), for detailed dredging quantities.

1. All dredge volumes for LDW upper reach SMA 10 are based on the preliminary design drawings developed during the LDW upper reach Preliminary (30%) RD (see Appendix B of the BODR).

cy: cubic yard

LDW: Lower Duwamish Waterway

RAA: remedial action area

RD: remedial design

SMA: sediment management area

**Table M5-2  
Summary of Preliminary (30%) Remedial Design Material Placement Quantities**

Description	LDW Middle Reach Volumes (cy)	LDW Upper Reach – SMA 10 Volumes (cy) <sup>1</sup>
Backfill Volume	74,900	12,400
Required RMC + Inner-/Outer-Perimeter RMC Volume	42,600	100
ENR Volume	5,400	200
Amended ENR Volume	1,100 <sup>2</sup>	--
Standard Engineered Cap Volume	78,800 <sup>3</sup>	2,100
Modified Engineered Cap Volume	6,400 <sup>4</sup>	--

Description	LDW Middle Reach Volumes (cy)	LDW Upper Reach – SMA 10 Volumes (cy) <sup>1</sup>
Utility Crossing AST Cover Volume	3,600 <sup>5</sup>	--
<b>Total Placement Volume</b>	<b>212,800</b>	<b>14,800</b>

Notes:

Volumes are rounded to the nearest hundred. See the detailed cost estimate workbook, Attachment M.1 (Attachment M.1.4), for detailed material placement quantities.

1. All placement volumes for LDW upper reach SMA 10 are based on the preliminary design drawings developed during the LDW upper reach Preliminary (30%) RD (see Appendix B of the BODR).
2. Amended ENR (AST B) is to be placed in RAAs 5A, 8C, 8G, 9L, 9M, and 20A as shown on the Drawings (Volume III).
3. Standard engineered cap is to be placed in RAAs 1B, 9J, 14, 15B, 22, 23A, 30A, 30B, 30D, 30E, 30F, 31B, and 31C. The cap at RAA 30A will be placed on existing grade.
4. Modified engineered cap is to be placed in RAAs 5B, 8B, 9A, 9D, 20C, 24I, 26, and 31D. The cap at RAA 26 is also referred to as AST E because it is a special application of a cap on existing grade.
5. Utility crossing cover (AST D) is to be placed in RAAs 9K and 30C, as shown on the Drawings (Volume III).

--: not applicable

AST: area-specific technology

cy: cubic yard

ENR: enhanced natural recovery

LDW: Lower Duwamish Waterway

RAA: remedial action area

RD: remedial design

RMC: residuals management cover

SMA: sediment management area

## 6 Costs Summary

The Opinion of Probable Cost for the Preliminary (30%) RD for the LDW middle reach and LDW upper reach SMA 10 implementation is summarized in Table M6-1.

As described in Section 4.1, a contingency of 30% was applied at the Preliminary (30%) RD level to the total direct construction, total indirect construction, and total additional construction oversight costs. This contingency is based on potential cost uncertainty associated with the level of information currently available and best professional judgment. It also accounts for scope unknowns, price uncertainty, and any other unforeseen circumstances that may impact the final project costs. Additionally, a separate contingency of 50% was included for LDW middle reach specific structural work items (temporary double-wall cofferdam and shoring wall installation and removal) as these costs could largely vary based on new geotechnical data informing quantities.

In addition, specific construction tasks are included in this Preliminary (30%) RD Opinion of Probable Cost but considered as allowances to cover potential costs incurred due to uncertainty in the associated scope. Allowances included are for construction tasks considered reasonably likely to occur and their scope (e.g., contingency re-dredging volume, outer-perimeter RMC volume, identified debris quantity, and direct standby time).

As discussed in Section 4.1, this Opinion of Probable Cost is based on a possible 10-construction-season assumption, which is a conservative construction duration estimate for Preliminary (30%) RD (see Section 12 of the BODR for discussion of the factors leading to high uncertainty in the total construction duration estimate). Cost and schedule savings could be realized if the current transloading throughput capacity is increased to more than 1,500 tons per day (i.e., more than one transloading facility being available). With more transload capacity, the dredging production rate would not be limited to a single facility's daily throughput rate, thus more dredging could be accomplished by the contractor on a daily basis using multiple sets of equipment: therefore, shortening the total construction duration will decrease overall costs.

**Table M6-1  
Total Project Cost for LDW Middle Reach and LDW Upper Reach SMA 10  
Implementation at Preliminary (30%) RD**

Task ID	Task Description	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS</b>				
1	Mobilization/Demobilization	\$17,100,000	\$19,000,000	\$22,800,000
2	Site Preparation	\$5,472,000	\$6,080,000	\$7,296,000
3	Surveys	\$4,922,000	\$5,469,000	\$6,563,000
4	Structural Work	\$6,637,000	\$7,374,000	\$8,849,000
5	Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal	\$138,809,000	\$154,232,000	\$185,079,000
6	Material Placement	\$20,839,000	\$23,155,000	\$27,786,000
7	Environmental Controls	\$405,000	\$450,000	\$540,000
8	Habitat Enhancement (TBD)	TBD	TBD	TBD
<b>LDW Middle Reach Direct Construction Costs Subtotal</b>		<b>\$194,184,000</b>	<b>\$215,760,000</b>	<b>\$258,913,000</b>
9a	Direct Construction Contingency (30.0%)	\$56,264,000	\$62,516,000	\$75,019,000
9b	Specific Contingency for Structural Work Items 4a and 4b (50.0%)	\$1,916,000	\$2,192,000	\$2,554,000
<b>LDW Middle Reach Direct Construction Cost Subtotal with Contingency</b>		<b>\$252,364,000</b>	<b>\$280,405,000</b>	<b>\$336,486,000</b>
10	Seattle Sales Tax (10.35%)	\$26,120,000	\$29,022,000	\$34,826,000
<b>LDW Middle Reach Total Direct Construction Costs (with Contingency and Sales Tax) – Rounded to Two Significant Figures</b>		<b>\$280,000,000</b>	<b>\$310,000,000</b>	<b>\$370,000,000</b>
<b>LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS</b>				
11	Site Preparation	\$9,000	\$10,000	\$12,000
12	Surveys	\$202,000	\$224,000	\$269,000
13	Dredging, Excavation, Transloading, Upland Transportation, and Disposal	\$4,470,000	\$4,966,000	\$5,960,000
14	Material Placement	\$1,326,000	\$1,473,000	\$1,768,000
<b>LDW Upper Reach SMA 10 Direct Construction Costs Subtotal</b>		<b>\$6,007,000</b>	<b>\$6,673,000</b>	<b>\$8,009,000</b>
15	Direct Construction Contingency (30.0%)	\$1,802,000	\$2,001,900	\$2,402,700
<b>LDW Upper Reach SMA 10 Direct Construction Cost Subtotal with Contingency</b>		<b>\$7,809,000</b>	<b>\$8,674,900</b>	<b>\$10,411,700</b>
16	Tukwila Sales Tax (10.2%)	\$797,000	\$885,000	\$1,062,000

Task ID	Task Description	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>LDW Upper Reach SMA 10 Total Direct Construction Costs (with Contingency and Sales Tax) – Rounded to Two Significant Figures</b>		<b>\$8,600,000</b>	<b>\$9,600,000</b>	<b>\$11,000,000</b>
<b>Total LDW Middle Reach and LDW Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax) – Rounded to Two Significant Figures</b>		<b>\$290,000,000</b>	<b>\$320,000,000</b>	<b>\$380,000,000</b>
<b>INDIRECT CONSTRUCTION COSTS</b>				
17	Project Management	\$900,000	\$1,000,000	\$1,200,000
18	Engineering Support Services	\$5,400,000	\$6,000,000	\$7,200,000
19	Construction QA	\$21,976,000	\$24,418,000	\$29,301,000
20	Site Access Agreements, Business Interruptions, and Temporary Leases	\$27,000,000	\$30,000,000	\$36,000,000
21	Community Outreach and Communications	\$1,800,000	\$2,000,000	\$2,400,000
<b>Indirect Construction Costs Subtotal</b>		<b>\$57,076,000</b>	<b>\$63,418,000</b>	<b>\$76,101,000</b>
22	Indirect Construction Contingency (30.0%)	\$17,123,000	\$19,025,000	\$22,830,000
<b>Indirect Construction Costs Subtotal with Contingency</b>		<b>\$74,199,000</b>	<b>\$82,443,000</b>	<b>\$98,931,000</b>
<b>Total Indirect Construction Costs (with Contingency) – Rounded to Two Significant Figures</b>		<b>\$74,000,000</b>	<b>\$82,000,000</b>	<b>\$99,000,000</b>
<b>ADDITIONAL CONSTRUCTION OVERSIGHT COSTS</b>				
23	Additional Construction Oversight Costs	\$4,500,000	\$5,000,000	\$6,000,000
<b>Additional Construction Oversight Costs Subtotal</b>		<b>\$4,500,000</b>	<b>\$5,000,000</b>	<b>\$6,000,000</b>
24	Additional Construction Oversight Contingency (30.0%)	\$1,350,000	\$1,500,000	\$1,800,000
<b>Additional Construction Oversight Costs Subtotal with Contingency</b>		<b>\$5,850,000</b>	<b>\$6,500,000</b>	<b>\$7,800,000</b>
<b>Total Additional Construction Oversight Costs (with Contingency) – Rounded to Two Significant Figures</b>		<b>\$5,900,000</b>	<b>\$6,500,000</b>	<b>\$7,800,000</b>
25	<b>TOTAL LDW MIDDLE REACH AND LDW UPPER REACH SMA 10 PROJECT COSTS – Rounded to Two Significant Figures</b>	<b>\$370,000,000</b>	<b>\$410,000,000</b>	<b>\$490,000,000</b>

Notes:

Costs are presented in present-day U.S. dollars (i.e., 2025).

Seattle sales tax is included at 10.35% to account for Washington State (6.5%) and the City of Seattle (3.85%) taxes. Tukwila sales tax is included at 10.2% to account for Washington State (6.5%), King County (1.4%), and the City of Tukwila (2.3%) taxes.

Attachment M.1 contains the detailed cost estimate workbook for the Preliminary (30%) RD Opinion of Probable Cost.

LDW: Lower Duwamish Waterway

QA: quality assurance

RD: remedial design

SMA: sediment management area

TBD: to be determined

## 7 References

Anchor QEA and Windward (Windward Environmental LLC), 2022. *Remedial Design Work Plan for the Lower Duwamish Waterway Middle Reach*. Final. Submitted to U.S. Environmental Protection Agency December 2, 2022.

EPA (U.S. Environmental Protection Agency), 2014. *Record of Decision*. Lower Duwamish Waterway Superfund Site. U.S. Environmental Protection Agency Region 10. November 2014.

Appendix M – Preliminary (30%) Remedial Design  
Opinion of Probable Cost

Attachment M.1

Detailed Cost Estimate Workbook

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Task ID	Task Description	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS</b>				
1	Mobilization/Demobilization	\$ 17,100,000	\$ 19,000,000	\$ 22,800,000
2	Site Preparation	\$ 5,472,000	\$ 6,080,000	\$ 7,296,000
3	Surveys	\$ 4,922,000	\$ 5,469,000	\$ 6,563,000
4	Structural Work	\$ 6,637,000	\$ 7,374,000	\$ 8,849,000
5	Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal	\$ 138,809,000	\$ 154,232,000	\$ 185,079,000
6	Material Placement	\$ 20,839,000	\$ 23,155,000	\$ 27,786,000
7	Environmental Controls	\$ 405,000	\$ 450,000	\$ 540,000
8	Habitat Enhancement (TBD)	TBD	TBD	TBD
<b>Middle Reach Direct Construction Costs Subtotal</b>		<b>\$ 194,184,000</b>	<b>\$ 215,760,000</b>	<b>\$ 258,913,000</b>
9	Direct Construction Contingency (30.0%)	\$ 56,264,000	\$ 62,516,000	\$ 75,019,000
9	Specific Contingency For Structural Work Items 4a and 4b (50.0%)	\$ 1,916,000	\$ 2,129,000	\$ 2,554,000
<b>Middle Reach Direct Construction Cost Subtotal with Contingency</b>		<b>\$ 252,364,000</b>	<b>\$ 280,405,000</b>	<b>\$ 336,486,000</b>
10	Sales Tax (10.35%)	\$ 26,120,000	\$ 29,022,000	\$ 34,826,000
<b>Total Middle Reach Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures</b>		<b>\$ 280,000,000</b>	<b>\$ 310,000,000</b>	<b>\$ 370,000,000</b>
<b>LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS</b>				
11	Site Preparation	\$ 9,000	\$ 10,000	\$ 12,000
12	Surveys	\$ 202,000	\$ 224,000	\$ 269,000
13	Dredging, Excavation, Transloading, Upland Transportation, and Disposal	\$ 4,470,000	\$ 4,966,000	\$ 5,960,000
14	Material Placement	\$ 1,326,000	\$ 1,473,000	\$ 1,768,000
<b>LDW Upper Reach SMA 10 Direct Construction Costs Subtotal</b>		<b>\$ 6,007,000</b>	<b>\$ 6,673,000</b>	<b>\$ 8,009,000</b>
15	Upper Reach Direct Construction Contingency (30.0%)	\$ 1,802,000	\$ 2,001,900	\$ 2,402,700
<b>LDW Upper Reach SMA 10 Direct Construction Cost Subtotal with Contingency</b>		<b>\$ 7,809,000</b>	<b>\$ 8,674,900</b>	<b>\$ 10,411,700</b>
16	City of Tukwila Sales Tax (10.2%)	\$ 797,000	\$ 885,000	\$ 1,062,000
<b>Total Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures</b>		<b>\$ 8,600,000</b>	<b>\$ 9,600,000</b>	<b>\$ 11,000,000</b>
<b>Total LDW Middle Reach and LDW Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax)- Rounded to Two Significant Figures</b>		<b>\$ 290,000,000</b>	<b>\$ 320,000,000</b>	<b>\$ 380,000,000</b>
<b>INDIRECT CONSTRUCTION COSTS</b>				
17	Project Management	\$ 900,000	\$ 1,000,000	\$ 1,200,000
18	Engineering Support Services	\$ 5,400,000	\$ 6,000,000	\$ 7,200,000
19	Construction Quality Assurance	\$ 21,976,000	\$ 24,418,000	\$ 29,301,000
20	Site Access Agreements, Business Interruption, and Temporary Leases	\$ 27,000,000	\$ 30,000,000	\$ 36,000,000
21	Community Outreach and Communications	\$ 1,800,000	\$ 2,000,000	\$ 2,400,000
<b>Indirect Construction Costs Subtotal</b>		<b>\$ 57,076,000</b>	<b>\$ 63,418,000</b>	<b>\$ 76,101,000</b>
22	Indirect Construction Contingency (30.0%)	\$ 17,123,000	\$ 19,025,000	\$ 22,830,000
<b>Indirect Construction Costs Subtotal with Contingency</b>		<b>\$ 74,199,000</b>	<b>\$ 82,443,000</b>	<b>\$ 98,931,000</b>
<b>Total Indirect Construction Costs (with Contingency) - Rounded to Two Significant Figures</b>		<b>\$ 74,000,000</b>	<b>\$ 82,000,000</b>	<b>\$ 99,000,000</b>

Task ID	Task Description	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>ADDITIONAL CONSTRUCTION OVERSIGHT COSTS</b>				
23	Additional Construction Oversight Costs	\$ 4,500,000	\$ 5,000,000	\$ 6,000,000
<b>Additional Construction Oversight Costs Subtotal</b>		<b>\$ 4,500,000</b>	<b>\$ 5,000,000</b>	<b>\$ 6,000,000</b>
24	Additional Construction Oversight Contingency (30.0%)	\$ 1,350,000	\$ 1,500,000	\$ 1,800,000
<b>Additional Construction Oversight Costs Subtotal with Contingency</b>		<b>\$ 5,850,000</b>	<b>\$ 6,500,000</b>	<b>\$ 7,800,000</b>
<b>Total Additional Construction Oversight Costs (with Contingency) - Rounded to Two Significant Figures</b>		<b>\$ 5,900,000</b>	<b>\$ 6,500,000</b>	<b>\$ 7,800,000</b>
<b>25</b>	<b>TOTAL LDW MIDDLE REACH AND LDW UPPER REACH SMA 10 PROJECT COSTS - Rounded to Two Significant Figures</b>	<b>\$ 370,000,000</b>	<b>\$ 410,000,000</b>	<b>\$ 490,000,000</b>

Notes:

1. In providing this Opinion of Probable Cost, the Client understands that the Consultant (Anchor QEA, LLC) has no control over the cost or availability of labor, equipment, or materials, or over market condition or the Contractor's method of pricing, and the Consultant's Engineer's construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, express or implied, that the bids or the negotiated cost of the work will not vary from the Consultant's Engineer's construction costs.
2. Costs are presented in present-day U.S. dollars (i.e., 2025).
3. Sales tax for LDW middle reach is included at 10.35% to account for Washington State [6.5%] and the City of Seattle [3.85%] taxes. Sales tax for LDW upper reach is included at 10.2% to account for Washington State [6.5%] and the City of Tukwila [3.7%] taxes.
4. A 30% contingency is applied to both total direct construction, total indirect construction costs and total additional construction oversight costs, based on consideration of potential cost uncertainty associated with the level of information currently available and engineering best professional judgement. Due to the nature of the project (i.e., environmental sediment remediation), additional factors that cannot be forecasted at this time—such as scope unknowns (i.e., significant changes in site conditions or quantities), price uncertainty (i.e., varying market conditions, increasing inflation, fuel and labor changes), or any other unforeseen circumstances (i.e., additional design requirements)—may influence contractor bidding prices and impact the final project costs outside, in excess, or below this contingency. Additionally, a separate contingency of 50% was included for specific structural work items (double-wall cofferdam and shoring wall installation and removal) as these costs could largely vary based on new geotechnical data informing quantities.

Task ID	Task Description	Quantity	Units	Lower Unit Cost (\$)	Mid-Range Unit Cost (\$)	Upper Unit Cost (\$)	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS</b>									
<b>1</b>	<b>Mobilization/Demobilization</b>								
1 a	Mobilization/Demobilization of In-Water and Upland Equipment	10	SEASON	\$ 1,530,000.00	\$ 1,700,000.00	\$ 2,040,000.00	\$ 15,300,000.00	\$ 17,000,000.00	\$ 20,400,000.00
1 b	Mobilization/Demobilization of Specialized Equipment (Pile Driving, Structure Demolition)	1	LS	\$ 1,800,000.00	\$ 2,000,000.00	\$ 2,400,000.00	\$ 1,800,000.00	\$ 2,000,000.00	\$ 2,400,000.00
<b>2</b>	<b>Site Preparation</b>								
2 a	Shoreline/Bank Preparation (Clearing and Grubbing)	4	AC	\$ 18,000.00	\$ 20,000.00	\$ 24,000.00	\$ 72,000.00	\$ 80,000.00	\$ 96,000.00
2 b	Upland Staging Area Setup and Site Decommissioning	10	SEASON	\$ 540,000.00	\$ 600,000.00	\$ 720,000.00	\$ 5,400,000.00	\$ 6,000,000.00	\$ 7,200,000.00
<b>3</b>	<b>Surveys</b>								
3 a	Daily Contractor Progress Surveys	1,050	DAY	\$ 3,600.00	\$ 4,000.00	\$ 4,800.00	\$ 3,780,000.00	\$ 4,200,000.00	\$ 5,040,000.00
3 b	Pre-Construction Surveys (Bathy and Topo)	10	SEASON	\$ 18,000.00	\$ 20,000.00	\$ 24,000.00	\$ 180,000.00	\$ 200,000.00	\$ 240,000.00
3 c	Post-Dredge Construction Survey (per RAA)	45	EA	\$ 7,200.00	\$ 8,000.00	\$ 9,600.00	\$ 324,000.00	\$ 360,000.00	\$ 432,000.00
3 d	Post-Placement Construction Survey (per RAA)	63	EA	\$ 7,200.00	\$ 8,000.00	\$ 9,600.00	\$ 453,600.00	\$ 504,000.00	\$ 604,800.00
3 e	Post-Construction Survey (Bathy and Topo)	9	SEASON	\$ 18,000.00	\$ 20,000.00	\$ 24,000.00	\$ 162,000.00	\$ 180,000.00	\$ 216,000.00
3 f	As-Built Surveys	1	LS	\$ 22,500.00	\$ 25,000.00	\$ 30,000.00	\$ 22,500.00	\$ 25,000.00	\$ 30,000.00
<b>4</b>	<b>Structural Work</b>								
4 a	Double-Wall Cofferdam Installation and Removal (RAA 24D)	1	LS	\$ 1,607,303.25	\$ 1,785,892.50	\$ 2,143,071.00	\$ 1,607,303.25	\$ 1,785,892.50	\$ 2,143,071.00
4 b	Shoring Wall Installation and Removal (RAA 24B-D)	1	LS	\$ 2,224,422.00	\$ 2,471,580.00	\$ 2,965,896.00	\$ 2,224,422.00	\$ 2,471,580.00	\$ 2,965,896.00
4 c	Outfall Re-Routing Installation, Monthly Bypass Operation, and Removal (RAA 24B-C)	1	LS	\$ 446,869.48	\$ 496,521.64	\$ 595,825.97	\$ 446,869.48	\$ 496,521.64	\$ 595,825.97
4 d	Pulling of Timber Piling and Replacement with Steel Piles (Multiple RAAs)	1	LS	\$ 1,775,390.53	\$ 1,972,656.14	\$ 2,367,187.37	\$ 1,775,390.53	\$ 1,972,656.14	\$ 2,367,187.37
4 e	Removal and Disposal of Submerged Barge (RAA 14A)	1	LS	\$ 270,000.00	\$ 300,000.00	\$ 360,000.00	\$ 270,000.00	\$ 300,000.00	\$ 360,000.00
4 f	Demolition and Disposal of Derelict Structures (RAA 24B-D, 8F)	1	LS	\$ 312,921.90	\$ 347,691.00	\$ 417,229.20	\$ 312,921.90	\$ 347,691.00	\$ 417,229.20
<b>5</b>	<b>Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal</b>								
5 a	Required Dredging and In-Water Transportation (Open-Water)	384,200	CY	\$ 32.33	\$ 35.92	\$ 43.10	\$ 12,419,631.69	\$ 13,799,590.76	\$ 16,559,508.92
5 b	Required Dredging and In-Water Transportation (Nearshore/Slope/Slow Dredging)	43,806	CY	\$ 55.70	\$ 61.89	\$ 74.27	\$ 2,440,019.33	\$ 2,711,132.58	\$ 3,253,359.10
5 c	Required Dredging and In-Water Transportation (Restricted Access)	18,047	CY	\$ 93.89	\$ 104.32	\$ 125.19	\$ 1,694,413.58	\$ 1,882,681.76	\$ 2,259,218.11
5 d	Required Dredging and In-Water Transportation (Tidally-Restricted) (RAAs 6, 9A to 9D, 9F, 9I, 20B, 20C)	8,922	CY	\$ 120.80	\$ 134.23	\$ 161.07	\$ 1,077,747.84	\$ 1,197,497.60	\$ 1,436,997.13
5 e	Contingency Re-Dredging - Allowance	13,531	CY	\$ 55.70	\$ 61.89	\$ 74.27	\$ 753,669.91	\$ 837,411.01	\$ 1,004,893.22
5 f	Equipment Decontamination (RAAs 19, 24B through 24D, and portions of RAAs 21A and 31B through 31D)	11	EVENT	\$ 4,950.00	\$ 5,500.00	\$ 6,600.00	\$ 54,450.00	\$ 60,500.00	\$ 72,600.00
5 g	On-Barge Dredge Return Water Management and Treatment (RAAs 19 and portions of RAAs 21A, 31B to 31D)	5	DAY	\$ 2,700.00	\$ 3,000.00	\$ 3,600.00	\$ 13,500.00	\$ 15,000.00	\$ 18,000.00
5 h	Land-Based Excavation (Shoreline/Bank)	8,236	CY	\$ 30.69	\$ 34.10	\$ 40.92	\$ 252,761.40	\$ 280,846.00	\$ 337,015.20
5 i	Dredged/Excavated Material Transloading at Transload Facility	711,500	TON	\$ 7.92	\$ 8.80	\$ 10.56	\$ 5,635,083.91	\$ 6,261,204.35	\$ 7,513,445.22
5 j	Dredged/Excavated Material Upland Transportation (Rail) and Disposal (Subtitle D)	709,900	TON	\$ 155.93	\$ 173.25	\$ 207.90	\$ 110,691,234.51	\$ 122,990,260.57	\$ 147,588,312.68
5 k	Procurement and Delivery of Cement for Stabilization of Portion of TSCA Waste and RCRA Hazardous Waste Material prior to Disposal (Subtitle C)	21	TON	\$ 171.00	\$ 190.00	\$ 228.00	\$ 3,539.70	\$ 3,933.00	\$ 4,719.60
5 l	Mixing of Cement for Stabilization of Portion of TSCA Waste and RCRA Hazardous Waste Material prior to Disposal (Subtitle C)	207	TON	\$ 67.50	\$ 75.00	\$ 90.00	\$ 13,972.50	\$ 15,525.00	\$ 18,630.00
5 m	Containerized Material Transfer at Transfer Station	3,632	TON	\$ 7.92	\$ 8.80	\$ 10.56	\$ 28,768.56	\$ 31,965.07	\$ 38,358.09
5 n	Upland Transportation (Truck/Rail) and Disposal of Containerized TSCA Waste/RCRA Hazardous Waste Material (Subtitle C)	3,405	TON	\$ 335.25	\$ 372.50	\$ 447.00	\$ 1,141,423.81	\$ 1,268,248.68	\$ 1,521,898.42
5 o	Upland Transportation (Truck/Rail) and Disposal of Containerized TSCA Waste/RCRA Hazardous Waste Material (Subtitle C) with Pre-Treatment (Stabilization)	228	TON	\$ 335.25	\$ 372.50	\$ 447.00	\$ 76,336.43	\$ 84,818.25	\$ 101,781.90
5 p	Removal of Identified Debris (Multiple RAAs)	30	DAY	\$ 22,500.00	\$ 25,000.00	\$ 30,000.00	\$ 675,000.00	\$ 750,000.00	\$ 900,000.00
5 q	Truck Transportation of Selected Identified Debris (RAA 24B through 24D) Directly to Transload Facility	90	TON	\$ 13.50	\$ 15.00	\$ 18.00	\$ 1,215.00	\$ 1,350.00	\$ 1,620.00
5 r	Identified Debris Transloading at Transload Facility	1,510	TON	\$ 7.92	\$ 8.80	\$ 10.56	\$ 11,959.20	\$ 13,288.00	\$ 15,945.60
5 s	Upland Transportation and Disposal (Subtitle D) of Identified Debris	1,600	TON	\$ 155.93	\$ 173.25	\$ 207.90	\$ 249,480.00	\$ 277,200.00	\$ 332,640.00
5 t	Directed Standby Time - Allowance	70	DAY	\$ 22,500.00	\$ 25,000.00	\$ 30,000.00	\$ 1,575,000.00	\$ 1,750,000.00	\$ 2,100,000.00

Detailed Preliminary (30%) RD Opinion of Probable Cost

Preliminary (30%) Remedial Design Opinion of Probable Cost

Task ID	Task Description	Quantity	Units	Lower Unit Cost (\$)	Mid-Range Unit Cost (\$)	Upper Unit Cost (\$)	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>6</b>	<b>Material Placement</b>								
6 a	Procurement and Delivery of Coarse Sand for RMC (Required+Stability+Inner+Outer Perimeter RMC)	57,555	TON	\$ 34.62	\$ 38.46	\$ 46.16	\$ 1,992,367.05	\$ 2,213,741.16	\$ 2,656,489.40
6 b	Procurement and Delivery of Coarse Sand for ENR	7,258	TON	\$ 34.62	\$ 38.46	\$ 46.16	\$ 251,234.09	\$ 279,148.99	\$ 334,978.79
6 c	Procurement and Delivery of Gravelly Sand for Backfill	106,015	TON	\$ 31.65	\$ 35.16	\$ 42.19	\$ 3,354,922.21	\$ 3,727,691.35	\$ 4,473,229.62
6 d	Procurement and Delivery of Gravelly Sand for Standard Cap CIL, Modified Cap CIL, and Amended ENR (RAAs 5A, 8C, 8G, 9L, 9M, 20A)	34,203	TON	\$ 31.65	\$ 35.16	\$ 42.19	\$ 1,082,372.23	\$ 1,202,635.82	\$ 1,443,162.98
6 e	Procurement and Delivery of Sandy Gravel for Standard Cap Filter Layer, Modified Cap Habitat Layer, and Modified Cap Erosion Protection Layer	43,585	TON	\$ 38.49	\$ 42.76	\$ 51.32	\$ 1,677,440.76	\$ 1,863,823.07	\$ 2,236,587.68
6 f	Procurement and Delivery of Quarry Spalls for Standard Cap Erosion Protection Layer	50,712	TON	\$ 61.32	\$ 68.14	\$ 81.77	\$ 3,109,832.74	\$ 3,455,369.72	\$ 4,146,443.66
6 g	Procurement and Delivery of AC for Amended ENR (RAAs 5A, 8C, 8G, 9L, 9M, 20A) and Modified Cap CIL (RAAs 5B, 8B, 9A, 9D, 26)	214	TON	\$ 2,700.00	\$ 3,000.00	\$ 3,600.00	\$ 577,470.43	\$ 641,633.82	\$ 769,960.58
6 h	Blending of Gravelly Sand/AC for Amended ENR (RAAs 5A, 8C, 8G, 9L, 9M, 20A) and Modified Cap CIL (RAAs 5B, 8B, 9A, 9D, 26)	9,719	CY	\$ 16.20	\$ 18.00	\$ 21.60	\$ 157,446.37	\$ 174,940.41	\$ 209,928.50
6 i	Placement of Coarse Sand for RMC (Neatline+ Daylight+ Stability+ Perimeter) (Open-Water)	35,700	CY	\$ 25.96	\$ 28.85	\$ 34.62	\$ 926,868.44	\$ 1,029,853.82	\$ 1,235,824.58
6 j	Placement of Coarse Sand ENR + Perimeter RMC (Nearshore)	6,554	CY	\$ 40.92	\$ 45.47	\$ 54.56	\$ 268,233.69	\$ 298,037.43	\$ 357,644.91
6 k	Placement of Coarse Sand ENR + Perimeter RMC (Restricted Access)	3,310	CY	\$ 56.27	\$ 62.52	\$ 75.03	\$ 186,258.22	\$ 206,953.57	\$ 248,344.29
6 l	Placement of Coarse Sand ENR + Perimeter RMC (Restricted Access - Underpier)	846	CY	\$ 133.65	\$ 148.50	\$ 178.20	\$ 113,117.86	\$ 125,686.51	\$ 150,823.82
6 m	Placement of Coarse Sand ENR + Perimeter RMC (Land-Based Equipment)	716	CY	\$ 30.60	\$ 34.00	\$ 40.80	\$ 21,919.64	\$ 24,355.16	\$ 29,226.19
6 n	Placement of Gravelly Sand Backfill (Open-Water)	33,268	CY	\$ 31.43	\$ 34.93	\$ 41.91	\$ 1,045,767.97	\$ 1,161,964.42	\$ 1,394,357.30
6 o	Placement of Gravelly Sand Backfill (Nearshore/Slope/Slow Backfilling)	19,411	CY	\$ 40.92	\$ 45.47	\$ 54.56	\$ 794,364.55	\$ 882,627.27	\$ 1,059,152.73
6 p	Placement of Gravelly Sand Backfill (Restricted Access)	10,098	CY	\$ 56.27	\$ 62.52	\$ 75.03	\$ 568,245.75	\$ 631,384.16	\$ 757,660.99
6 q	Placement of Gravelly Sand Backfill (Land-Based Equipment)	8,751	CY	\$ 30.60	\$ 34.00	\$ 40.80	\$ 267,775.33	\$ 297,528.15	\$ 357,033.78
6 r	Placement of Gravelly Sand for Cap CIL (Open-Water)	19,283	CY	\$ 31.43	\$ 34.93	\$ 41.91	\$ 606,160.04	\$ 673,511.15	\$ 808,213.38
6 s	Placement of Sandy Gravel for Cap Filter Layer (Open-Water)	19,283	CY	\$ 32.25	\$ 35.83	\$ 43.00	\$ 621,875.30	\$ 690,972.55	\$ 829,167.06
6 t	Placement of Quarry Spalls for Cap Erosion Layer (Open-Water)	28,925	CY	\$ 34.11	\$ 37.90	\$ 45.48	\$ 986,693.84	\$ 1,096,326.48	\$ 1,315,591.78
6 u	Placement of Gravelly Sand for Cap CIL (Nearshore) (Including Amended CIL for Modified Caps)	2,755	CY	\$ 45.44	\$ 50.49	\$ 60.59	\$ 125,173.63	\$ 139,081.81	\$ 166,898.17
6 v	Placement of Sandy Gravel for Cap Filter Layer (Nearshore)	3,445	CY	\$ 45.92	\$ 51.02	\$ 61.22	\$ 158,183.13	\$ 175,759.04	\$ 210,910.84
6 w	Placement of Quarry Spalls for Cap Erosion Layer (Nearshore)	2,419	CY	\$ 48.61	\$ 54.01	\$ 64.81	\$ 117,601.53	\$ 130,668.37	\$ 156,802.04
6 x	Placement of Gravelly Sand for Cap CIL (Restricted Access)	1,699	CY	\$ 60.08	\$ 66.76	\$ 80.11	\$ 102,071.56	\$ 113,412.85	\$ 136,095.42
6 y	Placement of Sandy Gravel for Cap Filter Layer (Restricted Access)	1,816	CY	\$ 60.67	\$ 67.41	\$ 80.89	\$ 110,187.33	\$ 122,430.37	\$ 146,916.44
6 z	Placement of Quarry Spalls for Cap Erosion Layer (Restricted Access)	2,460	CY	\$ 63.99	\$ 71.10	\$ 85.33	\$ 157,450.25	\$ 174,944.72	\$ 209,933.67
6 aa	Placement of Gravelly Sand/AC for Amended ENR (RAA 5A, 8C, 9L) (Nearshore/Slope)	658	CY	\$ 40.92	\$ 45.47	\$ 54.56	\$ 26,912.67	\$ 29,902.96	\$ 35,883.55
6 bb	Placement of Gravelly Sand/AC for Amended ENR (RAA 5A, 8C, 9L) (Restricted Access - Underpier)	89	CY	\$ 133.65	\$ 148.50	\$ 178.20	\$ 11,894.83	\$ 13,216.47	\$ 15,859.77
6 cc	Placement of Coarse Sand (Perimeter RMC), Gravelly Sand (Backfill and Modified Cap CIL), Gravelly Sand/AC (Amended ENR and Modified Cap CIL), Sandy Gravel (Modified Cap Erosion Layer) (Tidally-Restricted) (RAAs 5A, 6, 9A-9D, 9F, 9I, 9L, 9M, 20A-20C)	11,329	CY	\$ 125.30	\$ 139.22	\$ 167.06	\$ 1,419,514.70	\$ 1,577,238.56	\$ 1,892,686.27
<b>7</b>	<b>Environmental Controls</b>								
7 a	Furnish, Install, Repair, and Dispose Silt Curtain (RAAs 19, and portions of RAA 21A and 31B to 31D)	1	LS	\$ 270,000.00	\$ 300,000.00	\$ 360,000.00	\$ 270,000.00	\$ 300,000.00	\$ 360,000.00
7 b	Temporary Erosion and Sediment Control	1	LS	\$ 135,000.00	\$ 150,000.00	\$ 180,000.00	\$ 135,000.00	\$ 150,000.00	\$ 180,000.00
<b>8</b>	<b>Habitat Enhancement (TBD)</b>								
8 a	TBD	TBD	TBD	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	<b>Middle Reach Direct Construction Costs Subtotal</b>						<b>\$ 194,184,571.00</b>	<b>\$ 215,760,635.00</b>	<b>\$ 258,912,761.00</b>
<b>9 a</b>	<b>Middle Reach Direct Construction Contingency (Excludes Structural Work)</b>	30.00%	PERCENT				\$ 56,264,299.00	\$ 62,515,888.00	\$ 75,019,065.00
<b>9 b</b>	<b>Specific Contingency For Structural Work Items 4a and 4b</b>	50.00%	PERCENT				\$ 1,915,862.63	\$ 2,128,736.25	\$ 2,554,483.50
	<b>Middle Reach Direct Construction Cost Subtotal with Contingency</b>						<b>\$ 252,364,732.63</b>	<b>\$ 280,405,259.25</b>	<b>\$ 336,486,309.50</b>
<b>10</b>	<b>City of Seattle Sales Tax</b>	10.35%	PERCENT				\$ 26,119,750.00	\$ 29,021,944.00	\$ 34,826,333.00
	<b>Total Middle Reach Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures</b>						<b>\$ 280,000,000.00</b>	<b>\$ 310,000,000.00</b>	<b>\$ 370,000,000.00</b>

Detailed Preliminary (30%) RD Opinion of Probable Cost

Preliminary (30%) Remedial Design Opinion of Probable Cost

Task ID	Task Description	Quantity	Units	Lower Unit Cost (\$)	Mid-Range Unit Cost (\$)	Upper Unit Cost (\$)	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)
<b>LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS</b>									
<b>11</b>	<b>Site Preparation</b>								
11 a	Shoreline/Bank Preparation (Clearing and Grubbing)	0.5	AC	\$ 18,000.00	\$ 20,000.00	\$ 24,000.00	\$ 9,000.00	\$ 10,000.00	\$ 12,000.00
<b>12</b>	<b>Surveys</b>								
12 a	Daily Contractor Progress Surveys	52	DAY	\$ 3,600.00	\$ 4,000.00	\$ 4,800.00	\$ 187,200.00	\$ 208,000.00	\$ 249,600.00
12 b	Post-Dredge Construction Survey (per SMA)	1	EA	\$ 7,200.00	\$ 8,000.00	\$ 9,600.00	\$ 7,200.00	\$ 8,000.00	\$ 9,600.00
12 c	Post-Placement Construction Survey (per SMA)	1	EA	\$ 7,200.00	\$ 8,000.00	\$ 9,600.00	\$ 7,200.00	\$ 8,000.00	\$ 9,600.00
<b>13</b>	<b>Dredging, Excavation, Transloading, Upland Transportation, and Disposal</b>								
13 a	Required Dredging and In-Water Transportation (Open-Water)	5,964	CY	\$ 32.33	\$ 35.92	\$ 43.10	\$ 192,805.13	\$ 214,227.92	\$ 257,073.51
13 b	Required Dredging and In-Water Transportation (Nearshore/Slope/Slow Dredging)	7,048	CY	\$ 55.70	\$ 61.89	\$ 74.27	\$ 392,550.95	\$ 436,167.72	\$ 523,401.27
13 c	Contingency Re-Dredging - Allowance	784	CY	\$ 55.70	\$ 61.89	\$ 74.27	\$ 43,647.54	\$ 48,497.27	\$ 58,196.72
13 d	Land-Based Excavation (Shoreline/Bank)	1,432	CY	\$ 30.69	\$ 34.10	\$ 40.92	\$ 43,943.82	\$ 48,826.47	\$ 58,591.76
13 e	Dredged/Excavated Material Transloading at Transload Facility	22,941	TON	\$ 7.92	\$ 8.80	\$ 10.56	\$ 181,694.31	\$ 201,882.57	\$ 242,259.08
13 f	Dredged/Excavated Material Upland Transportation (Rail) and Disposal (Subtitle D)	22,941	TON	\$ 155.93	\$ 173.25	\$ 207.90	\$ 3,577,106.76	\$ 3,974,563.07	\$ 4,769,475.68
13 g	Removal of Identified Debris	1	DAY	\$ 22,500.00	\$ 25,000.00	\$ 30,000.00	\$ 22,500.00	\$ 25,000.00	\$ 30,000.00
13 h	Upland Transportation and Disposal (Subtitle D) of Identified Debris	100	TON	\$ 155.93	\$ 173.25	\$ 207.90	\$ 15,592.50	\$ 17,325.00	\$ 20,790.00
<b>14</b>	<b>Material Placement</b>								
14 a	Procurement and Delivery of Coarse Sand for RMC	138	TON	\$ 34.62	\$ 38.46	\$ 46.16	\$ 4,767.18	\$ 5,296.86	\$ 6,356.24
14 b	Procurement and Delivery of Coarse Sand for ENR	225	TON	\$ 34.62	\$ 38.46	\$ 46.16	\$ 7,786.04	\$ 8,651.16	\$ 10,381.39
14 c	Procurement and Delivery of Gravelly Sand for Backfill and Cap Habitat Layer	17,715	TON	\$ 31.65	\$ 35.16	\$ 42.19	\$ 560,621.18	\$ 622,912.43	\$ 747,494.91
14 d	Procurement and Delivery of Coarse Sand for Cap CIL	1,167	TON	\$ 31.65	\$ 35.16	\$ 42.19	\$ 36,921.96	\$ 41,024.40	\$ 49,229.28
14 e	Procurement and Delivery of Cobble/ Sandy Gravel for Cap Filter/ Erosion Protection Layer	741	TON	\$ 38.49	\$ 42.76	\$ 51.32	\$ 28,506.04	\$ 31,673.38	\$ 38,008.05
14 g	Procure/Deliver Amendment ZVI Material - Allowance	124	TON	\$ 1,303.50	\$ 1,448.33	\$ 1,738.00	\$ 161,029.18	\$ 178,921.31	\$ 214,705.57
14 h	Blending of Coarse Sand/ZVI for Cap CIL	915	CY	\$ 16.20	\$ 18.00	\$ 21.60	\$ 14,815.20	\$ 16,461.33	\$ 19,753.60
14 i	Placement of Coarse Sand for RMC (Open-Water)	51	CY	\$ 25.96	\$ 28.85	\$ 34.62	\$ 1,324.08	\$ 1,471.20	\$ 1,765.44
14 j	Placement of Coarse Sand for RMC (Nearshore)	51	CY	\$ 40.92	\$ 45.47	\$ 54.56	\$ 2,087.11	\$ 2,319.01	\$ 2,782.81
14 k	Placement of Coarse Sand ENR (Land-Based Equipment)	167	CY	\$ 30.60	\$ 34.00	\$ 40.80	\$ 5,097.58	\$ 5,663.98	\$ 6,796.77
14 l	Placement of Gravelly Sand Backfill (Open-Water)	9,588	CY	\$ 31.43	\$ 34.93	\$ 41.91	\$ 301,381.42	\$ 334,868.25	\$ 401,841.89
14 m	Placement of Gravelly Sand Backfill (Nearshore/Slope/Slow Backfilling)	1,416	CY	\$ 40.92	\$ 45.47	\$ 54.56	\$ 57,947.16	\$ 64,385.73	\$ 77,262.87
14 n	Placement of Gravelly Sand Backfill (Land-Based Equipment)	1,432	CY	\$ 30.60	\$ 34.00	\$ 40.80	\$ 43,813.64	\$ 48,681.82	\$ 58,418.19
14 o	Place Coarse Sand/ZVI Mix for Cap Chemical Isolation Layer	915	CY	\$ 48.61	\$ 54.01	\$ 64.81	\$ 44,453.89	\$ 49,393.21	\$ 59,271.85
14 p	Place Combined Cobble/Sandy Gravel for Cap Erosion Protection/Filter Layer	457	CY	\$ 48.61	\$ 54.01	\$ 64.81	\$ 22,226.94	\$ 24,696.61	\$ 29,635.93
14 q	Place Gravelly Sand for Cap Habitat Layer	686	CY	\$ 48.61	\$ 54.01	\$ 64.81	\$ 33,340.42	\$ 37,044.91	\$ 44,453.89
	<b>LDW Upper Reach SMA 10 Direct Construction Costs Subtotal</b>						<b>\$ 6,006,561.00</b>	<b>\$ 6,673,956.00</b>	<b>\$ 8,008,747.00</b>
<b>15</b>	<b>a Upper Reach Direct Construction Contingency</b>	30.00%	PERCENT				\$ 1,801,968.00	\$ 2,002,187.00	\$ 2,402,624.00
	<b>LDW Upper Reach SMA 10 Direct Construction Cost Subtotal with Contingency</b>						<b>\$ 7,808,529.00</b>	<b>\$ 8,676,143.00</b>	<b>\$ 10,411,371.00</b>
<b>16</b>	<b>City of Tukwila Sales Tax</b>	10.20%	PERCENT				\$ 796,470.00	\$ 884,967.00	\$ 1,061,960.00
	<b>Total Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures</b>						<b>\$ 8,600,000.00</b>	<b>\$ 9,600,000.00</b>	<b>\$ 11,000,000.00</b>
	<b>Total LDW Middle Reach and LDW Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax)- Rounded to Two Significant Figures</b>						<b>\$ 290,000,000.00</b>	<b>\$320,000,000.00</b>	<b>\$ 380,000,000.00</b>
<b>INDIRECT CONSTRUCTION COSTS</b>									
<b>17</b>	<b>Project Management</b>	10	YR	\$ 90,000.00	\$ 100,000.00	\$ 120,000.00	\$ 900,000.00	\$ 1,000,000.00	\$ 1,200,000.00
<b>18</b>	<b>Engineering Support Services</b>	10	SEASON	\$ 540,000.00	\$ 600,000.00	\$ 720,000.00	\$ 5,400,000.00	\$ 6,000,000.00	\$ 7,200,000.00
<b>19</b>	<b>Construction Quality Assurance</b>	1	LS	\$ 21,975,930.00	\$ 24,417,700.00	\$ 29,301,240.00	\$ 21,975,940.00	\$ 24,417,700.00	\$ 29,301,220.00
19 a	Construction Management (Inspection and Oversight)	57	MO	\$ 225,720.00	\$ 250,800.00	\$ 300,960.00	\$ 12,866,040.00	\$ 14,295,600.00	\$ 17,154,720.00
19 b	Environmental Compliance Monitoring	1	LS	\$ 9,109,890.00	\$ 10,122,100.00	\$ 12,146,520.00	\$ 9,109,900.00	\$ 10,122,100.00	\$ 12,146,500.00

Task ID	Task Description	Quantity	Units	Lower Unit Cost (\$)	Mid-Range Unit Cost (\$)	Upper Unit Cost (\$)	Lower Total Cost (\$)	Mid-Range Total Cost (\$)	Upper Total Cost (\$)	
20	Site Access Agreements, Business Interruption, and Temporary Leases	10	SEASON	\$ 2,700,000.00	\$ 3,000,000.00	\$ 3,600,000.00	\$ 27,000,000.00	\$ 30,000,000.00	\$ 36,000,000.00	
21	Community Outreach and Communications	10	SEASON	\$ 180,000.00	\$ 200,000.00	\$ 240,000.00	\$ 1,800,000.00	\$ 2,000,000.00	\$ 2,400,000.00	
<b>Indirect Construction Costs Subtotal</b>							<b>\$ 57,075,940.00</b>	<b>\$ 63,417,700.00</b>	<b>\$ 76,101,220.00</b>	
22	Indirect Construction Contingency	30.00%	PERCENT				\$ 17,122,782.00	\$ 19,025,310.00	\$ 22,830,366.00	
<b>Indirect Construction Costs Subtotal with Contingency</b>							<b>\$ 74,198,722.00</b>	<b>\$ 82,443,010.00</b>	<b>\$ 98,931,586.00</b>	
<b>Total Indirect Construction Costs (with Contingency) - Rounded to Two Significant Figures</b>							<b>\$ 74,000,000.00</b>	<b>\$ 82,000,000.00</b>	<b>\$ 99,000,000.00</b>	
<b>ADDITIONAL CONSTRUCTION OVERSIGHT COSTS</b>										
23	Additional Construction Oversight Costs									
23a	EPA Oversight	10	SEASON	\$ 450,000.00	\$500,000.00	\$ 600,000.00	\$ 4,500,000.00	\$ 5,000,000.00	\$ 6,000,000.00	
<b>Additional Construction Oversight Costs Subtotal</b>							<b>\$ 4,500,000.00</b>	<b>\$ 5,000,000.00</b>	<b>\$ 6,000,000.00</b>	
24	Additional Construction Oversight Contingency	30.00%	PERCENT				\$ 1,350,000.00	\$ 1,500,000.00	\$ 1,800,000.00	
<b>Additional Construction Oversight Costs Subtotal with Contingency</b>							<b>\$ 5,850,000.00</b>	<b>\$ 6,500,000.00</b>	<b>\$ 7,800,000.00</b>	
<b>Total Additional Construction Oversight Costs (with Contingency) - Rounded to Two Significant Figures</b>							<b>\$ 5,900,000.00</b>	<b>\$ 6,500,000.00</b>	<b>\$ 7,800,000.00</b>	
25	<b>TOTAL LDW MIDDLE REACH AND LDW UPPER REACH SMA 10 PROJECT COSTS - Rounded to Two Significant Figures</b>							<b>\$ 370,000,000.00</b>	<b>\$410,000,000.00</b>	<b>\$ 490,000,000.00</b>

Notes:

- In providing this Opinion of Probable Cost, the Client understands that the Consultant (Anchor QEA, LLC) has no control over the cost or availability of labor, equipment, or materials, or over market condition or the Contractor's method of pricing, and the Consultant's Engineer's construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, express or implied, that the bids or the negotiated cost of the work will not vary from the Consultant's Engineer's construction costs.
- Costs are presented in present-day U.S. dollars (i.e., 2025).
- Sales tax for LDW middle reach is included at 10.35% to account for Washington State [6.5%] and the City of Seattle [3.85%] taxes. Sales tax for LDW upper reach is included at 10.2% to account for Washington State [6.5%] and the City of Tukwila [3.7%] taxes.
- A 30% contingency is applied to both total direct construction, total indirect construction costs and total additional construction oversight costs, based on consideration of potential cost uncertainty associated with the level of information currently available and engineering best professional judgement. Due to the nature of the project (i.e., environmental sediment remediation), additional factors that cannot be forecasted at this time—such as scope unknowns (i.e., significant changes in site conditions or quantities), price uncertainty (i.e., varying market conditions, increasing inflation, fuel and labor changes), or any other unforeseen circumstances (i.e., additional design requirements)—may influence contractor bidding prices and impact the final project costs outside, in excess, or below this contingency. Additionally, a separate contingency of 50% was included for specific structural work items (double-wall cofferdam and shoring wall installation and removal) as these costs could largely vary based on new geotechnical data informing quantities.

- AC: acre
- AC: activated carbon
- CY: cubic yard
- EA: each
- LS: lump sum
- MO: month
- RAA: remedial action area
- RCRA: Resource Conservation and Recovery Act
- RD: remedial design
- SF: square foot
- SMA: sediment management area
- TON: U.S. ton
- TSCA: Toxic Substances Control Act
- YR: year
- ZVI: zero valent iron

General Notes	
1	The approach for developing the LDW middle reach Opinion of Probable Cost was based on several sources of information, including the following: <ul style="list-style-type: none"> <li>Anchor QEA's best professional judgment and past experience with similar remedial actions and associated pricing</li> <li>Review of contractor's bid costs and engineer's construction cost estimates for similar remediation projects completed (locally) in Seattle, Washington and (regionally) in the Pacific Northwest, as well as knowledge of construction activities and challenges identified during construction oversight.</li> <li>Engineering cost guidance (RS Means)</li> <li>Vendor/suppliers quotes for clean placement materials and amendment to be imported</li> </ul> Anchor QEA performed a detailed internal review of the cost assumptions and unit prices to determine their relevance, anticipated accuracy, and cost variability.
2	Assumed CY to TON conversions: 1) sediment: 1.5 TON/CY (in situ); 2) sand/gravel mix: 1.6 TON/CY; 3) sand: 1.4 TON/CY; 4) for quarry spalls: 1.5 TON/CY, for identified debris: 1.58 TON/CY (composite conversion factor based on concrete, wood, and steel densities).
3	The LDW middle reach falls in the City of Seattle jurisdiction and therefore, sales tax is included at 10.35% (to account for Washington State [6.5%] and the City of Seattle [3.85%] taxes). The LDW upper reach SMA 10 falls in the City of Tukwila jurisdiction, and therefore, sales taxes is included at 10.2% (to account for Washington State [6.5%] and the City of Tukwila [3.7%] taxes).
4	Estimated costs assume that construction could occur without interruptions from ongoing site operational uses, except as noted by in-water direct standby time.
Specific Notes by Task ID	
LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS	
1	<b>Mobilization/Demobilization</b>
1 a	Mobilization and demobilization costs based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumes ten mobilization/demobilization events, which includes: 150-ton derrick/spud rig, 5- to 8-cy buckets, 2 tugs, up to 4 x 1,700-ton scows, work boat, front-end loader, and various bucket sizes for working in shallow-water environments and under restricted conditions. Costs also includes costs for bond and insurance premiums (estimated to be 2% of the total direct construction costs), procedural costs and contractor work plans. Includes mobilization/demobilization events for ten construction seasons (in-water work window is defined as October 1 through February 15). Includes labor for procedural costs and contractor's development of required workplans and submittals. Costs estimated from Anchor QEA past project experience. Includes ten sets of project workplans and submittals for ten construction seasons.
1 b	Mobilization and demobilization costs are tracked separately for specialized equipment required for pile driving and structure demolition. These costs are based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects.
2	<b>Site Preparation</b>
2 a	Includes preparation of the shorelines and banks for cleanup work (clearing and grubbing of top of banks and adjacent upland areas prior to excavation). Costs are estimated on a acre-basis, based on Anchor QEA past project experience for similar projects of similar size.
2 b	Includes preparation, setup, operation, and maintenance of an upland area at a designated location (TBD) for on-site trailer offices (for contractor, Owner, and construction management teams' use) and other temporary facilities, as well as staging of equipment. Also, site decommissioning costs are included. Estimated from Anchor QEA past project experience for similar projects of similar size.
3	<b>Surveys</b>
3 a	Contractor daily progress bathymetric survey cost assumes multi-beam hydrographic survey equipment using: Real-Time Kinematic (RTK) GPS Positioning, Motion Platform, Multibeam Sonar, SV Profiler, eqQPS QINsY Software, mobilization/demobilization of survey vessel and survey equipment, data processing and product generation, one boat operator, and one licensed surveyor. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contractor daily progress survey costs assumed for the dredging and placement durations.
3 b	Includes costs for payment bathymetric and topographic surveys to be conducted prior to construction for the whole LDW middle reach site. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Includes ten sets of pre-construction bathy/topo surveys for ten construction seasons.
3 c	Includes costs for payment bathymetric survey to be conducted post-dredging for each RAA that requires dredging. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects.
3 d	Includes costs for payment bathymetric survey to be conducted post-backfill, Required RMC, Inner Perimeter RMC, Contingent Perimeter RMC, ENR, Amended ENR, and Standard and Modified Engineered Caps, for each RAA that requires material placement. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects.
3 e	Includes costs for payment bathymetric and topographic surveys to be conducted post-construction for the whole LDW middle reach site. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Includes nine sets of post-construction bathy/topo surveys.
3 f	Includes costs for final as-built surveys to be conducted post-construction for the whole LDW middle reach site. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Includes one set of as-built surveys at the end of the tenth construction season.
4	<b>Structural Work</b>
4 a	Structural costs provided by Bright Engineering, Inc. and David Evans and Associates, Inc. in September 2025. See Attachment M.1.6 for detailed assumptions for costing.
4 c	Structural costs provided by Bright Engineering, Inc. and David Evans and Associates, Inc. in September 2025. See Attachment M.1.6 for detailed assumptions for costing.
4 d	Structural costs provided by Bright Engineering, Inc. and David Evans and Associates, Inc. in September 2025. See Attachment M.1.6 for detailed assumptions for costing.
4 e	Structural costs provided by Bright Engineering, Inc. and David Evans and Associates, Inc. in September 2025. See Attachment M.1.6 for detailed assumptions for costing.
4 f	Structural costs provided by Bright Engineering, Inc. and David Evans and Associates, Inc. in September 2025. See Attachment M.1.6 for detailed assumptions for costing.

<b>5</b>	<b>Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal</b>
<b>5 a</b>	Open-water dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required dredge volume and daylight dredge volume for open-water dredging. Probable open-water dredge production rate estimated to be approximately 990 CY/10-hour shift.
<b>5 b</b>	Nearshore dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required dredge volume and daylight dredge volume for dredging conducted in nearshore shallow areas, slopes, and any slow dredging. Probable nearshore dredge production rate estimated to be approximately 580 CY/10-hour shift.
<b>5 c</b>	Restricted access dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required dredge volume and daylight dredge volume for dredging conducted adjacent to overwater structures (e.g., piers, bridges and bulkheads), or where waterway obstructions limit equipment access and require the use of flexifloat equipment. Probable restricted access dredge production rate estimated to be approximately 330 CY/10-hour shift.
<b>5 d</b>	Tidally-restricted dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. For RAAs 5C, 6, 9A-9D, 9F, 9I, and 20A-C, construction and equipment access may be limited by tidal conditions. Probable tidally restricted dredge production rate estimated to be approximately 180 CY/4-hour shift.
<b>5 e</b>	Contingency re-dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contingency re-dredging conducted over a portion of the total dredge area, applied to a 1-ft thickness to address generated residuals (15% of area; 1-ft thickness includes a 6-in overdredge allowance) and 2.5-ft thickness to remove missed inventory (20% of area, excluding any partial dredge and cap footprints; 2.5-ft thickness includes a 6-in overdredge allowance). Contingency re-dredging production rate estimated to be 580 CY/10-hour shift. These costs are considered an 'allowance' for this Preliminary (30%) RD Opinion of Probable Cost.
<b>5 f</b>	Daily equipment decontamination cost for RAAs 19, 21A, 24B-D, and 31B-D are based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Estimated number of events require for decontamination transitioning from hazardous waste to non-hazardous waste operations is based on the number of discrete areas of TSCA waste/RCRA hazardous waste material are removed within an RAA, such as areas with high hazardous waste-level PCB concentrations or combined PCB and mercury contamination.
<b>5 g</b>	On-barge dredge return water treatment required at RAAs 19 and portions of RAAs 21A and 31B-D. Daily dredge return water treatment cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Estimated number of days include dredge return water treatment during dredge/excavation and contingency re-dredge.
<b>5 h</b>	Excavation unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required excavated volume and daylight excavated volume in shorelines and riverbanks. Probable excavation production rate estimated to be approximately 500 CY/10-hour shift.
<b>5 i</b>	Transloading unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contractor's tonnage for transloading calculated from the contractor's dredge/excavated and incidental debris volume (converted with a 1.5 TON/CY factor), and anticipated identified debris tonnage (converted with a 1.58 TON/CY factor).
<b>5 j</b>	Transportation and disposal unit cost in a Subtitle D landfill facility based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Tonnage for transportation and disposal calculated from the contractor's dredge/excavated, and incidental debris volume (converted with a 1.5 TON/CY factor) for material designated as non-hazardous waste.
<b>5 k</b>	Assumes procurement and delivery costs for cement required for stabilization for TSCA waste/RCRA hazardous waste with mercury remediation waste greater than or equal to 10 ppm and TSCA waste that contains greater than or equal to 50 ppm. Assumes 10% by weight of cement amendment needed for total wet tonnage of TSCA waste/RCRA hazardous material.
<b>5 l</b>	Stabilization assumed to be conducted by mixing cement into the sediment prior to upland truck transport. Equipment and labor cost assumptions based on contractor bid reviews, similar project estimates, and Anchor QEA's best professional judgment. Assumes containerized TSCA waste/RCRA hazardous material containing high PCB and mercury concentrations is required to be stabilized prior to Subtitle C landfill disposal.
<b>5 m</b>	Assumes all containerized TSCA/RCRA waste material is transferred at a permitted intermodal station prior to shipment to the Subtitle C landfill. Cost assumptions based on contractor bid reviews, similar project estimates, and Anchor QEA's best professional judgment.
<b>5 n</b>	Transportation and disposal unit cost in a Subtitle C landfill facility based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgment based on past project experience for similar projects. Assumes containerized TSCA/RCRA waste material (not requiring stabilization) is trucked to a permitted intermodal facility and then railed to the Subtitle C landfill facility. Tonnage for transportation and disposal calculated TSCA/RCRA waste volume not requiring stabilization (converted with a 1.5 TON/CY factor).
<b>5 o</b>	Transportation and disposal unit cost in a Subtitle C landfill facility based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgment based on past project experience for similar projects. Assumes containerized TSCA/RCRA waste material requiring stabilization is trucked to a permitted intermodal facility and then railed to the Subtitle C landfill facility. Tonnage for transportation and disposal calculated TSCA/RCRA waste volume requiring stabilization (converted with a 1.5 TON/CY factor).
<b>5 p</b>	Identified debris removal unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Identified debris encompasses items larger than 12 inches in size and includes visible and potentially buried debris associated with concrete blocks, timber piling, steel I beams, rubble, cables, tires, and other items. Identified debris dimensions/quantities estimated based on visual aerial observations, shoreline photograph inventory, and measurements derived ArcGIS LDW webmap imagery, of the LDW middle reach shorelines/riverbanks for larger debris items. Buried and smaller debris is considered incidental dredge debris and its removal, transportation, and disposal are already accounted for in the contractor's dredge volume. These costs are considered an 'allowance' for this Preliminary (30%) RD Opinion of Probable Cost.
<b>5 q</b>	Truck transportation of selected Identified Debris (derelict piling) excavated from RAAs 24B-24D will be segregated from the total identified debris and transported via truck to the transload facility.
<b>5 r</b>	Transloading unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contractor's tonnage for transloading identified debris tonnage (converted with a 1.6 TON/CY factor).
<b>5 s</b>	Identifies debris transportation and disposal unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Tonnage for transportation and disposal calculated for identified debris material is assumed to be designated as non-hazardous waste.
<b>5 t</b>	In-water direct standby time is estimated to be 70 days of contractor's time, over ten construction seasons. Unit cost assumed to include equipment and labor costs at 70% of the daily dredging/placement costs; unit costs based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Directed standby compensates the contractor for temporarily suspending the contractor's in-water work when LDWG's construction management team directs the contractor to temporarily stop in-water work. Potential reasons for directed standby may include: additional unaccounted for Tribal fishing activities during the in-water work window, and other waterway use priorities not addressed in the Specifications.

6	Material Placement
6 a	Unit cost of coarse sand for Required RMC (including inner perimeter placement) and Contingent Outer Perimeter RMC based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed coarse sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Coarse sand is assumed to be used for placement of RMC at a 9-in targeted placement thickness (plus 3-in vertical placement tolerance) on the neatline dredge surface area and 2-ft targeted placement thickness (plus a 6-in vertical placement tolerance) on the side slope surface area. The RMC quantity also includes an additional automatic inner and contingent outer placement buffer surrounding the dredge area (at 9-in targeted placement thickness plus 3-in vertical placement tolerance); the Contingent Outer Perimeter RMC consists of RMC placed within an assumed 25% of perimeter outside of and surrounding the inner RMC perimeter. The Inner and Outer perimeter RMC are generally 20-ft wide in the upstream, cross channel, and downstream direction.
6 b	Unit cost of coarse sand for ENR based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed coarse sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Coarse sand is assumed to be used for placement of ENR at 9-in targeted placement thickness (plus a 3-in vertical placement tolerance).
6 c	Unit cost for gravelly sand for backfill based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed gravelly sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Gravelly sand is assumed to be used for placement of backfill (to pre-construction elevations and to flatten temporary steeper dredge cuts in all dredge areas located outside of the FNC above -10-ft mean lower low water).
6 d	Unit cost for gravelly sand based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed gravelly sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Gravelly sand is assumed to be used for placement of standard and modified cap chemical isolation layer (ranging from 6 to 24-in minimum thickness, plus 6-in maximum overplacement allowance) and amended ENR placement at 9-in targeted placement thickness (plus a 3-in vertical placement tolerance).
6 e	Unit cost for sandy gravel based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed sandy gravel unit cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Sandy gravel is assumed to be used for placement of standard cap filter layer at 6-in minimum thickness (plus 6-in maximum overplacement allowance) and modified cap habitat layer at 18-in minimum thickness (plus 6-in maximum overplacement allowance).
6 f	Unit cost for quarry spalls based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed quarry spalls cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Quarry spalls is assumed to be used for placement of standard cap erosion protection layer (ranging from 6 to 24-in minimum thickness, plus 6-in maximum overplacement allowance).
6 g	Unit cost for AC (to be used for amended ENR and modified cap amended chemical isolation layer) is based on discussion with local material supplier. Assumed AC unit cost for amended cover includes delivery by truck (from Pacific Coast Carbon, Ridgefield, WA) to LDW middle reach site. Tonnage required for AC material is assumed to be based on a 2% by weight with gravelly sand to be placed for the amended ENR. Assumed unit cost includes material procurement (gravelly sand and AC) costs.
6 h	Unit cost for blending AC uniformly into gravelly sand for amended ENR and modified cap amended chemical isolation layer. Blending cost includes equipment and labor costs required for mixing.
6 i	Coarse sand open-water placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Coarse sand open-water placement rate for RMC (including the neatline, daylight and perimeter) is estimated to be 960 CY/10-hour shift.
6 j	Coarse sand nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Coarse sand nearshore placement rate for ENR and perimeter RMC is estimated to be 610 CY/10-hour shift.
6 k	Coarse sand restricted access placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Coarse sand restricted access placement rate for ENR and perimeter RMC is estimated to be 440 CY/10-hour shift.
6 l	Coarse sand restricted access underpier placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Coarse sand restricted access underpier placement rate for ENR and perimeter RMC is estimated to be 120 CY/4-hour shift.
6 m	Coarse sand land-based equipment placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Coarse sand restricted access placement rate for ENR and perimeter RMC is estimated to be 500 CY/10-hour shift.
6 n	Gravelly sand open-water placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand open-water placement rate for backfill and is estimated to be 790 CY/10-hour shift.
6 o	Gravelly sand nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand nearshore placement rate for backfill and is estimated to be 610 CY/10-hour shift.
6 p	Gravelly sand restricted access placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand restricted access placement rate for backfill and is estimated to be 440 CY/10-hour shift.
6 q	Gravelly sand land-based equipment placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand restricted access placement rate for backfill and is estimated to be 500 CY/10-hour shift.
6 r	Gravelly sand open-water placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand open-water placement rate for engineered cap chemical isolation layer and is estimated to be 790 CY/10-hour shift.

Detailed Notes

6 s	Sandy gravel open-water placement placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sandy gravel open-water placement rate for engineered cap filter layer and is estimated to be 770 CY/10-hour shift.
6 t	Quarry spalls open-water placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Quarry spalls open-water placement rate for engineered cap erosion protection layer and is estimated to be 730 CY/10-hour shift.
6 u	Gravelly sand nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand nearshore placement rate for engineered cap chemical isolation layer and is estimated to be 550 CY/10-hour shift.
6 v	Sandy gravel nearshore placement placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sandy gravel nearshore placement rate for engineered cap filter layer and is estimated to be 540 CY/10-hour shift.
6 w	Quarry spalls nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Quarry spalls nearshore placement rate for engineered cap erosion protection layer and is estimated to be 510 CY/10-hour shift.
6 x	Gravelly sand restricted access placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand restricted access placement rate for engineered cap chemical isolation layer and is estimated to be 410 CY/10-hour shift.
6 y	Sandy gravel restricted access placement placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sandy gravel restricted access placement rate for engineered cap filter layer and is estimated to be 410 CY/10-hour shift.
6 z	Quarry spalls restricted access placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Quarry spalls restricted access placement rate for engineered cap erosion protection layer and is estimated to be 390 CY/10-hour shift.
6 aa	Gravelly sand/AC nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgment based on past project experience for similar projects. Gravelly sand/AC nearshore placement rate for amended ENR is estimated to be 610 CY/10-hour shift.
6 bb	Gravelly sand/AC restricted-access underpier placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgment based on past project experience for similar projects. Restricted-access underpier placement rate for amended ENR is estimated to be 120 CY/4-hour shift.
6 cc	Tidally-restricted placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgment based on past project experience for similar projects. Tidally restricted placement rate is estimated to be 150 CY/4-hour shift to accommodate tidal work windows.
<b>7</b>	<b>Environmental Controls</b>
7 a	Costs for furnishing, installing, maintaining/repairing, and disposing of silt curtains at RAA 19 and portions of RAAs 21A and 31B-D are included due to the presence of hazardous waste at these RAAs. The estimate is based of the perimeter of the largest RAA (i.e., RAA 31B-D), with the assumption that the silt curtain will be reused for multiple RAAs. Cost assumptions are based on review of contractor bid, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgment.
7 b	Temporary Erosion and Sediment Control (TESC) cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Includes TESC costs for ten construction seasons.
<b>8</b>	<b>Habitat Enhancement (TBD)</b>
8 a	TBD
<b>Direct construction costs subtotal is the sum of costs from all direct construction tasks.</b>	
9 a	Direct construction contingency of 30% is applied to the direct construction costs subtotal.
9 b	Structural contingency of 50% is applied to specific structural items 4a and 4b.
<b>Direct construction costs subtotal with contingency is the sum of direct construction cost subtotal and contingency costs.</b>	
10	Sales tax is included at 10.35% (to account for Washington State [6.5%] and the City of Seattle [3.85%] taxes).
<b>Total LDW middle reach direct construction costs are the sum of direct construction cost subtotal, contingency costs, and sales tax.</b>	
<b>LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS</b>	
<b>11</b>	<b>Site Preparation</b>
11 a	Includes preparation of the shorelines and banks for cleanup work (clearing and grubbing of top of banks and adjacent upland areas prior to excavation). Costs are estimated on a acre-basis, based on Anchor QEA past project experience for similar projects of similar size.
<b>12</b>	<b>Surveys</b>
12 a	Contractor daily progress bathymetric survey cost assumes multi-beam hydrographic survey equipment using: Real-Time Kinematic (RTK) GPS Positioning, Motion Platform, Multibeam Sonar, SV Profiler, eqQPS QINSy Software, mobilization/demobilization of survey vessel and survey equipment, data processing and product generation, one boat operator, and one licensed surveyor. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contractor daily progress survey costs assumed for the dredging and placement durations.
12 b	Includes costs for payment bathymetric survey to be conducted post-dredging. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects.
12 c	Includes costs for payment bathymetric survey to be conducted post-backfill, RMC, ENR, and Engineered Cap placement. Cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects.

## Detailed Notes

<b>13</b>	<b>Dredging, Excavation, Transloading, Upland Transportation, and Disposal</b>
<b>13 a</b>	Open-water dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required dredge volume and daylight dredge volume for open-water dredging. Probable open-water dredge production rate estimated to be approximately 990 CY/10-hour shift.
<b>13 b</b>	Nearshore dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required dredge volume and daylight dredge volume for dredging conducted in nearshore shallow areas, slopes, and any slow dredging. Probable nearshore dredge production rate estimated to be approximately 580 CY/10-hour shift.
<b>13 c</b>	Contingency re-dredging unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contingency re-dredging conducted over a portion of the total dredge area, applied to a 1-ft thickness to address generated residuals (15% of area; 1-ft thickness includes a 6-in overdredge allowance) and 2.5-ft thickness to remove missed inventory (20% of area; 2.5-ft thickness includes a 6-in overdredge allowance). Contingency re-dredging production rate estimated to be 580 CY/10-hour shift. These costs are considered an 'allowance' for this Preliminary (30%) RD Opinion of Probable Cost.
<b>13 d</b>	Excavation unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Volume includes required excavated volume and daylight excavated volume in shorelines and riverbanks. Probable excavation production rate estimated to be approximately 500 CY/10-hour shift.
<b>13 e</b>	Transloading unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Contractor's tonnage for transloading calculated from the contractor's dredge/excavated and incidental debris volume (converted with a 1.5 TON/CY factor), and anticipated identified debris tonnage (converted with a 1.58 TON/CY factor).
<b>13 f</b>	Transportation and disposal unit cost in a Subtitle D landfill facility based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Tonnage for transportation and disposal calculated from the contractor's dredge/excavated, amended dredge and incidental debris volume (converted with a 1.5 TON/CY factor) for material designated as non-hazardous waste.
<b>13 g</b>	Identified debris removal unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Identified debris encompasses items larger than 12 inches in size and includes visible and potentially buried debris associated with concrete blocks, timber piling, steel I beams, rubble, cables, tires, and other items. Identified debris dimensions/quantities estimated based on visual aerial observations, shoreline photograph inventory, and measurements derived ArcGIS LDW webmap imagery, of the LDW upper reach SMA 10 shoreline/riverbank for larger debris items. Buried and smaller debris is considered incidental dredge debris and its removal, transportation, and disposal are already accounted for in the contractor's dredge volume. These costs are considered an 'allowance' for this Preliminary (30%) RD Opinion of Probable Cost.
<b>13 h</b>	Identifies debris transportation and disposal unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Tonnage for transportation and disposal calculated for identified debris material is assumed to be designated as non-hazardous waste.
<b>14</b>	<b>Material Placement</b>
<b>14 a</b>	Unit cost of coarse sand for RMC based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW upper reach site has also been accounted for in the unit cost. Sand is assumed to be used for placement of RMC at a 6-in targeted placement thickness (plus 3-in vertical placement tolerance) on the neatline dredge surface area.
<b>14 b</b>	Unit cost of coarse sand for ENR based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW middle reach site has also been accounted for in the unit cost. Material is assumed to be used for placement of ENR at 9-in targeted placement thickness (plus a 3-in vertical placement tolerance).
<b>14 c</b>	Unit cost for gravelly sand for backfill and cap habitat layer based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed gravelly sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW upper reach site has also been accounted for in the unit cost. Gravelly sand is assumed to be used for placement of backfill to grade and cap habitat layer.
<b>14 d</b>	Unit cost for coarse sand based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed sand cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW upper reach site has also been accounted for in the unit cost. Sand is assumed to be used for placement of cap chemical isolation layer to a 1-ft minimum thickness (plus 6-in maximum overplacement allowance) .
<b>14 e</b>	Unit cost for cobble/gravel based on discussion with local material supplier, review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Assumed gobble/gravel cost from a local supplier includes loading onto barge; delivery of material by barge to the LDW upper reach site has also been accounted for in the unit cost. Cobble/gravel is assumed to be used for placement of cap erosion protection layer to a 1-ft minimum thickness (plus 6-in maximum overplacement allowance) .
<b>14 g</b>	Unit cost for Zero Valent Iron (ZVI) material based on discussions with material supplier (Connelly-GPM, Inc.). Assumed ZVI unit cost includes delivery by truck to LDW upper reach site. ZVI amendment material is assumed to be placed at 10% by weight for the LDW upper reach SMA 10-chemical isolation layer, mixed in with sand. Total SMA 10-chemical isolation layer placement thickness is assumed to be 1.5-ft (plus 6 inches maximum overplacement allowance). These costs are considered an 'allowance' for the upper probable cost in this Preliminary (30%) RD Opinion of Probable Cost. Unit cost for ZVI is based on discussion with local material supplier. Assumed ZVI unit cost includes delivery by truck (from Pacific Coast Carbon, Ridgefield, WA) to LDW upper reach site. Tonnage required for ZVI material is assumed to be based on a 2% by weight with gravelly sand. Assumed unit cost includes material procurement (gravelly sand and ZVI) costs.
<b>14 h</b>	Unit cost for blending ZVI uniformly into coarse sand. Blending cost includes equipment and labor costs required for mixing.
<b>14 i</b>	Coarse sand open-water placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand open-water placement rate for RMC (including the neatline, daylight and perimeter) is estimated to be 960 CY/10-hour shift.
<b>14 j</b>	Coarse sand nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand nearshore placement rate for RMC (including the neatline, daylight and perimeter) is estimated to be 610 CY/10-hour shift.
<b>14 k</b>	Coarse sand land-based equipment placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand restricted access placement rate for ENR is estimated to be 510 CY/10-hour shift.
<b>14 l</b>	Gravelly sand open-water placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand open-water placement rate for backfill and is estimated to be 790 CY/10-hour shift.
<b>14 m</b>	Gravelly sand nearshore placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand nearshore placement rate for backfill and is estimated to be 610 CY/10-hour shift.

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14 n	Gravelly sand land-based equipment placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand land-based placement rate for backfill and is estimated to be 510 CY/10-hour shift.
14 o	Coarse sand/ZVI placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Sand/ZVI placement rate for engineered cap chemical isolation layer and is estimated to be 510 CY/10-hour shift.
14 p	Combined cobble/sandy gravel placement placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Combined cobble/gravel placement rate for engineered cap filter layer and is estimated to be 510 CY/10-hour shift.
14 q	Gravelly sand placement unit cost based on review of contractor's bid costs, construction cost estimates of projects recently completed in Washington State, and Anchor QEA's best professional judgement based on past project experience for similar projects. Gravelly sand placement rate for the cap habitat layer and is estimated to be 510 CY/10-hour shift.
<b>Direct construction costs subtotal with contingency is the sum of direct construction cost subtotal and contingency costs.</b>	
15 a	Direct construction contingency of 30% is applied to the direct construction costs subtotal.
<b>Total direct construction costs are the sum of direct construction cost subtotal, contingency costs, and sales tax.</b>	
16	Sales tax is included at 10.20% (to account for Washington State [6.5%] and the City of Tukwila [3.7%] taxes).
<b>Total LDW upper reach SMA 10 direct construction costs are the sum of direct construction cost subtotal, contingency costs, and sales tax.</b>	
<b>Total LDW Middle Reach and LDW Upper Reach SMA 10 direct construction costs (with Contingency and Sales Tax) is the sum of the total direct construction costs for LDW middle reach and upper reach SMA 10.</b>	
<b>INDIRECT CONSTRUCTION COSTS</b>	
17	<b>Project management costs is assumed on an annual basis for the total construction duration.</b>
18	<b>Engineering support services cost is assumed on a construction season basis for the total construction duration.</b>
19	<b>Construction Quality Assurance</b>
19 a	Construction management (including inspection and oversight) costs include providing oversight of the contractor's implementation of the sediment remedy. Construction management costs typically refers to in-field work to oversee the contractor's work and includes construction inspection, progress tracking and reporting, reviewing progress payment requests, reviewing contractor submittals and work plans, addressing contractor Requests for Information and change order requests, leading adaptive design changes, and communicating with the Owner and EPA. Construction management cost is assumed on a monthly basis for the total construction duration and additional time needed for construction management before and after each construction season.
19 b	Environmental compliance monitoring costs assumed equipment, labor, analytical, and data validation for confirmatory sediment and water quality sampling, as well as air/noise/light monitoring, and cultural resources and inadvertent discovery monitoring.
20	<b>Site access agreements, business interruption, and temporary leases include costs on a construction season basis, for allowances for Tribal fishing interaction agreements, business interruption, and directed barge or vessel temporary relocations. It is not anticipated that special leases will be required.</b>
21	<b>Community outreach and communications include planning-level costs for each construction season for actions that will be used to engage with community members during construction activities related to the cleanup of the middle reach.</b>
<b>Indirect construction costs subtotal is the sum of costs from all indirect construction tasks.</b>	
22	Indirect construction contingency of 30% is applied to the indirect construction cost subtotal.
<b>Indirect construction costs subtotal with contingency is the sum of indirect construction cost subtotal and contingency costs.</b>	
<b>Total indirect construction costs are the sum of indirect construction cost subtotal and contingency costs.</b>	
<b>ADDITIONAL CONSTRUCTION OVERSIGHT COSTS</b>	
23 a	EPA oversight costs include supervision activities by EPA during implementation of the middle reach sediment remedy. EPA oversight costs are assumed on a construction season basis.
<b>Additional construction oversight costs subtotal is the sum of costs from implementing oversight and EPA oversight tasks.</b>	
24	Additional construction oversight contingency of 30% is applied to the additional construction oversight cost subtotal.
<b>Additional construction oversight costs subtotal with contingency is the sum of additional construction oversight cost subtotal and contingency costs.</b>	
<b>Total additional construction oversight costs are the sum of additional construction oversight cost subtotal and contingency costs.</b>	
25	<b>Total project cost is the sum of total direct construction costs, indirect construction costs, and additional construction oversight costs.</b>

Notes:  
 CY: cubic yard  
 ENR: enhanced natural recovery  
 EPA: Environmental Protection Agency  
 AC: Activated Carbon  
 LDW: Lower Duwamish Waterway  
 LS: lump sum  
 MO: month  
 RD: remedial design  
 RMC: residuals management cover  
 SMA: sediment management area  
 TBD: to be determined  
 TON: U.S. ton

RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Dredge Quantities							RMC Placement Quantities			Perimeter RMC Area				Backfill Placement Quantities				Required ENR/Amended Cover	Cap Surface Area					
		Neatline Surface Area (2D) (SF)	Daylight Surface Area (2D) (SF)	Neatline Volume (Not Including Overdredge) (CY)	Daylight Volume (Not Including Overdredge) (CY)	Neatline Overdredge Allowance Volume (CY)	Daylight Overdredge Allowance Volume (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-Dredge Volume (Generated Residuals and Missed Inventory)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)	Inner Dredge (SF)	Outer Dredge (SF, Assumed to be 25% of Outer RMC Placement Area)	Inner Dredge (CY)	Outer Dredge (CY, Assumed to be 25% of Outer RMC Placement Area)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Backfill Volume (Neatline+Daylight+Overdredge) (CY)		Vertical Placement Tolerance Volume (CY)	Total Backfill Volume (CY)	Neatline Surface Area (SF)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)
		1A	Dredge, RMC	15,053	4,078	2,519	430	558	151	3,077	362	15,053	4,078	15,053	10,964	3,058	406	113							0	0
1B	Dredge and Cap	12,274	2,473	3,423	196	455	92	288	68				10,020	2,822	371	105	2,473	379	46	424		0	12,274	0	12,274	
2	Dredge, RMC	2,976	950	220	33	110	36	331	72	2,976		2,976	6,175	2,175	229	81	950	58	18	76	0	0	0	0		
3	AST: ENR Placement (Underpier and Berthing Area)																				5,564	0	0	0		
4	Dredge, RMC	4,638	1,282	344	44	172	49	515	112	4,638		4,638	7,675	2,547	284	94	1,282	84	24	107	0	0	0	0		
5A	AST: Amended ENR																				2,300	0	0	0		
5B	Dredge and Modified Cap, Backfill to Grade	821	763	91	53	30	39	122	5				2,607	846	97	31					0	821	0	821		
5C	Dredge and Armor Restoration (Removal/Rip Rap Replacement)	0	0	0	0	0	0	0	0												0	0	0	0		
6	Dredge, Backfill to Grade	4,678	341	87	3	87	6	173	113				6,168	1,538	228	57	4,678	8	6	15		0	0	0		
7	Dredge, RMC	5,849	5,150	1,266	662	217	191	1,483	141	5,849	5,150	5,150	6,791	1,431	252	53						0	0	0		
8A	Dredge, Backfill to Grade	10,931	125	202	0	202	0	405	263				2,625	502	97	19	10,931	405	202	607		0	0	0		
8B	Dredge and Modified Cap, Backfill to Grade	8,724	415	1,454	293	323	146	1,777	48				2,963	493	110	18	415	439	8	446		8,724	0	8,724		
8C	AST: Amended ENR																				16,825	0	0	0		
8D	Dredge, Backfill to Grade	15,171	1,450	843	44	562	66	1,405	365				7,001	1,659	259	61	15,171	1,405	281	1,686		0	0	0		
8E	Dredge, Backfill to Grade	5,048	933	467	68	187	61	654	122				2,571	233	95	9	5,048	110	93	748		0	0	0		
8F	Dredge, Backfill to Grade	6,690	3,776	1,362	0	248	0	1,611	161				3,146	601	117	22	6,690	1,611	124	1,734		0	0	0		
8G	AST: Amended ENR																				931	0	0	0		
8H	ENR Placement																				12,607	0	0	0		
9A	Dredge and Modified Cap, Backfill to Grade	3,551	900	592	212	132	105	723	20				2,188	422	81	16						3,551	0	3,551		
9B	Dredge, Backfill to Grade	9,754	179	1,084	130	361	97	1,445	235				578	74	21	3	9,754	228	3	231		0	0	0		
9C	Dredge, Backfill to Grade	3,948	0	366	110	146	99	512	95				1,119	0	41	0	3,948	209	0	209		0	0	0		
9D	Dredge and Modified Cap	1,661	1,318	246	33	62	75	308	9				532	83	20	3						1,661	0	1,661		
9E	Dredge, Backfill to Grade	23,038	295	853	853	853	75	1,706	555				3,243	151	120	6	23,038	108	5	114		0	0	0		
9F	Dredge, Backfill to Grade	9,526	2,251	1,411	288	353	161	1,764	229				1,475	0	55	0	9,526	449	42	490		0	0	0		
9G	Dredge, RMC	15,108	8,157	3,257	1,063	560	302	3,817	364	15,108		15,108	4,194	935	155	35						0	0	0		
9H	Dredge, RMC	6,669	0	1,729	693	247	0	1,976	161	6,669		6,669									0	0	0	0		
9I	Dredge, Backfill to Grade	38,564	1,947	3,675	101	1,428	213	5,103	928				6,001	966	222	36	38,564	314	36	350		0	0	0		
9J	Dredge and Cap, Backfill, Stability RMC	49,453	26,869	19,625	6,165	1,832	995	21,457	275				10,878	2,003	403	74						0	49,453	0	49,453	
9K	AST: Dredge and Utility Crossing Cover, RMC	5,456	2,209	715	163	202	82	917	131		2,209	2,209	5,473	1,584	203	59	5,456	202	202	404		0	0	0		
9L	AST: Amended ENR																				896	0	0	0		
9M	AST: Amended ENR																				1,610	0	0	0		
10	No remedial action for 30%																				0	0	0	0		
11	Dredge, RMC, Stability RMC	46,569	29,631	20,630	7,639	1,725	1,097	22,355	1,121	46,569		46,569	20,171	4,710	747	174						0	0	0		
12	Dredge, Backfill to Grade	6,671	1,361	371	36	247	53	618	161				10,224	2,580	379	96	6,671	88	25	114		0	0	0		
13	No remedial action for 30%																					0	0	0		
14	Dredge and Cap, RMC	54,759	8,665	29,516	1,809	2,028	321	31,544	304				16,749	3,317	620	123						0	54,759	0	54,759	
15A	Dredge, Stability RMC	8,642	4,569	1,731	580	320	169	2,051	208	8,642	4,569	4,569	5,369	982	199	36						0	0	0		

RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Dredge Quantities								RMC Placement Quantities			Perimeter RMC Area				Backfill Placement Quantities					Required ENR/Amended Cover	Cap Surface Area			
		Neatline Surface Area (ZD) (SF)	Daylight Surface Area (ZD) (SF)	Neatline Volume (Not Including Overdredge) (CY)	Daylight Volume (Not Including Overdredge) (CY)	Neatline Overdredge Allowance Volume (CY)	Daylight Overdredge Allowance Volume (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-Dredge Volume (Generated Residuals and Missed Inventory)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)	Inner Dredge (SF)	Outer Dredge (SF, Assumed to be 25% of Outer RMC Placement Area)	Inner Dredge (CY)	Outer Dredge (CY, Assumed to be 25% of Outer RMC Placement Area)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Backfill Volume (Neatline + Daylight + Overdredge) (CY)	Vertical Placement Tolerance Volume (CY)	Total Backfill Volume (CY)		Neatline Surface Area (SF)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)
		15B	Dredge and Cap	9,871	1,835	2,511	248	366	2,877	55				2,476	571	92	21							0	9,871	0
16	Dredge, Backfill to Grade	3,460		128		128	256	83				4,576	630	169	23	3,460		256	64	320		0	0	0	0	
17	Dredge, Backfill to Grade	6,297	518	233	9	233	466	152				5,397	1,122	200	42	6,297	518	466	117	583		0	0	0	0	
18	Dredge, RMC	3,356	798	124	13	124	249	81	3,356	798	3,356	6,524	1,888	242	70						0	0	0	0	0	
19	Dredge, RMC	1,971	429	73	7	73	146	47	1,971		1,971	5,309	1,928	197	71		429	24	8	32	0	0	0	0	0	
20A	Amended ENR Placement																				5,908	0	0	0	0	
20B	Dredge, Backfill to Grade	5,072	3,610	94	5	94	188	122				291	192	11	7	5,072	3,610	16	67	83		0	0	0	0	
20C	Dredge and Modified Cap	8,649	6,087	961	191	320	1,281	48				5,073	1,531	188	57							8,649	0	6,087	6,087	
21A	Dredge, Backfill to Grade	5,205	1,412	771	194	193	964	125				5,249	1,172	194	43	5,205	1,412	303	26	329		0	0	0	0	
21B	ENR Placement																				41,672	0	0	0	0	
21C	Dredge, Backfill to Grade	1,323	187	24	1	24	49	32				4,404	941	163	35	1,323	187	4	3	8		0	0	0	0	
22	Dredge and Cap, RMC, Stability RMC	102,918	20,414	40,692	2,816	3,812	44,504	572				64,670	12,795	2,395	474		20,414	2,206	378	2,584	0	102,918	0	0	102,918	
23A	Dredge and Cap	82,965	25,233	14,394	4,514	3,073	17,467	461				40,480	6,575	1,499	244		25,233	4,670	467	5,169		82,965	0	0	82,965	
23B	ENR Placement																				1,908	0	0	0	0	
24A	ENR Placement																				1,415	0	0	0	0	
24B	Dredge, Backfill to Grade	2,928	0	217	38	108	325	70								2,928	0	80	0	80		0	0	0	0	
24C	Dredge, Backfill to Grade	12,887	0	3,875	0	477	4,352	310								12,887	0	4,352	239	4,591		0	0	0	0	
24D	Dredge, Backfill to Grade	8,618	0	2,672	0	319	2,991	207								8,618	0	2,991	160	3,151		0	0	0	0	
24E	Dredge, Backfill to Grade	3,767	0	488	117	140	628	91								3,767	0	628	70	698		0	0	0	0	
24F	Dredge, Backfill to Grade	4,217	0	234	22	156	390	102								4,217	0	390	78	469		0	0	0	0	
24G	Dredge, Backfill to Grade	4,080	0	680	214	151	831	98								4,080	0	831	76	907		0	0	0	0	
24H	Dredge, Backfill to Grade	5,704	404	317	37	211	528	137				3,684	855	136	32	5,704	404	528	106	634		0	0	0	0	
24I	Dredge and Modified Cap, Backfill to Grade	2,502	326	371	119	93	463	14				1,545	608	57	23		326	186	6	192		2,502	0	0	2,502	
24J	Dredge, Backfill to Grade	4,151	794	154	11	154	307	100				3,290	276	122	10	4,151	794	307	77	384		0	0	0	0	
25	ENR Placement																				1,931	0	0	0	0	
26	AST: Cap on Existing Grade																					1,794	0	0	1,794	
26B	Dredge, Backfill to Grade															0	0	0	0	0	0	0	0	0	0	
27A	Dredge, Backfill to Grade	20,268	10,920	1,877	349	751	2,627	488				10,889	2,546	403	94	20,268	10,920	2,627	375	3,003		0	0	0	0	
27B	ENR Placement																				40,483	0	0	0	0	
27C	Dredge, Backfill to Grade	9,180	4,356	1,190	262	340	1,530	221				10,673	3,279	395	121	9,180	4,356	419	81	500		0	0	0	0	
27D	ENR Placement																				7,344	0	0	0	0	
28	ENR Placement																				7,417	0	0	0	0	
29	Dredge, Backfill to Grade	3,576	650	66	4	66	132	86				6,735	2,329	249	86	3,576	650	132	66	199		0	0	0	0	
30A	Cap																					7,554	0	0	7,554	
30B	Dredge and Cap, RMC	52,102		4,018		1,930	5,948	289				21,093	5,318	781	197							52,102	0	0	52,102	
30C	AST: Dredge and Utility Crossing Cover, RMC	28,966	8,245	10,258	2,027	1,073	11,331	697				8,911	2,015	330	75	28,966	8,245	2,145.63	1,073	3,218		0	0	0	0	
30D	Dredge and Cap, Stability RMC	22,169		12,997		821	13,818	123				2,616	754	97	28							22,169	0	0	22,169	
			6,496		2,469		2,710															0	0	0	0	

RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Dredge Quantities							RMC Placement Quantities			Perimeter RMC Area				Backfill Placement Quantities					Required ENR/Amended Cover	Cap Surface Area				
		Neatline Surface Area (2D) (SF)	Daylight Surface Area (2D) (SF)	Neatline Volume (Not Including Overdredge) (CY)	Daylight Volume (Not Including Overdredge) (CY)	Neatline Overdredge Allowance Volume (CY)	Daylight Overdredge Allowance Volume (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-Dredge Volume (Generated Residuals and Missed Inventory)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)	Inner Dredge (SF)	Outer Dredge (SF, Assumed to be 25% of Outer RMC Placement Area)	Inner Dredge (CY)	Outer Dredge (CY, Assumed to be 25% of Outer RMC Placement Area)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Backfill Volume (Neatline + Daylight + Overdepth) (CY)	Vertical Placement Tolerance Volume (CY)		Total Backfill Volume (CY)	Neatline Surface Area (SF)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)
		RAA 31C																								
30E	Dredge and Cap, Stability RMC	35,980	--	21,965	--	1,333	--	23,298	200				3,640	916	135	34						--	35,980	0	0	35,980
		--	8,710	--	3,415	--	3,738	--	749													0	0	0	0	
		134,893	--	73,813	--	4,996	--	78,809	--													134,893	0	0	134,893	
30F	Dredge and Cap, Stability RMC	--	70,666	--	22,897	--	2,617	25,514	--				33,626	8,335	1,245	309						--	0	0	0	
																						0	0	0	0	
31A	ENR Placement																				6,621	0	0	0	0	
31B	Dredge and Cap	14,472	--	6,689	--	536	--	7,225	80				0	0	0	0					0	14,472	0	0	14,472	
		--	0	--	--	--	0	0	--												0	0	0	0	0	
31C	Dredge and Cap	29,076	--	16,105	--	1,077	--	17,182	162				0	0	0	0					0	29,076	0	0	29,076	
		--	0	--	--	--	0	0	--													0	0	0	0	
31D	Dredge and Modified Cap	1,862	--	207	--	69	--	276	10				3,924	825	145	31						1,862	0	0	1,862	
		--	1,607	--	132	--	93	225	--													0	1,607	0	1,607	
32	ENR Placement	--	--	--	--	--	--	--	--												10,304	0	0	0	0	
33	ENR Placement	--	--	--	--	--	--	--	--												2,513	0	0	0	0	
34A	Dredge, Backfill to Grade, RMC	7,040	--	1,474	--	261	--	1,735	169	7,040	7,040		6,930	1,949	257	72	7,040		1,735	130	1,865	0	0	0	0	
		--	5,835	--	1,035	--	216	1,251	--										5,835	574	108	682	0	0	0	
34B	Dredge, Backfill to Grade, RMC	9,352	--	692	--	346	--	1,038	225	9,352	9,352		7,079	2,095	262	78	9,352		1,038	173	1,212	0	0	0	0	
		--	1,114	--	41	--	74	115	--										1,114	102	21	123	0	0	0	
35A	Dredge, Backfill to Grade	12,642	--	234	--	234	--	468	304				8,732	1,643	323	61	12,642		468	234	702	0	0	0	0	
		--	508	--	5	--	11	15	--										508	15	9	25	0	0	0	
35B	ENR Placement	--	--	--	--	--	--	--	--												5,359	0	0	0	0	
		--	--	--	--	--	--	--	--													0	0	0	0	
36	Dredge, Backfill to Grade, RMC	7,929	--	881	--	294	--	1,175	191				9,703	2,289	359	85	7,929		1,175	147	1,321	0	0	0	0	
		--	3,489	--	129	--	96	226	--										3,489	305	65	370	0	0	0	

Total Quantities Throughout Site									RMC Placement Quantities			Perimeter RMC Area				Backfill Placement Quantities					ENR/Amended ENR Surface Area	Cap Surface Area			
Neatline Surface Area (2D) (SF)	Daylight Surface Area (2D) (SF)	Neatline Volume (Not Including Overdredge) (CY)	Daylight Volume (Not Including Overdredge) (CY)	Neatline Overdredge Allowance Volume (CY)	Daylight Overdredge Allowance Volume (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-Dredge Volume (Generated Residuals and Missed Inventory)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)	Inner Dredge (SF)	Outer Dredge (SF, Assumed to be 25% of Outer RMC Placement Area)	Inner Dredge (CY)	Outer Dredge (CY, Assumed to be 25% of Outer RMC Placement Area)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Backfill Volume (Neatline + Daylight + Overdepth) (CY)	Vertical Placement Tolerance Volume (CY)	Total Backfill Volume (CY)	Neatline Surface Area (SF)	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Total Surface Area (SF)		
1,045,667	410,238	319,559	90,270	38,021	15,360	463,211	13,531	127,223	186,121	313,344	444,418	101,085	16,460	3,744	306,135	166,655	69,129	9,393	78,522	173,608	638,049	9,775	647,825		



RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Material Placement Volume Distribution																										
		Dredge/Excavation Volume Distribution					Coarse Sand (RMC)	Coarse Sand (Inner and Outer Perimeter RMC)												Coarse Sand (ENR) - RAA 3, 8H, 21B, 23B, 24A, 25, 27B, 27D, 28, 31A, 32, 33, 35B				Gravelly Sand Blended with Activated Carbon (Amended ENR) - RAA 5A, 8C, 8G, 9L, 9M, and 20A				
		Open Water Dredging (CY)	Nearshore / Slope/ Slow Dredging (CY)	Restricted Access Dredging (CY)	Land-based Excavation (Shoreline/ Bank) (CY)	Tidally Restricted Dredging (CY)		RMC (Open Water) (CY)	Inner Perimeter RMC (Open Water) (CY)	Outer Perimeter RMC (Open Water) (CY)	Inner Perimeter RMC (Nearshore) (CY)	Outer Perimeter RMC (Nearshore) (CY)	Inner Perimeter RMC (Restricted Access) (CY)	Outer Perimeter RMC (Restricted Access) (CY)	Inner Perimeter RMC (Restricted Access-Underpier) (CY)	Outer Perimeter RMC (Restricted Access-Underpier) (CY)	Inner Perimeter RMC (Land-Based Equipment) (CY)	Outer Perimeter RMC (Land-Based Equipment) (CY)	Inner Perimeter RMC (Tidally Restricted) (CY)	Outer Perimeter RMC (Tidally Restricted) (CY)	ENR (Nearshore) (CY)	ENR (Restricted Access) (CY)	ENR (Restricted Access-Underpier) (CY)	ENR (Land-Based Equipment) (CY)	Amended ENR (Nearshore) (CY)	Amended ENR (Restricted Access-Underpier) (CY)	Amended ENR (Tidally Restricted) (CY)	
15B	Dredge and Cap	3,125	0	0	0	0		92	21	0	0	0	0	0	0	0	0	0	0									
16	Dredge, Backfill to Grade	0	0	286	0	0		0	0	0	0	169	23	0	0	0	0	0	0									
17	Dredge, Backfill to Grade	0	507	0	0	0		0	0	200	42	0	0	0	0	0	0	0	0									
18	Dredge, RMC	290	0	0	0	0	124 74	242	70	0	0	0	0	0	0	0	0	0	0									
19	Dredge, RMC	168	0	0	0	0	73	197	71	0	0	0	0	0	0	0	0	0	0									
20A	Amended ENR Placement	0	0	0	0	0																		0	0	219		
20B	Dredge, Backfill to Grade	0	0	0	0	204		0	0	0	0	0	0	0	0	0	11	7										
20C	Dredge and Modified Cap	0	0	0	0	1,607		0	0	0	0	0	0	0	0	188	57											
21A	Dredge, Backfill to Grade	0	0	1,267	0	0		0	0	0	0	194	43	0	0	0	0	0	0									
21B	ENR Placement	0	0	0	0	0														772	772	0	0					
21C	Dredge, Backfill to Grade	0	0	53	0	0		0	0	0	0	163	35	0	0	0	0	0	0									
22	Dredge and Cap, RMC, Stability RMC	64,110	0	0	0	0	5,111	2,395	474	0	0	0	0	0	0	0	0	0	0									
23A	Dredge and Cap	23,133	0	0	0	0		1,499	244	0	0	0	0	0	0	0	0	0	0									
23B	ENR Placement																			71	0	0	0					
24A	ENR Placement	0	0	0	0	0														52	0	0	0					
24B	Dredge, Backfill to Grade	0	0	0	405	0																						
24C	Dredge, Backfill to Grade	0	0	0	4,352	0																						
24D	Dredge, Backfill to Grade	0	0	0	2,991	0																						
24E	Dredge, Backfill to Grade	0	820	0	0	0																						
24F	Dredge, Backfill to Grade	0	444	0	0	0																						
24G	Dredge, Backfill to Grade	0	1,152	0	0	0																						
24H	Dredge, Backfill to Grade	0	620	0	0	0		0	0	136	32	0	0	0	0	0	0	0	0									
24I	Dredge and Modified Cap, Backfill to Grade	0	650	0	0	0		0	0	57	23	0	0	0	0	0	0	0	0									
24J	Dredge, Backfill to Grade	0	344	0	0	0		0	0	122	10	0	0	0	0	0	0	0	0									
25	ENR Placement	0	0	0	0	0														0	0	72	0					
26	AST: Cap on Existing Grade	0	0	0	0	0																						
26B	Dredge, Backfill to Grade	0	0	0	0	0																						
27A	Dredge, Backfill to Grade	0	3,271	0	0	0		0	0	403	94	0	0	0	0	0	0	0	0									
27B	ENR Placement	0	0	0	0	0														750	0	300	450					
27C	Dredge, Backfill to Grade	0	0	1,462	487	0		0	0	0	0	296	91	0	0	99	30	0	0									
27D	ENR Placement																			272	0	0	0					
28	ENR Placement	0	0	0	0	0														0	0	137	137					
29	Dredge, Backfill to Grade	0	143	0	0	0		0	0	249	86	0	0	0	0	0	0	0	0									
30A	Cap	0	0	0	0	0																						
30B	Dredge and Cap, RMC	1,306	0	7,400	0	0		117	30	0	0	664	167	0	0	0	0	0	0									
30C	AST: Dredge and Utility Crossing Cover, RMC	12,061	0	5,169	0	0		231	52	0	0	99	22	0	0	0	0	0	0									
30D	Dredge and Cap, Stability RMC	16,528	0	0	0	0		97	28	0	0	0	0	0	0	0	0	0	0									
							601																					



RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Material Placement Volume Distribution																	
		Gravelly Sand Material (Backfill)					Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)			
		Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Land-Based Equipment) (CY)	Backfill (Tidally Restricted) (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	
1A	Dredge, RMC	424	0	0	0	0													
1B	Dredge and Cap						455	455	682	0	0	0	0	0	0	0	0	0	0
2	Dredge, RMC	76	0	0	0	0													
3	AST: ENR Placement (Underpier and Berthing Area)																		
4	Dredge, RMC	107	0	0	0	0													
5A	AST: Amended ENR																		
5B	Dredge and Modified Cap, Backfill to Grade						0	0		0	0		30	91		0	0		
5C	Dredge and Armor Restoration (Removal/Rip Rap Replacement)						0	0	0	0	0		28	85		0	0		
6	Dredge, Backfill to Grade	0	0	0	0	260													0
7	Dredge, RMC	0	0	0	0	15													0
8A	Dredge, Backfill to Grade	0	547	61	0	0													
8B	Dredge and Modified Cap, Backfill to Grade	0	446	0	0	0	0	0		808	969		0	0		0	0		
8C	AST: Amended ENR																		
8D	Dredge, Backfill to Grade	0	0	1,686	0	0													
8E	Dredge, Backfill to Grade	0	0	137	0	0													
8F	Dredge, Backfill to Grade	598	0	150	0	0													
8G	Dredge, Backfill to Grade	118	0	29	0	0													
8F	Dredge, Backfill to Grade	0	1,214	520	0	0													
8G	AST: Amended ENR																		
8H	ENR Placement																		
9A	Dredge and Modified Cap, Backfill to Grade	0	0	0	0	333	0	0		0	0		0	0		132	395		
9B	Dredge, Backfill to Grade	0	813	0	0	813													
9C	Dredge, Backfill to Grade	0	115	0	0	115													
9D	Dredge, Backfill to Grade	0	0	0	0	585													
9D	Dredge and Modified Cap	0	0	0	0	209													
9E	Dredge, Backfill to Grade	0	0	0	0	0	0	0		0	0		0	0		62	185		
9E	Dredge, Backfill to Grade	2,133	0	0	0	0	0	0		0	0		0	0		49	146		
9F	Dredge, Backfill to Grade	114	0	0	0	0													
9F	Dredge, Backfill to Grade	0	970	0	0	970													
9G	Dredge, Backfill to Grade	0	245	0	0	245													
9G	Dredge, RMC	0	0	0	0	0													
9H	Dredge, RMC	597	0	0	0	0													
9H	Dredge, RMC	0	0	0	0	0													
9I	Dredge, Backfill to Grade	0	2,909	0	0	2,909													
9I	Dredge, Backfill to Grade	0	175	0	0	175													
9J	Dredge and Cap, Backfill, Stability RMC	0	0	0	0	0	1,832	1,832	2,747	0	0	0	0	0	0	0	0	0	0
9J	Dredge and Cap, Backfill, Stability RMC	2,930	0	0	0	0													
9K	AST: Dredge and Utility Crossing Cover, RMC	404	0	0	0	0													
9L	AST: Amended ENR																		
9M	AST: Amended ENR																		
10	No remedial action for 30%																		
11	Dredge, RMC, Stability RMC	0	0	0	0	0													
11	Dredge, RMC, Stability RMC	1,969	0	0	0	0													
12	Dredge, Backfill to Grade	0	741	0	0	0													
12	Dredge, Backfill to Grade	0	114	0	0	0													
13	No remedial action for 30%																		
14	Dredge and Cap, RMC	0	0	0	0	0	2,028	2,028	3,042	0	0	0	0	0	0	0	0	0	0
14	Dredge and Cap, RMC	6,711	0	0	0	0													
15A	Dredge Stability RMC																		

RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Material Placement Volume Distribution																
		Gravelly Sand Material (Backfill)					Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
		Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Land-Based Equipment) (CY)	Backfill (Tidally Restricted) (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)
15B	Dredge and Cap						366	366	548	0	0	0	0	0	0	0	0	0
16	Dredge, Backfill to Grade	0	0	320	0	0												
17	Dredge, Backfill to Grade	0	583	0	0	0												
18	Dredge, RMC																	
19	Dredge, RMC	32	0	0	0	0												
20A	Amended ENR Placement																	
20B	Dredge, Backfill to Grade	0	0	0	0	282												
20C	Dredge and Modified Cap	0	0	0	0	83	0	0		0	0		0	0		320	961	
21A	Dredge, Backfill to Grade	0	0	1,060	0	0												
21B	ENR Placement																	
21C	Dredge, Backfill to Grade	0	0	73	0	0												
22	Dredge and Cap, RMC, Stability RMC	2,584	0	0	0	0	3,812	3,812	5,718	0	0	0	0	0	0	0	0	0
23A	Dredge and Cap	5,169	0	0	0	0	3,073	3,073	4,609	0	0	0	0	0	0	0	0	0
23B	ENR Placement																	
24A	ENR Placement																	
24B	Dredge, Backfill to Grade	0	0	0	380	0												
24C	Dredge, Backfill to Grade	0	0	0	80	0												
24D	Dredge, Backfill to Grade	0	0	0	4,591	0												
24E	Dredge, Backfill to Grade	0	0	0	3,151	0												
24F	Dredge, Backfill to Grade	0	698	0	0	0												
24G	Dredge, Backfill to Grade	0	192	0	0	0												
24H	Dredge, Backfill to Grade	0	469	0	0	0												
24I	Dredge and Modified Cap, Backfill to Grade	0	54	0	0	0												
24J	Dredge, Backfill to Grade	0	907	0	0	0												
24K	Dredge, Backfill to Grade	0	321	0	0	0												
24L	Dredge, Backfill to Grade	0	634	0	0	0												
24M	Dredge and Modified Cap, Backfill to Grade	0	99	0	0	0	0	0		139	278		0	0		0	0	
24N	Dredge, Backfill to Grade	0	192	0	0	0												
24O	Dredge, Backfill to Grade	0	384	0	0	0												
24P	Dredge, Backfill to Grade	0	52	0	0	0												
25	ENR Placement																	
26	AST: Cap on Existing Grade						0	0		66	199		0	0		0	0	
26B	Dredge, Backfill to Grade																	
27A	Dredge, Backfill to Grade	0	3,003	0	0	0												
27B	ENR Placement	0	846	0	0	0												
27C	Dredge, Backfill to Grade	0	0	1,275	425	0												
27D	ENR Placement	0	0	375	125	0												
28	ENR Placement																	
29	Dredge, Backfill to Grade	0	199	0	0	0												
30A	Cap						280	280	420	0	0	0	0	0	0	0	0	0
30B	Dredge and Cap, RMC	324	0	1,838	0	0	289	289	434	0	0	0	1,640	1,640	2,460	0	0	0
30C	AST: Dredge and Utility Crossing Cover, RMC	2,253	0	966	0	0												
30D	Dredge and Cap, Stability RMC	2,841	0	1,218	0	0	821	821	1,232	0	0	0	0	0	0	0	0	0

RAA Number/Letter	Combined Remedial Actions (Neatline and Daylight)	Material Placement Volume Distribution																
		Gravelly Sand Material (Backfill)					Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
		Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Land-Based Equipment) (CY)	Backfill (Tidally Restricted) (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)
30E	Dredge and Cap, Stability RMC						1,333	1,333	1,999	0	0	0	0	0	0	0	0	0
30F	Dredge and Cap, Stability RMC						4,996	4,996	7,494	0	0	0	0	0	0	0	0	0
31A	ENR Placement																	
31B	Dredge and Cap						0	0	0	536	536	804	0	0	0	0	0	0
31C	Dredge and Cap						0	0	0	1,077	1,077	1,615	0	0	0	0	0	0
31D	Dredge and Modified Cap						0	0		69	207		0	0		0	0	
							0	0		60	179		0	0		0	0	
32	ENR Placement																	
33	ENR Placement																	
34A	Dredge, Backfill to Grade, RMC	1,865	0	0	0	0												
		682	0	0	0	0												
34B	Dredge, Backfill to Grade, RMC	1,212	0	0	0	0												
		123	0	0	0	0												
35A	Dredge, Backfill to Grade	0	702	0	0	0												
		0	25	0	0	0												
35B	ENR Placement																	
36	Dredge, Backfill to Grade, RMC	0	1,321	0	0	0												
		0	370	0	0	0												

Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Land-Based Equipment) (CY)	Backfill (Tidally Restricted) (CY)	Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
					Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)	Gravelly Sand For Cap Chemical Isolation Layer (CY)	Sandy Gravel For Cap Filter Layer + Habitat Erosion Protection Layer (CY)	Quarry Spalls for Erosion/ Protection Layer (CY)
33,268	19,411	10,098	8,751	6,994	19,283	19,283	28,925	2,755	3,445	2,419	1,699	1,816	2,460	788	2,363	0

## Attachment M.1.4

### LDW Middle Reach Detailed Quantities and Notes

#### Notes:

1. Total dredge volume includes the following: 1) required dredge volume, including associated external side-slope volumes (no transition slopes [between RAAs] have been yet developed or accounted for), as shown on the Drawings; 2) 1-foot overdredge allowance on the entire dredge footprint (with the exceptions prescribed at select RAAs 6, 8A, 20B, 21C, 29, and 35A); and 3) contingency re-dredging volume. Total dredge volume includes required dredge and required excavation volumes.
2. Backfill material is intended to restore for habitat purposes sediment bed to pre-dredge elevations in specific RAAs, for areas outside the FNC and above -10-foot MLLW (as shown on the Drawings). Backfill material is assumed to conform to a gravelly sand placed in sloped dredge surfaces and flat dredge surfaces. For RAAs backfilled to grade, the backfill volume was considered equivalent to the dredge volume; the backfill volume also accounts for a 6-inch vertical overplacement tolerance. The side-slope backfill volumes for elevation and thickness-based dredging were calculated using 2D perimeters for each RAA, measured by AutoCAD Civil3D software; these perimeters were multiplied by the surface area of the backfill design placement, measured using Drawing (Volume III) cross sections. Additionally, material placement volumes were calculated using AutoCAD Civil3D software for select RAAs with 3H:1V placement requirements.
3. RMC material assumed to be a coarse grained sand, applied at a 9-inch targeted placement thickness, plus a 3-inch vertical placement tolerance over 100% of the dredge area that does not receive backfill, and at a 2-foot targeted placement thickness, plus a 6-inch vertical placement tolerance on the side-slope surface area. On the dredge cut side-slopes (top to toe of dredge cut daylight), RMC is assumed to be placed at a 24-inch targeted placement thickness, plus the upper end of the vertical placement tolerance.
4. The RMC quantity also includes an additional automatic inner and contingent outer placement buffer surrounding the dredge area (at 9-inch targeted placement plus 3-inch vertical placement tolerance). Only 25% of the Outer Perimeter RMC surface area is considered for RMC placement for costing purposes (as shown on the Drawings).
5. ENR material assumed to be a coarse grained sand, applied at a 9-inch targeted placement thickness, plus a 3-inch vertical placement tolerance intended in specific RAAs (as shown on the Drawings). The ENR quantity assumes a placement footprint that includes a 10-foot buffer around the planned ENR placement area as shown on the Drawings.
6. Amended ENR is assumed to be a blend of gravelly sand and AC [2% by weight]), applied at a 9-inch targeted placement thickness, plus a 3-inch vertical placement tolerance, for RAAs 5A, 8C, 9L, 20A (as shown on the Drawings).
7. The standard engineered caps include the following assumptions: 1) chemical isolation layer (conforming to gravelly sand, with 6-inch minimum thickness plus a 6-inch maximum overplacement allowance); 2) filter layer (conforming to sandy gravel material, with a 6-inch minimum thickness plus a 6-inch maximum overplacement allowance); and 3) erosion protection layer (conforming to quarry spalls, with a 12-inch minimum thickness plus a 6-inch maximum overplacement allowance).
8. The modified caps include the following assumptions: 1) habitat layer (conforming to sandy gravel material, with 24-inch minimum thickness plus a 6-inch maximum overplacement allowance); 2) chemical isolation layer (conforming to gravelly sand material, with minimum thickness range from 6 to 24-inch plus a 6-inch maximum overplacement allowance); 3) AC amendment dosage assumptions: RAAs 5B, 9A, and 9D at 1% (by dry weight); RAA 8B at 10 % (by dry weight); RAAs 20C, 24I, and 31D: none required; RAA 26 at 5% (by dry weight).

CY: cubic yard

ENR: enhanced natural recovery

FNC: federal navigation channel

AC: activated carbon

MLLW: mean lower low water

RD: remedial design

RMC: residuals management cover

SF: square foot

RAA: remedial action area

Quantities Throughout LDW Upper Reach										
LDW Upper Reach Remedial Action Area	Technology Assignment	Slope Assumptions Description	Required ENR Surface Area (SF)	Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Required Dredge Volume (CY)	Overdredge Allowance Volume (No Side-Slopes) (CY)	Overdredge Allowance Volume for Side-Slopes Only (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-dredging (CY)
AREA 18	Partial Dredge and Cap (18A-18B) and Dredge and Partial Backfill/Partial RMC	2:1 Shoreline Slope, 3:1 for the Rest (7/21/22)		41,640	22,487	12,069	1,542	833	14,444	784
AREA 18	ENR		4,498							

Total Quantities Throughout Site							
Required ENR Surface Area (SF)	Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Required Dredge Volume (CY)	Overdredge Allowance Volume (No Side-Slopes) (CY)	Overdredge Allowance Volume for Side-Slopes Only (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)
4,498	41,640	22,487	12,069	1,542	833	14,444	784

			Quantities Inside FNC					
LDW Upper Reach Remedial Action Area	Technology Assignment	Slope Assumptions Description	Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Required Dredge Volume (CY)	Overdredge Allowance Volume (No Side-Slopes) (CY)	Overdredge Allowance Volume for Side-Slopes Only (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)
AREA 18	Partial Dredge and Cap (18A-18B) and Dredge and Partial Backfill/Partial RMC	2:1 Shoreline Slope, 3:1 for the Rest (7/21/22)	0	3,325	438	0	123	561
AREA 18	ENR							

Total Quantities Inside FNC					
Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Required Dredge Volume (CY)	Overdredge Allowance Volume (No Side-Slopes) (CY)	Overdredge Allowance Volume for Side-Slopes Only (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)
0	3,325	438	0	123	561

			Quantities Outside FNC						Dredge/Excavation Volume Distribution (CY)		
LDW Upper Reach Remedial Action Area	Technology Assignment	Slope Assumptions Description	Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Required Dredge Volume (CY)	Overdredge Allowance Volume (No Side-Slopes) (CY)	Overdredge Allowance Volume for Side- Slopes Only (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Open Water Dredging (CY)	Nearshore/ Slope/Slow Dredging (CY)	Excavation (Shoreline/Bank) (CY)
AREA 18	Partial Dredge and Cap (18A-18B) and Dredge and Partial Backfill/Partial RMC	2:1 Shoreline Slope, 3:1 for the Rest (7/21/22)	41,640	19,162	11,631	1,542	710	13,883	5,964	7,048	1,432
AREA 18	ENR										

Total Quantities Outside FNC								
Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Required Dredge Volume (CY)	Overdredge Allowance Volume (No Side-Slopes) (CY)	Overdredge Allowance Volume for Side- Slopes Only (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Open Water Dredging (CY)	Nearshore / Slope/ Slow Dredging (CY)	Excavation (Shoreline/Bank) (CY)
41,640	19,162	11,631	1,542	710	13,883	5,964	7,048	1,432

LDW Upper Reach Remedial Action Area	Technology Assignment	Slope Assumptions Description	Material Placement Volume Distribution (CY)								
			Sand Material			Gravelly Sand Material			Capping Materials		
			RMC/ ENR (Open Water) (CY)	RMC/ ENR (Nearshore) (CY)	RMC/ ENR (Land-Based Equipment) (CY)	Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Land-Based Equipment) (CY)	Sand/ZVI for Cap Chemical Isolation Layer (CY)	Cobble/Gravel For Cap Erosion Protection/Filter Layer (CY)	Gravelly Sand for Habitat Layer (CY)
AREA 18	Partial Dredge and Cap (18A-18B) and Dredge and Partial Backfill/Partial RMC	2:1 Shoreline Slope, 3:1 for the Rest (7/21/22)	51	51	0	9,588	1,416	1,432	915	457	686
AREA 18	ENR		0	0	167	0	0	0	0	0	0

RMC/ ENR (Open Water) (CY)	RMC/ ENR (Nearshore) (CY)	RMC/ ENR (Land-Based Equipment) (CY)	Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Land-Based Equipment) (CY)	Sand/ZVI for Cap Chemical Isolation Layer (CY)	Cobble/Gravel For Cap Erosion Protection/Filter Layer (CY)	Gravelly Sand for Habitat Layer (CY)
51	51	0	9,588	1,416	1,432	915	457	686

## Attachment M.1.5

### LDW Upper Reach SMA 10 Detailed Quantities and Notes

#### Notes:

1. ENR material assumed to be a coarse sand, applied at a minimum 6-in thickness, with a 6-in maximum overplacement allowance (as shown in drawings in BODR Appendix B and in accordance with 30% LDW Upper Reach BODR design criteria). ENR quantity assumes a placement footprint that includes a 10-foot buffer around the planned ENR placement area.
2. Total payable dredge volume includes: 1) required dredge volume (neatline), including associated external side-slope volumes ; and 2) 1-ft overdredge allowance on the entire dredge footprint.
3. Backfill material assumed to be a gravelly sand material, intended to restore for habitat purposes sediment bed to pre-dredge elevations for areas above -10-ft MLLW (as shown in drawings in BODR Appendix B and in accordance with 30% LDW Upper Reach BODR design criteria). For 30% RD, the backfill volumes were assumed to be equal to the dredge volumes in the habitat areas and may be overestimated.
4. RMC material assumed to be a medium-grained sand, applied at a minimum 6-in thickness, with a 3-in maximum overplacement allowance, over 100% of the dredge area that does not receive backfill or a cap, including side slopes (as shown in drawings in BODR Appendix B and in accordance with 30% LDW Upper Reach BODR design criteria).
5. Engineered capping is limited to portions of RAA 18 (as shown in drawings in BODR Appendix B and in accordance with 30% LDW Upper Reach BODR design criteria), outside of the FNC. Engineered cap is assumed to consist of two layers: chemical isolation layer (assumed to be a sand/ZVI mix; 1.5-ft thick with a 6-in maximum overplacement allowance) and erosion protection/filter layer (mixed cobble and sandy gravel; 6-in thick with a 6-in maximum overplacement allowance). A surficial 1.5-ft layer for clam habitat substrate (gravelly sand) is assumed to be placed above the engineered cap.

BODR: basis of design report

CY: cubic yard

ENR: enhanced natural recovery

FNC: Federal Navigation Channel

MLLW: mean lower low water

RAA: remedial action area

RD: remedial design

RMC: residuals management cover

SF: square foot

ZVI: zero valent iron



**Attachment M.1.6**  
**LDW Middle Reach Production Rates and Durations**

**Project Quantities and Durations**

Item Description	Totals
Dredge Volume (CY)	454,975
Contingency Re-Dredging Volume (CY)	13,531
Excavation Volume (CY)	8,236
Material Placement Volume (CY)	186,895
Total Dredge Duration (Work Days)	611
Total Material Placement Duration (Work Days)	386
Total Mob/Demob + Dredge/Material Placement Durations + Structural Work (Work Days)	1,057
Total Duration (Work Months)	34.8
Total Duration (Work Months) - Rounded	35.0
Total Dredge Duration (Calendar Days)	715
Total Material Placement Duration (Calendar Days)	460
Total Mob/Demob + Dredge/Material Placement Durations + Structural Work (Calendar Days)	1,233
Total Duration (Calendar Months)	40.5
Total Duration (Calendar Months) - Rounded	41.0

Notes:

- CY/day: cubic yard per day
- CY: cubic yard
- \$/CY-day: dollars per cubic yard per day
- ENR: enhanced natural recovery
- AC: activated carbon
- hrs/day: hours per day
- min: minute
- RMC: residuals management cover
- sec: second
- SF: square foot

LDW Upper Reach SMA 10 Production Rates and Durations

Summary Table

Item Description	Unit	Dredging/Excavation					Material Placement							
		Open-Water Dredging	Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	Land-Based Excavation (Shoreline/Bank)	RMC: Neatline+ Daylight (Open-Water)	RMC (Nearshore)	ENR (Land-Based Equipment)	Gravelly Sand Backfill (Open-Water)	Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)	Gravelly Sand Backfill (Land-Based Equipment)	Gravelly Sand For Cap Chemical Isolation Layer (Nearshore)	Cobble/ Gravel For Cap Filter/ Erosion Protection Layer (Nearshore)	Gravelly Sand For Cap Habitat Layer (Nearshore)
Dredge Volume/Placement Volume	CY	5,964	7,048	784	1,432	51	51	167	9,588	1,416	1,432	915	457	686
Cycle Time	min	1.87	2.20	2.20	2.17	2.23	2.40	2.33	2.70	2.40	2.33	3.07	3.07	3.07
Daily Production Rate	CY/day	993	576	576	503	961	609	505	793	609	505	513	513	513
	CY/day (rounded)	990	580	580	500	960	610	500	790	610	500	510	510	510
Daily Cost per Unit Volume	\$/CY-day	\$35.92	\$61.89	\$61.89	\$34.10	\$28.85	\$45.47	\$34.00	\$34.93	\$45.47	\$34.00	\$54.01	\$54.01	\$54.01
No. Dredge/Placement Work Days	Days	7	13	2	3	1	1	1	13	3	3	2	1	2
No. Dredge/Placement Calendar Days	Days	9	16	3	4	2	2	2	16	4	4	3	2	3

Cycle Times

Item Description	Unit	Dredging/Excavation					Material Placement							
		Open-Water Dredging	Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	Land-Based Excavation (Shoreline/Bank)	RMC: Neatline+ Daylight (Open-Water)	RMC (Nearshore)	ENR (Land-Based Equipment)	Gravelly Sand Backfill (Open-Water)	Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)	Gravelly Sand Backfill (Land-Based Equipment)	Gravelly Sand For Cap Chemical Isolation Layer (Nearshore)	Cobble/ Gravel For Cap Filter/ Erosion Protection Layer (Nearshore)	Gravelly Sand For Cap Habitat Layer (Nearshore)
Load Bucket	sec	20	24	24	26	20	22	20	26	22	20	32	32	32
Lift Load	sec	16	20	20	22	18	20	22	26	20	22	30	30	30
Swing Load	sec	16	18	18	22	20	20	20	22	20	20	24	24	24
Lower Load	sec	16	18	18	16	20	22	22	22	22	22	22	22	22
Dump/Place Load	sec	12	14	14	12	18	22	20	22	22	20	28	28	28
Return Swing	sec	10	12	12	10	12	12	10	12	12	10	12	12	12
Lower Bucket	sec	12	14	14	14	14	14	14	16	14	14	18	18	18
Lost Time (accelerating, positioning, stepping ahead, weather, hydraulics, bucket change, shifting anchors/silt curtains)	sec	10	12	12	8	12	12	12	16	12	12	18	18	18
Total Cycle Time	sec	112	132	132	130	134	144	140	162	144	140	184	184	184
	min	1.87	2.20	2.20	2.17	2.23	2.40	2.33	2.70	2.40	2.33	3.07	3.07	3.07

Daily Production Rate

Item Description	Unit	Dredging/Excavation					Material Placement							
		Open-Water Dredging	Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	Land-Based Excavation (Shoreline/Bank)	RMC: Neatline+ Daylight (Open-Water)	RMC (Nearshore)	ENR (Land-Based Equipment)	Gravelly Sand Backfill (Open-Water)	Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)	Gravelly Sand Backfill (Land-Based Equipment)	Gravelly Sand For Cap Chemical Isolation Layer (Nearshore)	Cobble/ Gravel For Cap Filter/ Erosion Protection Layer (Nearshore)	Gravelly Sand For Cap Habitat Layer (Nearshore)
Cycle Time	min	1.87	2.20	2.20	2.17	2.23	2.40	2.33	2.70	2.40	2.33	3.07	3.07	3.07
Bucket Capacity	CY	8	5	5	4	8	5	4	8	5	4	5	5	5
Effective Bucket Capacity	%	70%	65%	65%	70%	75%	75%	70%	75%	75%	70%	75%	75%	75%
	CY	5.6	3.25	3.25	2.8	6	3.75	2.8	6	3.75	2.8	3.75	3.75	3.75
Shift Duration	hrs/day	10	10	10	10	10	10	10	10	10	10	10	10	10
No. of Shifts	No.	1	1	1	1	1	1	1	1	1	1	1	1	1
Work Days/Week	No.	6	6	6	6	6	6	6	6	6	6	6	6	6
Running Time Efficiency	%	65%	65%	65%	65%	70%	65%	70%	70%	65%	70%	70%	70%	70%
Operational Delays Due to Vessel Traffic in the LDW	%	15%				15%			15%					
Daily Production Rate (per Shift)	cy/day	993	576	576	503	961	609	505	793	609	505	513	513	513

Specific Durations

LDW Upper Reach SMA 10 Production Rates and Durations

Preliminary (30%) Remedial Design Opinion of Probable Cost

Item Description	Unit	Dredging/Excavation					Material Placement							
		Open-Water Dredging	Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	Land-Based Excavation (Shoreline/Bank)	RMC: Neatline+ Daylight (Open-Water)	RMC (Nearshore)	ENR (Land-Based Equipment)	Gravelly Sand Backfill (Open-Water)	Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)	Gravelly Sand Backfill (Land-Based Equipment)	Gravelly Sand For Cap Chemical Isolation Layer (Nearshore)	Cobble/ Gravel For Cap Filter/ Erosion Protection Layer (Nearshore)	Gravelly Sand For Cap Habitat Layer (Nearshore)
Total Dredge Volume/Placement Volume	CY	5,964	7,048	784	1,432	51	51	167	9,588	1,416	1,432	915	457	686
No. Dredge/Placement Work Days	Days	7	13	2	3	1	1	1	13	3	3	2	1	2
No. Dredge/Placement Work Hours	hrs	70	130	20	30	10	10	10	130	30	30	20	10	20
<b>Total Dredge/Placement Duration (Work Days)</b>	<b>Days</b>	<b>25</b>					<b>27</b>							
No. Dredge/Placement Calendar Days	Days	9	16	3	4	2	2	2	16	4	4	3	2	3
<b>Total Dredge/Placement Duration (Calendar Days)</b>	<b>Days</b>	<b>32</b>					<b>38</b>							

Daily Unit Costs

Item Description	Unit	Dredging/Excavation					Material Placement							
		Open-Water Dredging	Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	Land-Based Excavation (Shoreline/Bank)	RMC: Neatline+ Daylight (Open-Water)	RMC (Nearshore)	ENR (Land-Based Equipment)	Gravelly Sand Backfill (Open-Water)	Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)	Gravelly Sand Backfill (Land-Based Equipment)	Gravelly Sand For Cap Chemical Isolation Layer (Nearshore)	Cobble/ Gravel For Cap Filter/ Erosion Protection Layer (Nearshore)	Gravelly Sand For Cap Habitat Layer (Nearshore)
Dredge or Excavator	\$/day	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900	\$ 9,900
Tug (2 for dredging and 1 for material placement)	\$/day	\$ 4,950	\$ 4,950	\$ 4,950	\$ -	\$ 2,475	\$ 2,475	\$ -	\$ 2,475	\$ 2,475	\$ -	\$ 2,475	\$ 2,475	\$ 2,475
Barge (1 for restricted access dredging, 2 for other dredging and 1 for material placement)	\$/day	\$ 4,950	\$ 4,950	\$ 4,950	\$ -	\$ 2,250	\$ 2,250	\$ -	\$ 2,250	\$ 2,250	\$ -	\$ 2,250	\$ 2,250	\$ 2,250
Flexi Floats (for shallower dredge areas- 1 for restricted access dredging and 1 for restricted access placement)	\$/day	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Work Boat	\$/day	\$ 660	\$ 660	\$ 660	\$ -	\$ 660	\$ 660	\$ -	\$ 660	\$ 660	\$ -	\$ 660	\$ 660	\$ 660
Front-end loader	\$/day	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550	\$ 550
Telebelt (Underpier Placement Only)	\$/day	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Daily Subtotal Cost for Equipment</b>	<b>\$/day</b>	<b>\$ 21,010</b>	<b>\$ 21,010</b>	<b>\$ 21,010</b>	<b>\$ 10,450</b>	<b>\$ 15,835</b>	<b>\$ 15,835</b>	<b>\$ 10,450</b>	<b>\$ 15,835</b>	<b>\$ 15,835</b>	<b>\$ 10,450</b>	<b>\$ 15,835</b>	<b>\$ 15,835</b>	<b>\$ 15,835</b>
FOG (15%)	\$/day	\$ 3,152	\$ 3,152	\$ 3,152	\$ 1,568	\$ 2,375	\$ 2,375	\$ 1,568	\$ 2,375	\$ 2,375	\$ 1,568	\$ 2,375	\$ 2,375	\$ 2,375
<b>Daily Total Cost for Equipment</b>	<b>\$/day</b>	<b>\$ 24,162</b>	<b>\$ 24,162</b>	<b>\$ 24,162</b>	<b>\$ 12,018</b>	<b>\$ 18,210</b>	<b>\$ 18,210</b>	<b>\$ 12,018</b>	<b>\$ 18,210</b>	<b>\$ 18,210</b>	<b>\$ 12,018</b>	<b>\$ 18,210</b>	<b>\$ 18,210</b>	<b>\$ 18,210</b>
	<b>\$/cy</b>	<b>\$ 24.34</b>	<b>\$ 41.94</b>	<b>\$ 41.94</b>	<b>\$ 23.88</b>	<b>\$ 18.96</b>	<b>\$ 29.88</b>	<b>\$ 23.81</b>	<b>\$ 22.95</b>	<b>\$ 29.88</b>	<b>\$ 23.81</b>	<b>\$ 35.50</b>	<b>\$ 35.50</b>	<b>\$ 35.50</b>
Superintendent	\$/day	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100
Operator Foreman	\$/day	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825
Dredge or Excavator Operator	\$/day	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825
Deck Hands for Dredge (assumed 3)	\$/day	\$ 2,145	\$ 2,145	\$ 2,145	\$ -	\$ 2,145	\$ 2,145	\$ -	\$ 2,145	\$ 2,145	\$ -	\$ 2,145	\$ 2,145	\$ 2,145
Tug Operator (2 for dredging and 1 for material placement)	\$/day	\$ 1,815	\$ 1,815	\$ 1,815	\$ -	\$ 908	\$ 908	\$ -	\$ 908	\$ 908	\$ -	\$ 908	\$ 908	\$ 908
Deck Hands for Tug (2 for dredging and 1 for material placement)	\$/day	\$ 1,815	\$ 1,815	\$ 1,815	\$ -	\$ 908	\$ 908	\$ -	\$ 908	\$ 908	\$ -	\$ 908	\$ 908	\$ 908
Front-loader Operator	\$/day	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825	\$ 825
Health and Safety and Quality Assurance	\$/day	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100	\$ 1,100
<b>Daily Subtotal Cost for Labor</b>	<b>\$/day</b>	<b>\$ 10,450</b>	<b>\$ 10,450</b>	<b>\$ 10,450</b>	<b>\$ 4,675</b>	<b>\$ 8,635</b>	<b>\$ 8,635</b>	<b>\$ 4,675</b>	<b>\$ 8,635</b>	<b>\$ 8,635</b>	<b>\$ 4,675</b>	<b>\$ 8,635</b>	<b>\$ 8,635</b>	<b>\$ 8,635</b>
Travel / Per Diem Allowance (10%)	\$/day	\$ 1,045	\$ 1,045	\$ 1,045	\$ 468	\$ 864	\$ 864	\$ 468	\$ 864	\$ 864	\$ 468	\$ 864	\$ 864	\$ 864
<b>Daily Total Cost for Labor</b>	<b>\$/day</b>	<b>\$ 11,495</b>	<b>\$ 11,495</b>	<b>\$ 11,495</b>	<b>\$ 5,143</b>	<b>\$ 9,499</b>	<b>\$ 9,499</b>	<b>\$ 5,143</b>	<b>\$ 9,499</b>	<b>\$ 9,499</b>	<b>\$ 5,143</b>	<b>\$ 9,499</b>	<b>\$ 9,499</b>	<b>\$ 9,499</b>
	<b>\$/cy</b>	<b>\$ 11.58</b>	<b>\$ 19.95</b>	<b>\$ 19.95</b>	<b>\$ 10.22</b>	<b>\$ 9.89</b>	<b>\$ 15.59</b>	<b>\$ 10.19</b>	<b>\$ 11.97</b>	<b>\$ 15.59</b>	<b>\$ 10.19</b>	<b>\$ 18.51</b>	<b>\$ 18.51</b>	<b>\$ 18.51</b>
<b>Daily Total Cost for Equipment and Labor</b>	<b>\$/day</b>	<b>\$ 35,657</b>	<b>\$ 35,657</b>	<b>\$ 35,657</b>	<b>\$ 17,160</b>	<b>\$ 27,709</b>	<b>\$ 27,709</b>	<b>\$ 17,160</b>	<b>\$ 27,709</b>	<b>\$ 27,709</b>	<b>\$ 17,160</b>	<b>\$ 27,709</b>	<b>\$ 27,709</b>	<b>\$ 27,709</b>
	<b>\$/cy</b>	<b>\$ 35.92</b>	<b>\$ 61.89</b>	<b>\$ 61.89</b>	<b>\$ 34.10</b>	<b>\$ 28.85</b>	<b>\$ 45.47</b>	<b>\$ 34.00</b>	<b>\$ 34.93</b>	<b>\$ 45.47</b>	<b>\$ 34.00</b>	<b>\$ 54.01</b>	<b>\$ 54.01</b>	<b>\$ 54.01</b>

**Attachment M.1.7**

**LDW Upper Reach SMA 10 Production Rates and Durations**

**Project Quantities and Durations**

Item Description	Totals
Dredge /Excavation Volume (CY)	14,444
Contingency Re-Dredging Volume (CY)	784
Material Placement Volume (CY)	14,762
Total Dredge Duration (Work Days)	25
Total Material Placement Duration (Work Days)	27
Total Dredge/Material Placement Durations (Work Days)	52
Total Duration (Work Months)	1.7
Total Duration (Work Months) - Rounded	2.0
Total Dredge Duration (Calendar Days)	32
Total Material Placement Duration (Calendar Days)	38
Total Dredge/Material Placement Durations (Calendar Days)	61
Total Duration (Calendar Months)	2.0
Total Duration (Calendar Months) - Rounded	2.0

Notes:

CY/day: cubic yard per day

CY: cubic yard

\$/CY-day: dollars per cubic yard per day

ENR: enhanced natural recovery

AC: activated carbon

hrs/day: hours per day

min: minute

RMC: residuals management cover

sec: second

SF: square foot

**Attachment M.1.8**  
**Detailed Structural Work Costs**

Bid Item No.	Specs Section No.	Item	Quantity	Unit	Min Unit Cost	Max Unit Cost	Bracketed Avg Unit Cost <sup>1</sup>	Probable Unit Cost <sup>2</sup>	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost <sup>2</sup>	Duration (days)
<b>SCHEDULE A - Structures</b>													
<b>OVER AND IN-WATER STRUCTURES</b>													
<b>ST05 (RAA 23) - Pile Demolition: Timber Mooring Dolphin Pile Clusters, Steel Pile Mooring Dolphins</b>													
		Remove Creosote Timber Mooring Dolphin Pile Cluster (4 dolphins with 20 Pile Cluster)	4	Ea	\$ 20,000.00	\$ 40,000.00	\$ 30,000.00	\$ 34,500.00	\$ 80,000	\$ 160,000	\$ 120,000	\$ 138,000	10
		Remove Steel Pile Mooring Dolphin (36" pipe pile)	6	Ea	\$ 1,500.00	\$ 2,000.00	\$ 1,750.00	\$ 2,012.50	\$ 9,000	\$ 12,000	\$ 10,500	\$ 12,075	2
		Creosote Timber Pile Processing and Disposal	100	Ton	\$ 150.00	\$ 210.00	\$ 180.00	\$ 207.00	\$ 15,000	\$ 21,000	\$ 18,000	\$ 20,700	
		<b>Subtotal</b>							<b>\$ 104,000</b>	<b>\$ 193,000</b>	<b>\$ 148,500</b>	<b>\$ 170,775</b>	<b>12</b>
<b>ST05 (RAA 23) - Pile Replacement: Steel Pile Mooring Dolphins</b>													
		Replacement Steel Piles - (10 - 36"x0.75"x90'-0") Coated Steel Pipe Pile	10	Ea	\$ 50,000.00	\$ 70,000.00	\$ 60,000.00	\$ 69,000.00	\$ 500,000	\$ 700,000	\$ 600,000	\$ 690,000	
		Installation Steel Piles	10	Ea	\$ 4,000.00	\$ 6,000.00	\$ 5,000.00	\$ 5,750.00	\$ 40,000	\$ 60,000	\$ 50,000	\$ 57,500	5
		<b>Subtotal</b>							<b>\$ 540,000</b>	<b>\$ 760,000</b>	<b>\$ 650,000</b>	<b>\$ 747,500</b>	<b>5</b>
<b>ST06 (RAAs 20B and 20C) - Pile Demolition: Timber Mooring Dolphin Pile Clusters, Timber Piles, Steel Pile Mooring Dolphins</b>													
		Remove Creosote Timber Mooring Dolphin Pile Cluster - (3 dolphins with 3 pile cluster)	3	Ea	\$ 3,000.00	\$ 6,000.00	\$ 4,500.00	\$ 5,175.00	\$ 9,000	\$ 18,000	\$ 13,500	\$ 15,525	3
		Remove Creosote Timber Pile - (5) Creosoted Timber Piles	5	Ea	\$ 1,000.00	\$ 2,000.00	\$ 2,729.46	\$ 3,138.88	\$ 5,000	\$ 10,000	\$ 13,647	\$ 15,694	2
		Remove Steel Mooring Dolphin Pile (36" pipe piles)	2	Ea	\$ 1,000.00	\$ 2,000.00	\$ 2,343.93	\$ 2,695.52	\$ 2,000	\$ 4,000	\$ 4,688	\$ 5,391	1
		Creosote Timber Pile Processing and Disposal	25	Ton	\$ 150.00	\$ 210.00	\$ 251.12	\$ 288.79	\$ 3,813	\$ 5,338	\$ 6,384	\$ 7,341	
		<b>Subtotal</b>							<b>\$ 19,813</b>	<b>\$ 37,338</b>	<b>\$ 38,219</b>	<b>\$ 43,952</b>	<b>6</b>
<b>ST06 (RAAs 20B and 20C) - Pile Replacement: Steel Piles and Steel Pile Mooring Dolphins</b>													
		Replacement Steel Piles - (5 - 12"x0.5"x70'-0") Steel Pipe Piles	5	Ea	\$ 10,000.00	\$ 20,000.00	\$ 15,000.00	\$ 17,250.00	\$ 50,000	\$ 100,000	\$ 75,000	\$ 86,250	
		Replacement Steel Piles - (5 - 36"x0.75"x90'-0") Steel Pile Dolphins	5	Ea	\$ 50,000.00	\$ 70,000.00	\$ 60,000.00	\$ 69,000.00	\$ 250,000	\$ 350,000	\$ 300,000	\$ 345,000	
		Installation Steel Piles	10	Ea	\$ 4,000.00	\$ 6,000.00	\$ 5,000.00	\$ 5,750.00	\$ 40,000	\$ 60,000	\$ 50,000	\$ 57,500	6
		<b>Subtotal</b>							<b>\$ 340,000</b>	<b>\$ 510,000</b>	<b>\$ 425,000</b>	<b>\$ 488,750</b>	<b>6</b>
<b>ST14 (RAAs 21 and 22) - Pile Demolition: Timber Piles</b>													
		Remove Creosoted Timber Pile - (13) Creosoted Timber Piles	13	Ea	\$ 1,000.00	\$ 2,000.00	\$ 2,729.46	\$ 3,138.88	\$ 13,000	\$ 26,000	\$ 35,483	\$ 40,805	3
		Creosote Timber Pile Processing and Disposal	17	Ton	\$ 150.00	\$ 210.00	\$ 251.12	\$ 288.79	\$ 2,619	\$ 3,666	\$ 4,384	\$ 5,042	
		<b>Subtotal</b>							<b>\$ 15,619</b>	<b>\$ 29,666</b>	<b>\$ 39,867</b>	<b>\$ 45,848</b>	<b>3</b>
<b>ST14 (RAAs 21 and 22) - Pile Replacement: Steel Piles</b>													
		Replacement Steel Piles - (13 - 12"x0.5"x70'-0") Steel Pipe Piles	13	Ea	\$ 10,000.00	\$ 20,000.00	\$ 15,000.00	\$ 17,250.00	\$ 130,000	\$ 260,000	\$ 195,000	\$ 224,250	
		Installation Steel Piles	13	Ea	\$ 4,000.00	\$ 6,000.00	\$ 5,000.00	\$ 5,750.00	\$ 52,000	\$ 78,000	\$ 65,000	\$ 74,750	7
		<b>Subtotal</b>							<b>\$ 182,000</b>	<b>\$ 338,000</b>	<b>\$ 260,000</b>	<b>\$ 299,000</b>	<b>7</b>

**Attachment M.1.8**  
**Detailed Structural Work Costs**

Bid Item No.	Specs Section No.	Item	Quantity	Unit	Min Unit Cost	Max Unit Cost	Bracketed Avg Unit Cost <sup>1</sup>	Probable Unit Cost <sup>2</sup>	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost <sup>2</sup>	Duration (days)
<b>ST15 (RAAs 21 and 22) - Pile Demolition: Timber Mooring Dolphin Pile Clusters</b>													
		Remove Creosoted Timber Mooring Dolphin Pile Cluster - (2 dolphins with 6 Pile Cluster)	2	Ea	\$ 8,000.00	\$ 12,000.00	\$ 10,000.00	\$ 11,500.00	\$ 16,000	\$ 24,000	\$ 20,000	\$ 23,000	3
		Creosote Timber Pile Processing and Disposal	15	Ton	\$ 150.00	\$ 210.00	\$ 251.12	\$ 288.79	\$ 2,250	\$ 3,150	\$ 3,767	\$ 4,332	
		<b>Subtotal</b>							<b>\$ 18,250</b>	<b>\$ 27,150</b>	<b>\$ 23,767</b>	<b>\$ 27,332</b>	<b>3</b>
<b>ST15 (RAAs 21 and 22) - Pile Replacement: Steel Pile Mooring Dolphins</b>													
		Replacement Steel Piles - (2 36"x0.75"x90'-0") Steel Pile Dolphins	2	Ea	\$ 50,000.00	\$ 70,000.00	\$ 60,000.00	\$ 69,000.00	\$ 100,000	\$ 140,000	\$ 120,000	\$ 138,000	
		Installation Steel Piles	2	Ea	\$ 4,000.00	\$ 6,000.00	\$ 5,000.00	\$ 5,750.00	\$ 8,000	\$ 12,000	\$ 10,000	\$ 11,500	1
		<b>Subtotal</b>							<b>\$ 108,000</b>	<b>\$ 152,000</b>	<b>\$ 130,000</b>	<b>\$ 149,500</b>	<b>1</b>
<b>(RAA 8F) - Derelict Timber Pier</b>													
		Demolition Timber Deck	1,080	SF	\$ 50.00	\$ 70.00	\$ 60.00	\$ 69.00	\$ 54,000	\$ 75,600	\$ 64,800	\$ 74,520	5
		Demolition Timber Piles	22	EA	\$ 1,000.00	\$ 2,000.00	\$ 1,500.00	\$ 1,725.00	\$ 22,000	\$ 44,000	\$ 33,000	\$ 37,950	5
		Creosote Timber Piling and Pier Processing and Disposal	20	Ton	\$ 150.00	\$ 210.00	\$ 180.00	\$ 207.00	\$ 3,000	\$ 4,200	\$ 3,600	\$ 4,140	
		<b>Subtotal</b>							<b>\$ 79,000</b>	<b>\$ 123,800</b>	<b>\$ 101,400</b>	<b>\$ 116,610</b>	<b>10</b>
<b>(RAA 8F) - Derelict Timber Wharf</b>													
		Demolition Timber Deck	1,000	SF	\$ 50.00	\$ 70.00	\$ 60.00	\$ 69.00	\$ 50,000	\$ 70,000	\$ 60,000	\$ 69,000	4
		Demolition Timber Piles	15	EA	\$ 1,000.00	\$ 2,000.00	\$ 1,500.00	\$ 1,725.00	\$ 15,000	\$ 30,000	\$ 22,500	\$ 25,875	4
		Creosote Timber Piling and Pier Processing and Disposal	13	Ton	\$ 150.00	\$ 210.00	\$ 180.00	\$ 207.00	\$ 1,950	\$ 2,730	\$ 2,340	\$ 2,691	
		<b>Subtotal</b>							<b>\$ 66,950</b>	<b>\$ 102,730</b>	<b>\$ 84,840</b>	<b>\$ 97,566</b>	<b>8</b>
<b>(RAAs 24B, 24C, 24D) - Derelict Timber Wharf</b>													
		Demolition Timber Deck	1,500	SF	\$ 50.00	\$ 70.00	\$ 60.00	\$ 69.00	\$ 75,000	\$ 105,000	\$ 90,000	\$ 103,500	6
		Demolition Timber Piles	15	EA	\$ 1,000.00	\$ 2,000.00	\$ 1,500.00	\$ 1,725.00	\$ 15,000	\$ 30,000	\$ 22,500	\$ 25,875	4
		Creosote Timber Piling and Pier Processing and Disposal	20	Ton	\$ 150.00	\$ 210.00	\$ 180.00	\$ 207.00	\$ 3,000	\$ 4,200	\$ 3,600	\$ 4,140	
		<b>Subtotal</b>							<b>\$ 93,000</b>	<b>\$ 139,200</b>	<b>\$ 116,100</b>	<b>\$ 133,515</b>	<b>10</b>
		<b>Total</b>							<b>\$ 1,566,632</b>	<b>\$ 2,412,885</b>	<b>\$ 2,017,693</b>	<b>\$ 2,320,347</b>	<b>71</b>

**Attachment M.1.8**  
**Detailed Structural Work Costs**

Bid Item No.	Specs Section No.	Item	Quantity	Unit	Min Unit Cost	Max Unit Cost	Bracketed Avg Unit Cost <sup>1</sup>	Probable Unit Cost <sup>2</sup>	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost <sup>2</sup>	Duration (days)	
<b>SCHEDULE B - Outfalls</b>														
<b>Plug and Abandon, Temporary Bypass, Temporary Support, Extension and Bank Protection</b>														
<b>OF27 (RAAs 24B, 24C, 24D) - Temporary Diversion</b>														
		Install Temporary Bypass System	1	EA	\$ 14,664.00	\$ 18,330.00	\$ 16,497.00	\$ 18,971.55	\$ 14,664	\$ 18,330	\$ 16,497	\$ 18,972	1	
		Operational Bypass System (Monthly)	12	Month	\$ 20,986.82	\$ 26,233.52	\$ 23,610.17	\$ 27,151.69	\$ 251,842	\$ 314,802	\$ 283,322	\$ 325,820	363	
		Remove Temporary Bypass System	1	EA	\$ 10,664.00	\$ 13,330.00	\$ 11,997.00	\$ 13,796.55	\$ 10,664	\$ 13,330	\$ 11,997	\$ 13,797	1	
		<b>Subtotal</b>							<b>\$ 277,170</b>	<b>\$ 346,462</b>	<b>\$ 311,816</b>	<b>\$ 358,588</b>	<b>365</b>	
<b>OF28 (RAAs 24B, 24C, 24D) - Temporary Diversion</b>														
		Install Temporary Bypass System	1	EA	\$ 730.15	\$ 912.69	\$ 821.42	\$ 944.64	\$ 730	\$ 913	\$ 821	\$ 945	1	
		Operational Bypass System (Monthly)	12	Month	\$ 8,778.28	\$ 10,972.85	\$ 9,875.57	\$ 11,356.90	\$ 105,339	\$ 131,674	\$ 118,507	\$ 136,283	363	
		Remove Temporary Bypass System	1	EA	\$ 545.54	\$ 681.92	\$ 613.73	\$ 705.79	\$ 546	\$ 682	\$ 614	\$ 706	1	
		<b>Subtotal</b>							<b>\$ 106,615</b>	<b>\$ 133,269</b>	<b>\$ 119,942</b>	<b>\$ 137,933</b>	<b>365</b>	
		<b>Total</b>							<b>\$ 383,785</b>	<b>\$ 479,731</b>	<b>\$ 431,758</b>	<b>\$ 496,522</b>	<b>730</b>	
												<b>Subtotal</b>	<b>\$ 2,816,869</b>	
												<b>TOTAL</b>	<b>\$ 2,816,869</b>	<b>801</b>
<b>SCHEDULE C - BULKHEADS</b>														
<b>WALL 1 (RAA 24B, 24C, 24D) - North Bank Sheet Piles with Tieback Anchors</b>														
		NZ 28 Bulkhead Wall - (Sheet Length 60', Wall Length 280LF, No Coating)	280	LF	\$ 3,500.00	\$ 4,500.00	\$ 4,050.00	\$ 4,657.50	\$ 980,000	\$ 1,260,000	\$ 1,134,000	\$ 1,304,100		
		Soil Anchors - (7-Strand, 8" Diameter, 175' Long, Grouted, No Corrosion Protection)	36	EA	\$ 3,000.00	\$ 4,000.00	\$ 3,600.00	\$ 4,140.00	\$ 108,000	\$ 144,000	\$ 129,600	\$ 149,040		
		Installation Sheet Piles - Per Pair	61	Pairs	\$ 4,000.00	\$ 6,000.00	\$ 5,400.00	\$ 6,210.00	\$ 244,000	\$ 366,000	\$ 329,400	\$ 378,810	35	
		Soil Anchor Installation	36	EA	\$ 11,000.00	\$ 13,000.00	\$ 11,700.00	\$ 13,455.00	\$ 396,000	\$ 468,000	\$ 421,200	\$ 484,380	45	
		Removal Bulkhead Wall and Soil Anchors	1	LS	\$ 100,000.00	\$ 150,000.00	\$ 135,000.00	\$ 155,250.00	\$ 100,000	\$ 150,000	\$ 135,000	\$ 155,250	10	
		<b>Subtotal</b>							<b>\$ 1,828,000</b>	<b>\$ 2,388,000</b>	<b>\$ 2,149,200</b>	<b>\$ 2,471,580</b>	<b>90</b>	
<b>WALL 2 (RAA 24B, 24C, 24D) - Inlet East Mouth Cofferdam</b>														
		NZ 28 Sheets - (Sheet Length 60', Wall Length 280LF, No Coating)	179	LF	\$ 3,500.00	\$ 4,500.00	\$ 4,050.00	\$ 4,657.50	\$ 626,500	\$ 805,500	\$ 724,950	\$ 833,693		
		MC12x50 Waler and Rods (Length 176')	10	Tons	\$ 2,000.00	\$ 30,000.00	\$ 27,000.00	\$ 31,050.00	\$ 20,000	\$ 300,000	\$ 270,000	\$ 310,500		
		Installation Sheet Piles - Per Pair, Waler, and Rods	39	Pairs	\$ 4,000.00	\$ 6,000.00	\$ 5,400.00	\$ 6,210.00	\$ 156,000	\$ 234,000	\$ 210,600	\$ 242,190	41	
		Fill (Includes Installation)	430	CY	\$ 150.00	\$ 200.00	\$ 180.00	\$ 207.00	\$ 64,500	\$ 86,000	\$ 77,400	\$ 89,010	2	
		Dewatering System (Pumps, Settling Tanks, Treatment Tanks)	1	LS	\$ 100,000.00	\$ 200,000.00	\$ 180,000.00	\$ 207,000.00	\$ 100,000	\$ 200,000	\$ 180,000	\$ 207,000	10	
		Removal Doubled-Walled Cofferdam	1	LS	\$ 80,000.00	\$ 100,000.00	\$ 90,000.00	\$ 103,500.00	\$ 80,000	\$ 100,000	\$ 90,000	\$ 103,500	10	
		<b>Subtotal</b>							<b>\$ 1,047,000</b>	<b>\$ 1,725,500</b>	<b>\$ 1,552,950</b>	<b>\$ 1,785,893</b>	<b>63</b>	
		<b>Total</b>							<b>\$ 2,875,000</b>	<b>\$ 4,113,500</b>	<b>\$ 3,702,150</b>	<b>\$ 4,257,473</b>	<b>153</b>	
												<b>Subtotal</b>	<b>\$ 4,257,473</b>	
												<b>50% Contingency</b>	<b>\$ 2,128,736</b>	
												<b>TOTAL</b>	<b>\$ 6,386,209</b>	<b>153</b>

<sup>1</sup> Bracketed Average is calculated average with outliers omitted.

<sup>2</sup> Probable Cost is Bracketed Average plus 15% bump.

Steel Disposal cost is assumed to be a credit, and not considered in this estimate