Appendix N
Intermediate (60%) Remedial Design Opinion of Probable Cost

TABLE OF CONTENTS

1 Introduction 1

2 Sources of Cost Information and Costing Approach 3

3 Direct Construction, Indirect Construction, and Additional Construction Oversight Tasks 5

3.1 Direct Construction Tasks 5

3.2 Indirect Construction Tasks 7

3.3 Additional Construction Oversight Tasks 8

4 Costing Assumptions Used for the Intermediate (60%) Remedial Design 9

4.1 General Costing Assumptions 9

4.2 Specific Remedial Design Costing Assumptions 12

5 Dredge and Material Placement Quantities Summary 19

6 Costs Summary 21

7 References 24

TABLES

Table N4-1 Assumed Dredging Production Rates 10

Table N4-2 Assumed Placement Production Rates 10

Table N5-1 Summary of Intermediate (60%) Remedial Design Dredging Quantities 19

Table N5-2 Summary of Intermediate (60%) Remedial Design Material Placement Quantities 19

Table N6-1 Total Project Cost for LDW Middle Reach and LDW Upper Reach SMA 10 Implementation at Intermediate (60%) RD 22

ATTACHMENT

Attachment N.1 Detailed Cost Estimate Workbook

ABBREVIATIONS

AC	activated carbon
AST	area-specific technology
BODR	*Basis of Design Report*
contractor	Remedial Action Contractor
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 Intermediate (60%) 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) and upper reach Sediment Management Area (SMA) 10[1] 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 Intermediate (60%) RD Opinion of Probable Cost was prepared in support of the Intermediate (60%) RD *Basis of Design Report* (BODR), based on the design information provided on the Intermediate (60%) Drawings. Based on the degree of LDW middle reach project definition being at the 60% RD, this Intermediate (60%) RD Opinion of Probable Cost is classified as Class 2, in accordance with the Standard Classification for Cost Estimate Classification System (ASTM E2516-11; ASTM 2019).

This Intermediate (60%) 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 Intermediate (60%) 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 Intermediate (60%) Remedial Design
- Section 5: Dredge and Material Placement Quantities Summary
- Section 6: Costs Summary

Attachment N.1 contains the detailed cost estimate workbook for the Intermediate (60%) RD Opinion of Probable Cost, organized as follows:

- Attachment N.1.1: Summary Intermediate (60%) RD Opinion of Probable Cost
- Attachment N.1.2: Detailed Intermediate (60%) RD Opinion of Probable Cost
- Attachment N.1.3: Detailed Notes
- Attachment N.1.4: LDW Middle Reach Detailed Quantities and Notes
- Attachment N.1.5: LDW Upper Reach SMA 10 Detailed Quantities and Notes
- Attachment N.1.6: LDW Middle Reach Production Rates and Durations

[1] Per BODR Section 2.2.4, SMA 10 is a deferred cleanup area from the LDW upper reach. SMA 10 has been incorporated into the middle reach design as part of this Intermediate (60%) RD and for the purposes of this appendix.

- Attachment N.1.7: LDW Upper Reach SMA 10 Production Rates and Durations
- Attachment N.1.8: Detailed Structural Work Costs

2 Sources of Cost Information and Costing Approach

The development of the Intermediate (60%) 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 Intermediate (60%) 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)
- Davis-Beacon Act WD # WA20260125 for wage determination[2]
- 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[3] for standard inflation to present-day U.S. dollars [2026] for comparison to current costing of the middle reach sediment remedy).

[2] Last revised May 18, 2026; accessed July 17, 2026. Available at: https://sam.gov/wage-determination/WA20260080/1.

[3] For escalation purposes to 2026 US dollars, inflation rates derived from historical information from the Consumer Price Index (based on the Bureau of Labor Statistics [https://www.bls.gov/cpi/home.htm] of the U.S. Department of Labor; accessed July 17, 2026) and the U.S. Army Corps of Engineers Construction Civil Works Construction Cost Index System [CWCCIS – Table 1, Feature Code 12; https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/EM%201110-2-1304_2021.pdf; accessed July 17, 2026]) 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 N.1 (see Attachment N.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 Intermediate (60%) 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.[4]
- **Surveys** include the costs for contactor 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.

[4]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 Intermediate (60%) 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 the appropriate permitted disposal facility(ies). 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 14A); and demolition and disposal of derelict structures (RAAs 24B through 24D and RAA 8F and 8H).
- **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 off-site disposal of identified debris** include 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** include costs for transloading bulk material regulated as nonhazardous waste (classified as Subtitle D level, that is not characterized as Toxic Substances Control Act [TSCA] waste[5], Resource Conservation and Recovery Act [RCRA] hazardous waste, or Washington State dangerous waste). Bulk materials include dredged sediment, small dredged debris, and identified debris and will be offloaded at a commercial transload facility (assumed to be located within the LDW) and then transported (via rail) to an off-site, permitted Subtitle D landfill for final disposal.
- **Containerization and stabilization** includes costs for the segregation and direct load into containers of sediment materials classified as Subtitle C level, including dredged sediment classified as TSCA waste, RCRA hazardous waste, and Washington State dangerous waste characteristics. Per Section 9.2.2 of the BODR, TSCA waste, RCRA hazardous waste, and dangerous waste will be handled separately from nonhazardous waste and placed into containers before these materials are offloaded at the transload facility. In addition, pre-treatment (stabilization) is assumed to be required prior to upland transportation and off-site disposal for materials that characterize as RCRA hazardous waste (RAAs 8B, 8F, 9B through 9D, 20B, 24C through 24G, and 31B[6]).
- **Transfer, upland transportation, and disposal of containerized sediments at off-site Subtitle C disposal facility** include costs for transferring (via truck) containerized sediment materials that meet Subtitle C-level characteristics to an intermodal facility (assumed to be

[5] TSCA waste (i.e., polychlorinated biphenyl [PCB] remediation waste) refers to material containing total PCB concentrations of 50 milligrams per kilogram or greater.
[6] Note, Phase III investigations to determine the final waste designations for these RAAs are currently underway.

located in south Seattle) and then transporting them (via rail) to an off-site, permitted Subtitle C landfill for final disposal.[7]
    - The exception is the containerized dangerous waste which can be disposed of at an off-site, permitted Subtitle D landfill.
- **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 8B, 8F, 9A through 9E, 20B, 21A, 24B through 24G, 30H, and 31B through 31D, and SMA 10).
- **On-barge dredge return water management and treatment** include daily costs for dewatering activities of sediments removed from within 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 Intermediate (60%) RD; therefore, costs for planting preparation, landscaping, and maintenance in localized areas of the site will be determined at Pre-Final (90%) 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 Intermediate (60%) 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.

[7] 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 PCB remediation waste will be disposed of in a RCRA-permitted hazardous waste landfill or a TSCA-authorized disposal facility.

- **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 Intermediate (60%) Remedial Design

The Intermediate (60%) 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 and in the detailed cost estimate workbook (Attachment N.1).

4.1 General Costing Assumptions

The following are general assumptions used in the Intermediate (60%) 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).[8] 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 six and nine[9] construction seasons, but for costing purposes only, the Intermediate (60%) Opinion of Probable Cost uses nine construction seasons as the most probable construction duration estimate 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 during 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 1,035 cubic yards [cy] per day[10]) 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 multiple locations within the site, the dredging production rates in this Intermediate (60%) RD

[8] Equivalent to an effective 111 days per construction season, excluding 10 Sundays and seven holidays.
[9] The lower end of this estimate relies on overcoming challenges related to limited transloading capacity and other factors discussed in BODR Section 12.2.
[10] Using a 1.45 ton/cy conversion factor, based on actual sediment tonnages/volumes measured during upper reach construction seasons 1 and 2.

Opinion of Probable Cost are assumed to be limited by the existing transload daily capacity for the single commercial facility.[11]

- 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 N4-1.

Table N4-1
Assumed Dredging Production Rates

Dredging Scenario	Assumed Dredging Production Rate (cy/day)	Assumptions
Open-Water Dredging	990	Applied to unobstructed, open-water areas (e.g., the LDW middle reach FNC) and below -5 feet MLLW
Nearshore/Slope/ Slow Dredging	580	Applied to nearshore areas above -5 feet MLLW, steep slopes, or where dredging may be slow (due to shallow depths)
Restricted Access Dredging	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
Tidally Restricted Dredging	180	Based on a reduced 4-hour work shift per day to accommodate tidal windows. Applied specifically to RAAs 5A, 6, 8A, 8F, 8H, 9A to 9D, 9F, 9I, 9M, 20B, 21A, 24E-H, and 27C where equipment access may be limited by tidal conditions.
Land-Based Excavation	500	Applied to shorelines or bank excavation work conducted from the land
Contingency Re-Dredging	390	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

[11] As discussed in BODR Section 12, LDWG will continue to assess the feasibility that private parties or ports may develop a new facility, that LDWG may partner with third parties to secure additional transloading capacity, or that existing transload facilities increase their throughput. However, at this time it is unclear if an alternative facility will be available by the time the LDW middle reach remedial action starts. The LDW middle reach cost estimate and construction duration will be updated during Pre-Final (90)%, and Final (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 N4-2.

Table N4-2
Assumed Placement Production Rates

Placement Scenario	Assumed Placement Production Rate (cy/day)	Assumptions
Open-Water Placement	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	
Nearshore/ Slope/Slow Placement	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	
Restricted Access Placement	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	
Restricted Access – Underpier	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
Tidally Restricted Placement	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, 8A, 8F, 8H, 9A–9D, 9F, 9I, 9L, 9M, 20B, 21A–C, 24A, 24E–H, 27B–C, 28, and 27C where equipment access may be limited by tidal conditions; for RMC, backfill, amended ENR, and capping applications.
Land-Based Placement	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 Intermediate (60%) 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[12] 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 Intermediate (60%) 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 10.55% to account for Washington State (6.5%) and the City of Seattle (4.05 %) taxes.
  - As an exception, the LDW upper reach 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 10.4% to account for Washington State (6.5%) and the City of Tukwila (3.9%).
- 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 Intermediate (60%) RD Opinion of Probable Cost are presented in present-day U.S. dollars (i.e., 2026).

[12] It is anticipated that for RAAs 5A, 6, 8A, 8F, 8H, 9A-9D, 9F, 9I, 9L–9M, 20A, 20B, 21A–21C, 24A, 24E–24H, 27B–27C, 28, and 31A 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 Intermediate (60%) 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
  - 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, 29, and 35A), as shown on the Drawings.
  - The dredge volume for each elevation-based RAA was calculated by developing a triangulated irregular network surface model in AutoCAD Civil3D, based on the design dredge plan on the Drawings.
  - 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 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 (excluding any partial dredge and cap footprints and side slopes) 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 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 1,650 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 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 240 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 bulk sediment material regulated as nonhazardous waste (classified as Subtitle D level, that is not TSCA waste, RCRA nonhazardous waste, or dangerous waste) will be transloaded, transported (via rail), and disposed of at an off-site, permitted Subtitle D landfill, assumed to be located in Arlington, Oregon.
- Containerization and Stabilization: Sediment material that is TSCA waste, RCRA hazardous waste, and Washington State dangerous waste (see BODR Figures 9-1a through 9-1c) will be required to be containerized for transportation and off-site disposal. For costing purposes, it is assumed that portions of the RAAs 8F, 9B through 9D, 20B, 24C through 24G, and 31B material (which contains metal-driven RCRA hazardous waste) will require pre-treatment (i.e., stabilization) with cement at 10% by wet 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 is designated as TSCA waste and RCRA hazardous waste will be trucked to an intermodal facility for transfer, transported (via rail), and disposed of at an off-site, permitted Subtitle C landfill, assumed to be located in Arlington, Oregon. The exception is the containerized Washington State dangerous waste which can be disposed of at an off-site, permitted Subtitle D landfill.
- RAA-Specific Equipment Decontamination: The equipment decontamination costs for portions of RAAs 8F, 9B through 9D, 20B, 24B through 24G, 30H, and 31B through 31D and SMA 10 are calculated for 25 events, which are equivalent to the discrete areas of TSCA waste, RCRA hazardous waste, dangerous waste, or mixed waste streams removed within these RAAs, requiring segregation of these materials and, therefore, equipment decontamination.
- Directed Standby Time: Paid standby time is assumed for costing purposes to be 63 days total over the nine 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 and dewatering pump, treatment system, and direct discharge 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 14A; and 5) demolition and disposal of an estimated 312 tons of derelict structures at RAAs 24B through D and 8F and 8H.
- 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 (see 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 for RAA 30D and 30E 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 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 specific dredge areas that are not backfilled or capped after dredging (as shown on the Drawings).
  - 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 (3 inches).
    - 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 (6 inches; see Section 9.1.5.2 of the BODR).
    - Required RMC material is assumed to conform to a medium-to-coarse-grained sand or gravel, depending on location (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 Drawings).
  - 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:
    - 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 (3 inches).
    - 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).
- Placement of ENR:
  - ENR will be placed in RAAs 3, 8H, 21B, 23B, 24A, 25, 27B, 27D, 28, 31A, 32, 33, and 35B (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.
  - 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 (3 inches).
  - 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 AC) will be applied to dredge offset areas in RAAs 5A, 8C, 8G, 9L, 9M, and 20A (as shown on the Drawings), where placement under structures or within dredge offsets is required and the ENR upper limit is exceeded (see Section 9.6.1

of the BODR). Additionally, amended ENR 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 H).
  - 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 (3 inches).
  - 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, 14A, 15B, 22, 23A, 30A[13], 30B through 30H, 31B, and 31C (as shown on the Drawings) 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- to 18-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, 20B, 24I, 26, and 31D (as shown on the Drawings).
  - For costing purposes, the modified engineered caps are assumed to consist of three layers:
    - Chemical isolation layer (conforming to gravelly sand material, with 6 to 12-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)

[13] The standard engineered cap at RAA 30A will be placed on existing grade.

  - 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 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, the applied technology is partial dredge and cap at RAA 9K to avoid impacts to a buried utility crossing (see Section 9.6.3 of the BODR).
    - For costing purposes at RAA 9K, the utility crossing cover is assumed to consist of a sandy gravel cover
- Environmental controls: this cost assumes procurement, deployment, maintenance, and removal of a silt curtain/moonpool system for environmental protection, specifically during dredging within RAAs 21A and 31B to 31D.
- 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 Intermediate (60%) RD dredging and material placement quantities for the LDW middle reach are summarized in Tables N5-1 and N5-2, respectively. In addition, these tables present the quantities for dredging and material placement for the LDW upper reach SMA 10, which was incorporated into the LDW middle reach design as part of Intermediate (60%) RD.

Table N5-1
Summary of Intermediate (60%) Remedial Design Dredging Quantities

Description	LDW Middle Reach Volumes (cy)	LDW Upper Reach – SMA 10 Volumes (cy)
Required Dredge Volume	360,100	15,700
Overdredge Allowance Volume	48,200	2,400
Contingency Re-Dredging Volume	9,100	1,300
Total Dredge Volume	**417,400**	**19,400**

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; 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 N.1 (Attachment N.1.4), for detailed dredging quantities.

cy: cubic yard

LDW: Lower Duwamish Waterway

RAA: remedial action area

SMA: sediment management area

Table N5-2
Summary of Intermediate (60%) Remedial Design Material Placement Quantities

Description	LDW Middle Reach Volumes (cy)	LDW Upper Reach – SMA 10 Volumes (cy)
Backfill Volume	48,300	16,700
Required RMC + Sloped RMC + Inner-/Outer-Perimeter RMC Volume	74,600	1,500
ENR Volume	5,400	--
Amended ENR Volume	1,800[a]	100
Standard Engineered Cap Volume	83,700[b]	--
Modified Engineered Cap Volume	5,900[c]	--
Utility Crossing Cover Volume	400[d]	--
Total Placement Volume	**220,100**	**18,300**

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

a. Amended ENR (AST B) is to be placed in RAAs 5A, 8C, 8G, 9L, 9M, and 20A as shown on the Drawings.
b. Standard engineered cap is to be placed in RAAs 1B, 9J, 14A, 15B, 22, 23A, 30A, 30B through 30H, 31B, and 31C. The cap at RAA 30A will be placed on existing grade. Partial dredging will occur prior to cap placement within the other RAAs listed in this note.
c. Modified engineered cap is to be placed in RAAs 5B, 8B, 9A, 9D, 20B, 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.
d. Utility crossing cover (AST D) is to be placed in RAA 9K, as shown on the Drawings.

--: not applicable
AST: area-specific technology
cy: cubic yard
ENR: enhanced natural recovery
LDW: Lower Duwamish Waterway
RAA: remedial action area
RMC: residuals management cover
SMA: sediment management area

6 Costs Summary

The Opinion of Probable Cost for the Intermediate (60%) RD for the LDW middle reach and LDW upper reach SMA 10 implementation is summarized in Table N6-1.

As described in Section 4.1, a contingency of 30% was applied at the Intermediate (60%) 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 Intermediate (60%) 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 nine-construction-season assumption, which is a conservative construction duration estimate for Intermediate (60%) 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 N6-1
Total Project Cost for LDW Middle Reach and LDW Upper Reach SMA 10 Implementation at Intermediate (60%) RD

Task ID	Task Description	Lower Total Cost ($)	Mid-Range Total Cost ($)	Upper Total Cost ($)
LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS				
1	Mobilization/Demobilization	$15,570,000	$17,300,000	$20,760,000
2	Site Preparation	$4,932,000	$5,480,000	$6,576,000
3	Surveys	$4,528,000	$5,031,000	$6,037,000
4	Structural Work	$7,144,000	$7,938,000	$9,525,000
5	Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal	$120,369,000	$133,743,000	$160,481,000
6	Material Placement	$24,482,000	$24,980,000	$29,976,000
7	Environmental Controls	$405,000	$450,000	$540,000
8	Habitat Enhancement (TBD)	TBD	TBD	TBD
LDW Middle Reach Direct Construction Costs Subtotal		**$175,430,000**	**$194,922,000**	**$233,895,000**
9a	Direct Construction Contingency (30.0%)	$50,486,000	$56,095,000	$67,311,000
9b	Specific Contingency for Structural Work Items 4a and 4b (50.0%)	$1,970,000	$2,189,000	$2,626,000
LDW Middle Reach Direct Construction Cost Subtotal with Contingency		**$227,886,000**	**$253,206,000**	**$303,832,000**
10	Seattle Sales Tax (10.55%)	$24,042,000	$26,713,000	$32,054,000
LDW Middle Reach Total Direct Construction Costs (with Contingency and Sales Tax) – Rounded to Two Significant Figures		**$250,000,000**	**$280,000,000**	**$340,000,000**
LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS				
11	Site Preparation	$9,000	$10,000	$12,000
12	Surveys	$248,000	$276,000	$331,000
13	Dredging, Excavation, Transloading, Upland Transportation, and Disposal	$5,795,000	$6,439,000	$7,727,000
14	Material Placement	$1,538,000	$1,709,000	$2,051,000
LDW Upper Reach SMA 10 Direct Construction Costs Subtotal		**$7,590,000**	**$8,434,000**	**$10,121,000**
15	Direct Construction Contingency (30.0%)	$2,277,000	$2,530,200	$3,036,300
LDW Upper Reach SMA 10 Direct Construction Cost Subtotal with Contingency		**$9,867,000**	**$10,964,200**	**$13,157,300**
16	Tukwila Sales Tax (10.4%)	$1,006,000	$1,118,000	$1,342,000
LDW Upper Reach SMA 10 Total Direct Construction Costs (with Contingency and Sales Tax) – Rounded to Two Significant Figures		**$11,000,000**	**$12,000,000**	**$14,000,000**

Task ID	Task Description	Lower Total Cost ($)	Mid-Range Total Cost ($)	Upper Total Cost ($)
Total LDW Middle Reach and LDW Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax) – Rounded to Two Significant Figures		**$260,000,000**	**$290,000,000**	**$350,000,000**
INDIRECT CONSTRUCTION COSTS				
17	Project Management	$810,000	$900,000	$1,080,000
18	Engineering Support Services	$4,860,000	$5,400,000	$6,480,000
19	Construction QA	$21,663,000	$24,070,000	$28,884,000
20	Site Access Agreements, Business Interruptions, and Temporary Leases	$24,300,000	$27,000,000	$32,400,000
21	Community Outreach and Communications	$1,620,000	$1,800,000	$2,160,000
Indirect Construction Costs Subtotal		**$53,253,000**	**$59,170,000**	**$71,004,000**
22	Indirect Construction Contingency (30.0%)	$15,976,000	$17,751,000	$21,301,000
Indirect Construction Costs Subtotal with Contingency		**$69,229,000**	**$76,921,000**	**$92,305,000**
Total Indirect Construction Costs (with Contingency) – Rounded to Two Significant Figures		**$69,000,000**	**$77,000,000**	**$92,000,000**
ADDITIONAL CONSTRUCTION OVERSIGHT COSTS				
23	Additional Construction Oversight Costs	$4,050,000	$4,500,000	$5,400,000
Additional Construction Oversight Costs Subtotal		**$4,050,000**	**$4,500,000**	**$5,400,000**
24	Additional Construction Oversight Contingency (30.0%)	$1,215,000	$1,350,000	$1,620,000
Additional Construction Oversight Costs Subtotal with Contingency		**$5,265,000**	**$5,850,000**	**$7,020,000**
Total Additional Construction Oversight Costs (with Contingency) – Rounded to Two Significant Figures		**$5,300,000**	**$5,900,000**	**$7,000,000**
25	**TOTAL LDW MIDDLE REACH AND LDW UPPER REACH SMA 10 PROJECT COSTS – Rounded to Two Significant Figures**	**$340,000,000**	**$370,000,000**	**$450,000,000**

Notes:
Costs are presented in present-day U.S. dollars (i.e., 2026).
Seattle sales tax is included at 10.55% to account for Washington State (6.5%) and the City of Seattle (4.05%) taxes. Tukwila sales tax is included at 10.4% to account for Washington State (6.5%)and the City of Tukwila (3.9%) taxes.
Attachment N.1 contains the detailed cost estimate workbook for the Intermediate (60%) 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

ASTM (ASTM International), 2019. Standard Classification for Cost Estimate Classification System – ASTM E2516-11. Reapproved 2019.

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 N – Intermediate (60%) Remedial Design Opinion of Probable Cost

Attachment N.1
Detailed Cost Estimate Workbook

Attachment N.1.1
Summary Intermediate (60%) RD Opinion of Probable Cost

Task ID	Task Description	Lower Total Cost ($)	Mid-Range Total Cost ($)	Upper Total Cost ($)
LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS				
1	Mobilization/Demobilization	$ 15,570,000	$ 17,300,000	$ 20,760,000
2	Site Preparation	$ 4,932,000	$ 5,480,000	$ 6,576,000
3	Surveys	$ 4,528,000	$ 5,031,000	$ 6,037,000
4	Structural Work	$ 7,144,000	$ 7,938,000	$ 9,525,000
5	Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal	$ 120,369,000	$ 133,743,000	$ 160,481,000
6	Material Placement	$ 22,482,000	$ 24,980,000	$ 29,976,000
7	Environmental Controls	$ 405,000	$ 450,000	$ 540,000
8	Habitat Enhancement (TBD)	TBD	TBD	TBD
	Middle Reach Direct Construction Costs Subtotal	**$ 175,430,000**	**$ 194,922,000**	**$ 233,895,000**
9	Direct Construction Contingency (30.0%)	$ 50,486,000	$ 56,095,000	$ 67,311,000
9	Specific Contingency For Structural Work Item 4 (50.0%)	$ 1,970,000	$ 2,189,000	$ 2,626,000
	Middle Reach Direct Construction Cost Subtotal with Contingency	**$ 227,886,000**	**$ 253,206,000**	**$ 303,832,000**
10	Sales Tax (10.55%)	$ 24,042,000	$ 26,713,000	$ 32,054,000
	Total Middle Reach Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures	**$ 250,000,000**	**$ 280,000,000**	**$ 340,000,000**
LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS				
11	Site Preparation	$ 9,000	$ 10,000	$ 12,000
12	Surveys	$ 248,000	$ 276,000	$ 331,000
13	Dredging, Excavation, Transloading, Upland Transportation, and Disposal	$ 5,795,000	$ 6,439,000	$ 7,727,000
14	Material Placement	$ 1,538,000	$ 1,709,000	$ 2,051,000
	LDW Upper Reach SMA 10 Direct Construction Costs Subtotal	**$ 7,590,000**	**$ 8,434,000**	**$ 10,121,000**
15	Upper Reach Direct Construction Contingency (30.0%)	$ 2,277,000	$ 2,530,200	$ 3,036,300
	LDW Upper Reach SMA 10 Direct Construction Cost Subtotal with Contingency	**$ 9,867,000**	**$ 10,964,200**	**$ 13,157,300**
16	City of Tukwila Sales Tax (10.4%)	$ 1,006,000	$ 1,118,000	$ 1,342,000
	Total Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures	**$ 11,000,000**	**$ 12,000,000**	**$ 14,000,000**
	Total LDW Middle Reach and LDW Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax)- Rounded to Two Significant Figures	**$ 260,000,000**	**$ 290,000,000**	**$ 360,000,000**
INDIRECT CONSTRUCTION COSTS				
17	Project Management	$ 810,000	$ 900,000	$ 1,080,000
18	Engineering Support Services	$ 4,860,000	$ 5,400,000	$ 6,480,000
19	Construction Quality Assurance	$ 21,663,000	$ 24,070,000	$ 28,884,000
20	Site Access Agreements, Business Interruption, and Temporary Leases	$ 24,300,000	$ 27,000,000	$ 32,400,000
21	Community Outreach and Communications	$ 1,620,000	$ 1,800,000	$ 2,160,000
	Indirect Construction Costs Subtotal	**$ 53,253,000**	**$ 59,170,000**	**$ 71,004,000**
22	Indirect Construction Contingency (30.0%)	$ 15,976,000	$ 17,751,000	$ 21,301,000
	Indirect Construction Costs Subtotal with Contingency	**$ 69,229,000**	**$ 76,921,000**	**$ 92,305,000**
	Total Indirect Construction Costs (with Contingency) - Rounded to Two Significant Figures	**$ 69,000,000**	**$ 77,000,000**	**$ 92,000,000**

Attachment N.1.1
Summary Intermediate (60%) RD Opinion of Probable Cost

Task ID	Task Description	Lower Total Cost ($)	Mid-Range Total Cost ($)	Upper Total Cost ($)
ADDITIONAL CONSTRUCTION OVERSIGHT COSTS				
23	Additional Construction Oversight Costs	$ 4,050,000	$ 4,500,000	$ 5,400,000
	Additional Construction Oversight Costs Subtotal	**$ 4,050,000**	**$ 4,500,000**	**$ 5,400,000**
24	Additional Construction Oversight Contingency (30.0%)	$ 1,215,000	$ 1,350,000	$ 1,620,000
	Additional Construction Oversight Costs Subtotal with Contingency	**$ 5,265,000**	**$ 5,850,000**	**$ 7,020,000**
	Total Additional Construction Oversight Costs (with Contingency) - Rounded to Two Significant Figures	**$ 5,300,000**	**$ 5,900,000**	**$ 7,000,000**
25	**TOTAL LDW MIDDLE REACH AND LDW UPPER REACH SMA 10 PROJECT COSTS - Rounded to Two Significant Figures**	**$ 340,000,000**	**$ 370,000,000**	**$ 450,000,000**

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., 2026).

3. Sales tax for LDW middle reach is included at 10.55% to account for Washington State [6.5%] and the City of Seattle [4.05%] taxes. Sales tax for LDW upper reach is included at 10.4% to account for Washington State [6.5%] and the City of Tukwila [3.9%] 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.

TBD: to be determined

Attachment N.1.2
Detailed Intermediate (60%) RD 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 ($)	Upper Total Cost ($)
LDW MIDDLE REACH DIRECT CONSTRUCTION COSTS										
1		**Mobilization/Demobilization**								
1	a	Mobilization/Demobilization of In-Water and Upland Equipment	9	SEASON	$ 1,530,000.00	$ 1,700,000.00	$ 2,040,000.00	$ 13,770,000.00	$ 15,300,000.00	$ 18,360,000.00
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
2		**Site Preparation**								
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	9	SEASON	$ 540,000.00	$ 600,000.00	$ 720,000.00	$ 4,860,000.00	$ 5,400,000.00	$ 6,480,000.00
3		**Surveys**								
3	a	Daily Contractor Progress Surveys	967	DAY	$ 3,600.00	$ 4,000.00	$ 4,800.00	$ 3,481,200.00	$ 3,868,000.00	$ 4,641,600.00
3	b	Pre-Construction Surveys (Bathy and Topo)	9	SEASON	$ 18,000.00	$ 20,000.00	$ 24,000.00	$ 162,000.00	$ 180,000.00	$ 216,000.00
3	c	Post-Dredge Construction Survey (per RAA)	41	EA	$ 7,200.00	$ 8,000.00	$ 9,600.00	$ 291,600.00	$ 324,000.00	$ 388,800.00
3	d	Post-Placement Construction Survey (per RAA)	59	EA	$ 7,200.00	$ 8,000.00	$ 9,600.00	$ 426,600.00	$ 474,000.00	$ 568,800.00
3	e	Post-Construction Survey (Bathy and Topo)	8	SEASON	$ 18,000.00	$ 20,000.00	$ 24,000.00	$ 144,000.00	$ 160,000.00	$ 192,000.00
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
4		**Structural Work**								
4	a	Installation and Removal of Double-Wall Cofferdam, and Dewatering Pump and Treatment System (RAA 24D)	1	LS	$ 1,714,500.00	$ 1,905,000.00	$ 2,286,000.00	$ 1,714,500.00	$ 1,905,000.00	$ 2,286,000.00
4	b	Shoring Wall Installation and Removal (RAA 24B-D)	1	LS	$ 2,224,800.00	$ 2,472,000.00	$ 2,966,400.00	$ 2,224,800.00	$ 2,472,000.00	$ 2,966,400.00
4	c	Outfall Re-Routing Installation, Monthly Bypass Operation, and Removal (RAA 24B–C)	1	LS	$ 447,300.00	$ 497,000.00	$ 596,400.00	$ 447,300.00	$ 497,000.00	$ 596,400.00
4	d	Pulling of Timber Piling and Replacement with Steel Piles (Multiple RAAs)	1	LS	$ 1,775,700.00	$ 1,973,000.00	$ 2,367,600.00	$ 1,775,700.00	$ 1,973,000.00	$ 2,367,600.00
4	e	Removal and Disposal of Submerged Barge (RAA 14A)	1	LS	$ 450,000.00	$ 500,000.00	$ 600,000.00	$ 450,000.00	$ 500,000.00	$ 600,000.00
4	f	Demolition and Disposal of Derelict Structures (RAA 24B-D and 8F [Subtitle C] and 8H [Subtitle D])	1	LS	$ 528,300.00	$ 587,000.00	$ 704,400.00	$ 528,300.00	$ 587,000.00	$ 704,400.00
4	g	Truck Transportation of Derelict Structures (RAA 24B through 24D) Directly to Transfer Facility	240	TON	$ 13.50	$ 15.00	$ 18.00	$ 3,240.00	$ 3,600.00	$ 4,320.00
5		**Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal**								
5	a	Required Dredging and In-Water Transportation (Open-Water)	339,352	CY	$ 32.33	$ 35.92	$ 43.10	$ 10,969,862.39	$ 12,188,735.99	$ 14,626,483.19
5	b	Required Dredging and In-Water Transportation (Nearshore/Slope/Slow Dredging)	34,271	CY	$ 55.70	$ 61.89	$ 74.27	$ 1,908,914.25	$ 2,121,015.83	$ 2,545,219.00
5	c	Required Dredging and In-Water Transportation (Restricted Access)	17,068	CY	$ 94.59	$ 105.10	$ 126.12	$ 1,614,390.37	$ 1,793,767.07	$ 2,152,520.49
5	d	Required Dredging and In-Water Transportation (Tidally-Restricted) (RAAs 5A, 6, 8A, 8F, 8H, 9A–9D, 9F, 9I, 9M, 20B, 21A, 24E–H, and 27C)	10,015	CY	$ 121.50	$ 135.00	$ 162.00	$ 1,216,847.81	$ 1,352,053.12	$ 1,622,463.75
5	e	Contingency Re-Dredging - Allowance	9,078	CY	$ 82.28	$ 91.43	$ 109.71	$ 746,987.47	$ 829,986.08	$ 995,983.30
5	f	Equipment Decontamination (RAAs 8B, 8F, 9A-E, 20B, 21A, 24B–G, 30H, 31B–31D)	21	EVENT	$ 4,950.00	$ 5,500.00	$ 6,600.00	$ 103,950.00	$ 115,500.00	$ 138,600.00
5	g	On-Barge Dredge Return Water Management and Treatment (RAAs 21A and 31B through 31D)	22	DAY	$ 2,700.00	$ 3,000.00	$ 3,600.00	$ 59,237.20	$ 65,819.11	$ 78,982.93
5	h	Land-Based Excavation (Shoreline/Bank)	7,669	CY	$ 30.69	$ 34.10	$ 40.92	$ 235,357.46	$ 261,508.29	$ 313,809.95
5	i1	Transloading of Bulk Dredged/Excavated Sediments at Transload Facility	592,682	TON	$ 8.10	$ 9.00	$ 10.80	$ 4,800,721.15	$ 5,334,134.62	$ 6,400,961.54
5	i2	Upland Transportation (Truck/Rail) and Disposal of Bulk Dredged/Excavated Sediments (Subtitle D)	592,682	TON	$ 155.93	$ 173.25	$ 207.90	$ 92,413,882.23	$ 102,682,091.36	$ 123,218,509.64
5	j1	Transloading of Containerized Dangerous Waste at Transload Facility (RAAs 8B, 9A, 9B, 9E and 30H)	5,108	TON	$ 8.10	$ 9.00	$ 10.80	$ 41,378.29	$ 45,975.88	$ 55,171.05
5	j2	Upland Transportation (Truck/Rail) and Disposal of Containerized Dangerous Waste (Subtitle D) (RAAs 8B, 9A, 9B, 9E and 30H)	5,108	TON	$ 155.93	$ 173.25	$ 207.90	$ 796,532.03	$ 885,035.59	$ 1,062,042.71
5	k1	Transloading of Containerized TSCA Waste at Transload Facility (RAA 21A, 31C Through D)	1,787	TON	$ 8.10	$ 9.00	$ 10.80	$ 14,472.45	$ 16,080.50	$ 19,296.60
5	k2	Upland Transportation (Truck/Rail) and Disposal of Containerized TSCA Waste (Subtitle C) (RAA 21A, 31C Through D)	1,787	TON	$ 324.00	$ 360.00	$ 432.00	$ 578,898.00	$ 643,220.00	$ 771,864.00
5	l1	Procurement and Delivery of Cement for Stabilization of Mixed TSCA Waste/RCRA Hazardous Waste prior to Disposal (Subtitle C) (RAAs 8C, 8F, 9B-D, 20B, 31B)	207	TON	$ 171.00	$ 190.00	$ 228.00	$ 35,379.71	$ 39,310.79	$ 47,172.95
5	l2	Mixing of Cement for Stabilization of Mixed TSCA Waste/RCRA Hazardous Waste prior to Disposal (Subtitle C) (RAAs 8C, 8F, 9B-D, 20B, 31B)	2,276	TON	$ 67.50	$ 75.00	$ 90.00	$ 153,622.43	$ 170,691.58	$ 204,829.90
5	l3	Transloading of Containerized Mixed TSCA Waste/RCRA Hazardous Waste with Pre-Treatment (Stabilization) at Transload Facility (RAAs 8C, 8F, 9B–D, 20B, 31B)	2,276	TON	$ 8.10	$ 9.00	$ 10.80	$ 18,434.69	$ 20,482.99	$ 24,579.59
5	l4	Upland Transportation (Truck/Rail) and Disposal of Containerized Mixed TSCA Waste/RCRA Hazardous Waste (Subtitle C) with Pre-Treatment (Stabilization) (RAAs 8C, 8F, 9B–D, 20B, 31B)	2,276	TON	$ 324.00	$ 360.00	$ 432.00	$ 737,387.64	$ 819,319.60	$ 983,183.52
5	m1	Direct Container Loading and Trucking of Dangerous Waste, TSCA and Mixed TSCA Waste/RCRA Hazardous Waste to Transfer Facility (RAAs 24B Through 24G)	3,661	TON	$ 27.00	$ 30.00	$ 33.00	$ 98,834.90	$ 109,816.56	$ 120,798.21

Task ID		Task Description	Quantity	Units	Lower Unit Cost ($)	Mid-Range Unit Cost ($)	Upper Unit Cost ($)	Lower Total Cost ($)	Mid-Range Total Cost ($)	Upper Total Cost ($)
5	m2	Procurement and Delivery of Cement for Stabilization of Mixed TSCA Waste/RCRA Hazardous Waste prior to Disposal (Subtitle C) (RAAs 24C Through 24G)	291	TON	$ 171.00	$ 190.00	$ 228.00	$ 49,770.91	$ 55,301.01	$ 66,361.22
5	m3	Mixing of Cement for Stabilization of Mixed TSCA Waste/RCRA Hazardous Waste prior to Disposal (Subtitle C) (RAAs 24C Through 24G)	3,202	TON	$ 67.50	$ 75.00	$ 90.00	$ 216,110.54	$ 240,122.82	$ 288,147.38
5	m4	Transferring of Containerized Dangerous Waste, TSCA, and Mixed TSCA Waste/RCRA Hazardous Waste with Pre-Treatment (Stabilization) at Transfer Facility (RAAs 24B Through 24G)	3,952	TON	$ 8.10	$ 9.00	$ 10.80	$ 32,008.04	$ 35,564.49	$ 42,677.39
5	m5	Upland Transportation (Truck/Rail) and Disposal of Containerized TSCA and Mixed TSCA Waste/RCRA Hazardous Waste (Subtitle C) with Pre-Treatment (Stabilization) (RAAs 24C Through G)	3,635	TON	$ 324.00	$ 360.00	$ 432.00	$ 1,177,800.78	$ 1,308,667.53	$ 1,570,401.04
5	m6	Upland Transportation (Truck/Rail) and Disposal of Dangerous Waste (Subtitle D) (RAA 24B)	316	TON	$ 155.93	$ 173.25	$ 207.90	$ 49,338.14	$ 54,820.15	$ 65,784.18
5	n	Removal of Identified Debris (Multiple RAAs)	26	DAY	$ 22,500.00	$ 25,000.00	$ 30,000.00	$ 585,000.00	$ 650,000.00	$ 780,000.00
5	o	Transloading of Identified Debris at Transload Facility	1,500	TON	$ 8.10	$ 9.00	$ 10.80	$ 12,150.00	$ 13,500.00	$ 16,200.00
5	p	Upland Transportation and Disposal (Subtitle D) of Identified Debris	1,200	TON	$ 155.93	$ 173.25	$ 207.90	$ 187,110.00	$ 207,900.00	$ 249,480.00
5	q	Upland Transportation and Disposal (Subtitle C) of Identified Debris	300	TON	$ 324.00	$ 360.00	$ 432.00	$ 97,200.00	$ 108,000.00	$ 129,600.00
5	r	Directed Standby Time - Allowance	63	DAY	$ 22,500.00	$ 25,000.00	$ 30,000.00	$ 1,417,500.00	$ 1,575,000.00	$ 1,890,000.00
6		**Material Placement**								
6	a	Procurement and Delivery of Coarse Sand for RMC (Required+Inner+Outer Perimeter RMC)	42,432	TON	$ 43.73	$ 48.59	$ 58.31	$ 1,855,478.04	$ 2,061,642.26	$ 2,473,970.71
6	b	Procurement and Delivery of Coarse Sand for ENR	7,315	TON	$ 43.73	$ 48.59	$ 58.31	$ 319,867.12	$ 355,407.91	$ 426,489.49
6	c	Procurement and Delivery of Gravelly Sand for Backfill	65,169	TON	$ 30.27	$ 33.64	$ 40.37	$ 1,972,916.39	$ 2,192,129.32	$ 2,630,555.18
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)	35,170	TON	$ 30.27	$ 33.64	$ 40.37	$ 1,064,727.27	$ 1,183,030.30	$ 1,419,636.36
6	e	Procurement and Delivery of Sandy Gravel for Standard Cap Filter Layer, Modified Cap Habitat Layer, Modified Cap Erosion Protection Layer, Sloped RMC and Utility Crossing Cover (RAA 9K)	44,686	TON	$ 41.66	$ 46.29	$ 55.55	$ 1,861,561.67	$ 2,068,401.86	$ 2,482,082.23
6	f	Procurement and Delivery of Quarry Spalls for Standard Cap Erosion Protection Layer	120,921	TON	$ 42.18	$ 46.86	$ 56.24	$ 5,099,983.04	$ 5,666,647.82	$ 6,799,977.38
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)	174	TON	$ 2,700.00	$ 3,000.00	$ 3,600.00	$ 470,626.28	$ 522,918.08	$ 627,501.70
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)	3,949	TON	$ 16.20	$ 18.00	$ 21.60	$ 63,977.78	$ 71,086.43	$ 85,303.71
6	i	Placement of Coarse Sand for RMC (Neatline+ Daylight+ Perimeter) (Open-Water)	26,203	CY	$ 26.20	$ 29.12	$ 34.94	$ 686,657.59	$ 762,952.87	$ 915,543.45
6	j	Placement of Coarse Sand RMC (Neatline+ Daylight+ Perimeter) + ENR (Nearshore/Slope/Slow Placement)	3,844	CY	$ 41.31	$ 45.90	$ 55.07	$ 158,798.67	$ 176,442.97	$ 211,731.56
6	k	Placement of Coarse Sand RMC (Neatline+ Daylight+ Perimeter) + ENR (Restricted Access)	2,256	CY	$ 56.27	$ 62.52	$ 75.03	$ 126,946.72	$ 141,051.91	$ 169,262.29
6	l	Placement of Coarse Sand ENR + Perimeter RMC (Restricted Access - Underpier)	2,489	CY	$ 133.65	$ 148.50	$ 178.20	$ 332,673.10	$ 369,636.77	$ 443,564.13
6	m	Placement of Gravelly Sand Backfill (Open-Water)	6,439	CY	$ 31.73	$ 35.25	$ 42.30	$ 204,298.31	$ 226,998.12	$ 272,397.75
6	n	Placement of Gravelly Sand Backfill (Nearshore/Slope/Slow Placement)	17,984	CY	$ 41.31	$ 45.90	$ 55.07	$ 742,830.32	$ 825,367.02	$ 990,440.43
6	o	Placement of Gravelly Sand Backfill (Restricted Access)	6,147	CY	$ 56.27	$ 62.52	$ 75.03	$ 345,907.85	$ 384,342.06	$ 461,210.47
6	p	Placement of Gravelly Sand Backfill (Land-Based Equipment)	8,121	CY	$ 30.60	$ 34.00	$ 40.80	$ 248,505.43	$ 276,117.14	$ 331,340.57
6	q	Placement of Gravelly Sand for Cap CIL (Open-Water)	19,708	CY	$ 31.73	$ 35.25	$ 42.30	$ 625,285.07	$ 694,761.19	$ 833,713.43
6	r	Placement of Sandy Gravel for Cap Filter Layer and Sloped RMC (Open-Water)	20,801	CY	$ 32.55	$ 36.17	$ 43.40	$ 677,095.35	$ 752,328.17	$ 902,793.81
6	s	Placement of Quarry Spalls for Cap Erosion Layer (Open-Water)	73,592	CY	$ 34.43	$ 38.26	$ 45.91	$ 2,533,829.21	$ 2,815,365.79	$ 3,378,438.95
6	t	Placement of Gravelly Sand for Cap CIL (Nearshore/Slope/Slow Placement) (Including Amended CIL for Modified Caps)	2,751	CY	$ 45.87	$ 50.96	$ 61.16	$ 126,189.07	$ 140,210.08	$ 168,252.09
6	u	Placement of Sandy Gravel for Cap Filter Layer (Nearshore/Slope/Slow Placement)	3,683	CY	$ 46.35	$ 51.50	$ 61.79	$ 170,700.91	$ 189,667.68	$ 227,601.21
6	v	Placement of Quarry Spalls for Cap Erosion Layer (Nearshore/Slope/Slow Placement)	2,878	CY	$ 49.06	$ 54.51	$ 65.42	$ 141,225.08	$ 156,916.75	$ 188,300.10
6	w	Placement of Gravelly Sand for Cap CIL (Restricted Access)	1,761	CY	$ 60.08	$ 66.76	$ 80.11	$ 105,784.35	$ 117,538.16	$ 141,045.80
6	x	Placement of Sandy Gravel for Cap Filter Layer and Sloped RMC (Restricted Access)	2,452	CY	$ 60.67	$ 67.41	$ 80.89	$ 148,781.67	$ 165,312.97	$ 198,375.56
6	y	Placement of Quarry Spalls for Cap Erosion Layer (Restricted Access)	4,136	CY	$ 63.99	$ 71.10	$ 85.33	$ 264,667.67	$ 294,075.19	$ 352,890.23
6	z	Placement of Gravelly Sand/AC for Amended ENR (RAA 5A, 8C, 9L) (Restricted Access - Underpier)	1,239	CY	$ 133.65	$ 148.50	$ 178.20	$ 165,640.51	$ 184,045.02	$ 220,854.02
6	aa	Placement of Coarse Sand (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, 8A, 8F, 8H, 9A–9D, 9F, 9I, 9L, 9M, 20B, 21A-C, 24A, 24E–H, 27B–C, 28, 31A)	13,072	CY	$ 150.48	$ 167.20	$ 200.64	$ 1,967,041.25	$ 2,185,601.39	$ 2,622,721.67

Task ID		Task Description	Quantity	Units	Lower Unit Cost ($)	Mid-Range Unit Cost ($)	Upper Unit Cost ($)	Lower Total Cost ($)	Mid-Range Total Cost ($)	Upper Total Cost ($)
7		**Environmental Controls**								
7	a	Furnish, Install, Repair, and Dispose Silt Curtain (RAAs 21A and 31C 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
8		**Habitat Enhancement (TBD)**								
8	a	TBD	TBD	TBD	$ -	$ -	$ -	$ -	$ -	$ -
		Middle Reach Direct Construction Costs Subtotal						**$ 175,429,815.00**	**$ 194,922,017.00**	**$ 233,895,438.00**
9	**a**	**Middle Reach Direct Construction Contingency (Excludes Structural Work)**	30.00%	PERCENT				$ 50,485,792.00	$ 56,095,325.00	$ 67,311,095.00
9	**b**	**Specific Contingency For Structural Work Items 4a and 4b**	50.00%	PERCENT				$ 1,969,650.00	$ 2,188,500.00	$ 2,626,200.00
		Middle Reach Direct Construction Cost Subtotal with Contingency						**$ 227,885,257.00**	**$ 253,205,842.00**	**$ 303,832,733.00**
10		**City of Seattle Sales Tax**	10.55%	PERCENT				$ 24,041,895.00	$ 26,713,216.00	$ 32,054,353.00
Total Middle Reach Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant Figures								**$ 250,000,000.00**	**$ 280,000,000.00**	**$ 340,000,000.00**
LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS										
11		**Site Preparation**								
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
12		**Surveys**								
12	a	Daily Contractor Progress Surveys	65	DAY	$ 3,600.00	$ 4,000.00	$ 4,800.00	$ 234,000.00	$ 260,000.00	$ 312,000.00
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
13		**Dredging, Excavation, Transloading, Upland Transportation, and Disposal**								
13	a	Required Dredging and In-Water Transportation (Nearshore/Slope/Slow Dredging)	18,102	CY	$ 55.70	$ 61.89	$ 74.27	$ 1,008,259.70	$ 1,120,288.55	$ 1,344,346.27
13	b	Contingency Re-Dredging - Allowance	1,302	CY	$ 82.28	$ 91.43	$ 109.71	$ 107,126.92	$ 119,029.91	$ 142,835.90
13	c	Equipment Decontamination	4	EVENT	$ 4,950.00	$ 5,500.00	$ 6,600.00	$ 19,800.00	$ 22,000.00	$ 26,400.00
13	d1	Transloading of Bulk Dredged Sediments at Transload Facility	20,367	TON	$ 8.10	$ 9.00	$ 10.80	$ 164,975.62	$ 183,306.25	$ 219,967.50
13	d2	Upland Transportation (Truck/Rail) and Disposal of Bulk Dredged/Excavated Sediments (Subtitle D)	20,217	TON	$ 155.93	$ 173.25	$ 207.90	$ 3,152,391.99	$ 3,502,657.77	$ 4,203,189.32
13	e3	Transloading of Containerized Washington Dangerous Waste at Transload Facility	7,768	TON	$ 8.10	$ 9.00	$ 10.80	$ 62,918.40	$ 69,909.33	$ 83,891.20
13	e4	Upland Transportation (Truck/Rail) and Disposal of Containerized Washington Dangerous Waste (Subtitle D)	7,768	TON	$ 155.93	$ 173.25	$ 207.90	$ 1,211,179.20	$ 1,345,754.67	$ 1,614,905.60
13	f	Removal of Identified Debris	2	DAY	$ 22,500.00	$ 25,000.00	$ 30,000.00	$ 45,000.00	$ 50,000.00	$ 60,000.00
13	g	Upland Transportation and Disposal (Subtitle D) of Identified Debris	150	TON	$ 155.93	$ 173.25	$ 207.90	$ 23,388.75	$ 25,987.50	$ 31,185.00
14		**Material Placement**								
14	a	Procurement and Delivery of Coarse Sand for RMC	2,085	TON	$ 43.73	$ 48.59	$ 58.31	$ 91,163.21	$ 101,292.46	$ 121,550.95
14	b	Procurement and Delivery of Gravelly Sand for Backfill and Amended ENR	22,610	TON	$ 30.27	$ 33.64	$ 40.37	$ 684,482.56	$ 760,536.18	$ 912,643.41
14	c	Procurement and Delivery of AC for Amended ENR	2	TON	$ 2,700.00	$ 3,000.00	$ 3,600.00	$ 5,584.10	$ 6,204.55	$ 7,445.46
14	d	Blending of Gravelly Sand/AC for Amended ENR	102	TON	$ 16.20	$ 18.00	$ 21.60	$ 1,656.72	$ 1,840.80	$ 2,208.96
14	e	Placement of Coarse Sand for RMC (Neatline+ Daylight+ Perimeter	1,544	CY	$ 41.31	$ 45.90	$ 55.07	$ 63,781.04	$ 70,867.83	$ 85,041.39
14	f	Placement of Gravelly Sand Backfill and Amended ENR (Nearshore/Slope/Slow Placement)	16,749	CY	$ 41.31	$ 45.90	$ 55.07	$ 691,826.06	$ 768,695.62	$ 922,434.74
		LDW Upper Reach SMA 10 Direct Construction Costs Subtotal						**$ 7,590,935.00**	**$ 8,434,372.00**	**$ 10,121,246.00**
15	**a**	**Upper Reach Direct Construction Contingency**	30.00%	PERCENT				$ 2,277,280.00	$ 2,530,311.00	$ 3,036,374.00
		LDW Upper Reach SMA 10 Direct Construction Cost Subtotal with Contingency						**$ 9,868,215.00**	**$ 10,964,683.00**	**$ 13,157,620.00**
16		**City of Tukwila Sales Tax**	10.40%	PERCENT				$ 1,026,294.00	$ 1,140,327.00	$ 1,368,392.00
Total Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax) - Rounded to Two Significant								**$ 11,000,000.00**	**$ 12,000,000.00**	**$ 15,000,000.00**
Total LDW Middle Reach and LDW Upper Reach SMA 10 Direct Construction Costs (with Contingency and Sales Tax)- Rounded to Two Significant Figures								**$ 260,000,000.00**	**$ 290,000,000.00**	**$ 360,000,000.00**

Attachment N.1.2
Detailed Intermediate (60%) RD 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 ($)	Upper Total Cost ($)
INDIRECT CONSTRUCTION COSTS									
17	**Project Management**	9	YR	$ 90,000.00	$ 100,000.00	$ 120,000.00	$ 810,000.00	$ 900,000.00	$ 1,080,000.00
18	**Engineering Support Services**	9	SEASON	$ 540,000.00	$ 600,000.00	$ 720,000.00	$ 4,860,000.00	$ 5,400,000.00	$ 6,480,000.00
19	**Construction Quality Assurance**	1	LS	$ 21,662,640.00	$ 24,069,600.00	$ 28,883,520.00	$ 21,662,700.00	$ 24,069,600.00	$ 28,883,600.00
19 a	Construction Management (Inspection and Oversight)	55	MO	$ 225,720.00	$ 250,800.00	$ 300,960.00	$ 12,414,600.00	$ 13,794,000.00	$ 16,552,800.00
19 b	Environmental Compliance Monitoring	1	LS	$ 9,248,040.00	$ 10,275,600.00	$ 12,330,720.00	$ 9,248,100.00	$ 10,275,600.00	$ 12,330,800.00
20	**Site Access Agreements, Business Interruption, and Temporary Leases**	9	SEASON	$ 2,700,000.00	$ 3,000,000.00	$ 3,600,000.00	$ 24,300,000.00	$ 27,000,000.00	$ 32,400,000.00
21	**Community Outreach and Communications**	9	SEASON	$ 180,000.00	$ 200,000.00	$ 240,000.00	$ 1,620,000.00	$ 1,800,000.00	$ 2,160,000.00
	Indirect Construction Costs Subtotal						**$ 53,252,700.00**	**$ 59,169,600.00**	**$ 71,003,600.00**
22	**Indirect Construction Contingency**	30.00%	PERCENT				$ 15,975,810.00	$ 17,750,880.00	$ 21,301,080.00
	Indirect Construction Costs Subtotal with Contingency						**$ 69,228,510.00**	**$ 76,920,480.00**	**$ 92,304,680.00**
	Total Indirect Construction Costs (with Contingency) - Rounded to Two Significant Figures						**$ 69,000,000.00**	**$ 77,000,000.00**	**$ 92,000,000.00**
ADDITIONAL CONSTRUCTION OVERSIGHT COSTS									
23	**Additional Construction Oversight Costs**								
23 a	EPA Oversight	9	SEASON	$ 450,000.00	$500,000.00	$ 600,000.00	$ 4,050,000.00	$ 4,500,000.00	$ 5,400,000.00
	Additional Construction Oversight Costs Subtotal						**$ 4,050,000.00**	**$ 4,500,000.00**	**$ 5,400,000.00**
24	**Additional Construction Oversight Contingency**	30.00%	PERCENT				$ 1,215,000.00	$ 1,350,000.00	$ 1,620,000.00
	Additional Construction Oversight Costs Subtotal with Contingency						**$ 5,265,000.00**	**$ 5,850,000.00**	**$ 7,020,000.00**
	Total Additional Construction Oversight Costs (with Contingency) - Rounded to Two Significant Figures						**$ 5,300,000.00**	**$ 5,900,000.00**	**$ 7,000,000.00**
25	**TOTAL LDW MIDDLE REACH AND LDW UPPER REACH SMA 10 PROJECT COSTS - Rounded to Two Significant Figures**						**$ 340,000,000.00**	**$ 370,000,000.00**	**$ 450,000,000.00**

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., 2026).

3. Sales tax for LDW middle reach is included at 10.55% to account for Washington State [6.5%] and the City of Seattle [4.05%] taxes. Sales tax for LDW upper reach is included at 10.4% to account for Washington State [6.5%] and the City of Tukwila [3.9%] 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.

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
TON: U.S. ton

TSCA: Toxic Substances Control Act

YR: year

RAA: remedial action area

Attachment N.1.3
Detailed Notes

General Notes		
1		The approach for developing the LDW middle reach Opinion of Probably Cost was based on several sources of information, including the following: • Anchor QEA's best professional judgment and past experience with similar remedial actions and associated pricing • 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. • Engineering cost guidance (RS Means) • Vendor/suppliers quotes for clean placement materials and amendment to be imported 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: 1.45 TON/CY (in situ); 2) sand/gravel mix: 1.6 TON/CY, 3) sand: 1.4 TON/CY; 4) for quarry spalls: 1.45 TON/CY, for identified debris: 1.92 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 10.55% (to account for Washington State [6.5%] and the City of Seattle [4.05%] taxes). The LDW upper reach SMA 10 falls in the City of Tukwila jurisdiction, and therefore, sales taxes is included at 10.4% (to account for Washington State [6.5%] and the City of Tukwila [3.9%] 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		**Mobilization/Demobilization**
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		**Site Preparation**
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		**Surveys**
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		**Structural Work**
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.
4	**g**	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.

5		**Dredging, Excavation, Transloading or Transfer, Upland Transportation, and Disposal**
5	**a**	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.
5	**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.
5	**c**	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.
5	**d**	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 RAAs 5A, 6, 8A, 8F, 8H, 9A to 9D, 9F, 9I, 9M, 20B, 21A, and 27C 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.
5	**e**	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 390 CY/10-hour shift. These costs are considered an 'allowance' for this Preliminary (30%) RD Opinion of Probable Cost.
5	**f**	Daily equipment decontamination cost for RAAs 8C, 8F, 9B through 9D, 20B, 21A, 24C through 24G, and 31B Through 31D 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.
5	**g**	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.
5	**h**	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.
5	**i1**	Transloading unit cost based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Contractor tonnage for transloading calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY), plus anticipated identified debris tonnage (converted using a factor of 1.58 ton/CY).
5	**i2**	Transportation and disposal unit cost at a Subtitle D landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY) for material designated as non-hazardous waste.
5	**j1**	Sediment designated as Washington State dangerous waste is assumed to require containerization for transportation and off-site disposal. Transloading unit cost based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Contractor tonnage for transloading calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY), plus anticipated identified debris tonnage (converted using a factor of 1.58 ton/CY).
5	**j2**	Transportation and disposal unit cost for containerized Washington State dangerous waste at a Subtitle D landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY) for material designated as non-hazardous waste.
5	**k1**	Sediment designated as TSCA waste containing PCB concentrations greater than or equal to 50 ppm is assumed to require containerization for transportation and off-site disposal. Transloading unit cost based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Contractor tonnage for transloading calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY), plus anticipated identified debris tonnage (converted using a factor of 1.58 ton/CY).
5	**k2**	Transportation and disposal unit cost at a Subtitle C landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from TSCA/RCRA waste volume not requiring stabilization (converted using a factor of 1.45 ton/CY).
5	**l1**	Assumes procurement and delivery of cement required for stabilization of mixed TSCA/RCRA hazardous waste containing metals (arsenic, cadmium, chromium, lead, or mercury) at concentrations equal to or greater than regulatory criteria and TSCA waste containing PCB concentrations greater than or equal to 50 ppm. Assumes a cement amendment rate of 10 percent by weight based on the total wet tonnage of TSCA/RCRA hazardous material.
5	**l2**	Stabilization is assumed to be conducted by mixing cement into the sediment prior to being transferered. Equipment and labor cost assumptions are based on contractor bid reviews, similar project estimates, and Anchor QEA's professional judgment. Assumes containerized TSCA/RCRA hazardous material containing elevated PCB and metal (arsenic, cadmium, chromium, lead, or mercury) concentrations requires stabilization prior to Subtitle C landfill disposal.
5	**l3**	Containerized TSCA/RCRA hazardous material is assumed to require containerization for transportation and off-site disposal. Transloading unit cost based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Contractor tonnage for transloading calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY), plus anticipated identified debris tonnage (converted using a factor of 1.58 ton/CY).
5	**l4**	Transportation and disposal unit cost at a Subtitle C landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from mixed TSCA/RCRA waste volume not requiring stabilization (converted using a factor of 1.45 ton/CY).
5	**m1**	For RAAs 24B through 24G, assumes all containerized Washington State dangerous waste, TSCA waste, and mixed TSCA/RCRA is directly loaded into trucks prior to being transferered. Cost assumptions are based on contractor bid reviews, similar project estimates, and Anchor QEA's professional judgment.
5	**m2**	For RAAs 24C through 24G, assumes procurement and delivery of cement required for stabilization of mixed TSCA/RCRA hazardous waste containing metals (arsenic, cadmium, chromium, lead, or mercury) at concentrations equal to or greater than regulatory criteria and TSCA waste containing PCB concentrations greater than or equal to 50 ppm. Assumes a cement amendment rate of 10 percent by weight based on the total wet tonnage of TSCA/RCRA hazardous material.
5	**m3**	For RAAs 24C through 24G, stabilization is assumed to be conducted by mixing cement into the sediment prior to upland truck transport. Equipment and labor cost assumptions are based on contractor bid reviews, similar project estimates, and Anchor QEA's professional judgment. Assumes containerized mixed TSCA/RCRA hazardous material containing elevated PCB and metal (arsenic, cadmium, chromium, lead, or mercury) concentrations requires stabilization prior to Subtitle C landfill disposal.
5	**m4**	For RAAs 24C through 24G, assumes all containerized Washington State dangerous waste, TSCA waste, and mixed TSCA/RCRA waste material is transferred at a permitted intermodal facility prior to shipment to a Subtitle C landfill. Cost assumptions are based on contractor bid reviews, similar project estimates, and Anchor QEA's professional judgment.
5	**m6**	For RAAs 24C through 24G, transportation and disposal unit cost for TSCA waste and mixed TSCA/RCRA waste at a Subtitle C landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from mixed TSCA/RCRA waste volume not requiring stabilization (converted using a factor of 1.45 ton/CY).
5	**m5**	For RAA 24B, transportation and disposal unit cost for containerized Washington State dangerous waste at a Subtitle D landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY).

5	**n**	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.
5	**o**	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).
5	**p**	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 and to be disposed at a Subtitle D landfill facility
5	**q**	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 TSCA waste and mixed TSCA/RCRA waste at a Subtitle C landfill facility
5	**r**	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 2-ft targeted placement thickness (plus a 6-in vertical placement tolerance) for sloped RMC and standard cap filter layer at 6-in minimum thickness (plus 6-in maximum overplacement allowance), modified cap habitat layer at 18-in minimum thickness (plus 6-in maximum overplacement allowance), and utility crossing cover (AST D at RAA 9K) at 2-ft thickness.
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 ofstandard 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 RMC (including the neatline, daylight and perimeter) 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 RMC (including the neatline, daylight and perimeter) 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**	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	**n**	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	**o**	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	**p**	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	**q**	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.
6	**r**	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	**s**	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 sloped RMC and engineered cap erosion protection layer and is estimated to be 730 CY/10-hour shift.
6	**t**	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	**u**	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 sloped RMC is estimated to be 540 CY/10-hour shift.
6	**v**	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	**w**	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	**x**	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 sloped RMC is estimated to be 410 CY/10-hour shift.
6	**y**	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 sloped RMC and engineered cap erosion protection layer and is estimated to be 390 CY/10-hour shift.
6	**z**	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	**aa**	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.
7		**Environmental Controls**
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.
8		**Habitat Enhancement (TBD)**
8	**a**	TBD
		Direct construction costs subtotal is the sum of costs from all direct construction tasks.
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.
		Direct construction costs subtotal with contingency is the sum of direct construction cost subtotal and contingency costs.
10		Sales tax is included at 10.55% (to account for Washington State [6.5%] and the City of Seattle [4.05%] taxes).
		Total LDW middle reach direct construction costs are the sum of direct construction cost subtotal, contingency costs, and sales tax.

LDW UPPER REACH SMA 10 DIRECT CONSTRUCTION COSTS		
11		**Site Preparation**
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.
12		**Surveys**
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.
13		**Dredging, Excavation, Transloading, Upland Transportation, and Disposal**
13	**a**	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.
13	**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.
13	**d1**	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 1.45 TON/CY factor), and anticipated identified debris tonnage (converted with a 1.58 TON/CY factor).
13	**d2**	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 1.45 TON/CY factor) for material designated as non-hazardous waste.
13	**e3**	Sediment designated as Washington State dangerous waste is assumed to require containerization for transportation and off-site disposal. Transloading unit cost based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Contractor tonnage for transloading calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY), plus anticipated identified debris tonnage (converted using a factor of 1.58 ton/CY).
13	**e4**	Transportation and disposal unit cost for containerized Washington State dangerous waste at a Subtitle D landfill facility based on contractor bid reviews, construction cost estimates from recently completed Washington State projects, and Anchor QEA's professional judgment based on experience with similar projects. Tonnage for transportation and disposal calculated from dredged/excavated sediment and incidental debris volumes (converted using a factor of 1.45 ton/CY) for material designated as non-hazardous waste.
13	**f**	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.
13	**g**	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.
14		**Material Placement**
14	**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 upper 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.
14	**b**	Unit cost for gravelly sand for backfill and amended 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 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.
14	**c**	Unit cost for AC (to be used for amended ENR) 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.
14	**d**	Unit cost for blending AC uniformly into gravelly sand for amended ENR. Blending cost includes equipment and labor costs required for mixing.
14	**e**	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.
14	**f**	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 amended ENR is estimated to be 610 CY/10-hour shift.
		Direct construction costs subtotal with contingency is the sum of direct construction cost subtotal and contingency costs.
15	**a**	Direct construction contingency of 30% is applied to the direct construction costs subtotal.
		Total direct construction costs are the sum of direct construction cost subtotal, contingency costs, and sales tax.
16		Sales tax is included at 10.40% (to account for Washington State [6.5%] and the City of Tukwila [3.9%] taxes).
		Total LDW upper reach SMA 10 direct construction costs are the sum of direct construction cost subtotal, contingency costs, and sales tax.
		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.

INDIRECT CONSTRUCTION COSTS		
17		**Project management costs is assumed on an annual basis for the total construction duration.**
18		**Engineering support services cost is assumed on a construction season basis for the total construction duration.**
19		**Construction Quality Assurance**
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		**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.**
21		**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.**
		Indirect construction costs subtotal is the sum of costs from all indirect construction tasks.
22		Indirect construction contingency of 30% is applied to the indirect construction cost subtotal.
		Indirect construction costs subtotal with contingency is the sum of indirect construction cost subtotal and contingency costs.
		Total indirect construction costs are the sum of indirect construction cost subtotal and contingency costs.
ADDITIONAL CONSTRUCTION OVERSIGHT COSTS		
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.
		Additional construction oversight costs subtotal is the sum of costs from implementing oversight and EPA oversight tasks.
24		Additional construction oversight contingency of 30% is applied to the additional construction oversight cost subtotal.
		Additional construction oversight costs subtotal with contingency is the sum of additional construction oversight cost subtotal and contingency costs.
		Total additional construction oversight costs are the sum of additional construction oversight cost subtotal and contingency costs.
25		**Total project cost is the sum of total direct construction costs, indirect construction costs, and additional construction oversight costs.**

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

			Dredge Quantities								RMC Placement Quantities				Coarse Sand	Sloped RMC Placement Quantities		Gravel	*Perimeter RMC Area*				Backfill Placement Quantities					Required ENR/ Amended Cover	Cap Surface Area			Cap Daylight Volume		
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	*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)*	Total Surface Area Based-Volume (Neatline +Daylight) (CY)	*Total RMC Volume (CY)*	*3H:1V Daylight RMC Volume (CY)*	*Vertical Placement Tolerance Volume (CY)*	*Total Daylight RMC Volume (CY)*	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)*	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	Neatline	Dredge, RMC	15,053		2,519		558		3,077	362	15,053		*15,053*	558	935			197	10,975	3,068	406	114							0	0	0			
	East			4,078		430		151	581			4,078	*4,078*	378															0	0	0			
	West			2,473		196		92	288			*2,473*	*2,473*	--		151	46													0			
1B	Neatline	Dredge and Standard Cap, RMC	12,274		3,423		455		3,878						513			42	10,039	2,832	372	105							12,274	0	12,274	21	62	171
	East			5,542		782		205	987			5,542	*5,542*	513															0	0	0			
	West			3,804		502		141	643			3,804	*3,804*	--		98	70													0			
2	Neatline	Dredge, RMC	2,976		220		110		331	72	2,976		*2,976*	110	110			127	6,175	2,175	229	81												
	East			950		36		41	77			950	*950*	--		109	18																
	West																																	
3	Neatline	AST: ENR Placement (Berthing Area)	--		--																							5,564						
	East			--		--																												
	West			--		--																												
4	Neatline	Dredge, RMC	4,638		344		172		515	112	4,638		*4,638*	172	172			166	7,675	2,547	284	94							821		821	16	131	--
	East			1,282		48		53	101			1,282	*1,282*	--		143	24																
	West																																	
5A	Neatline	AST: Amended ENR	--		--																							3,210						
	East			--		--																												
	West			--		--																												
5B	Neatline	Dredge and Modified Cap, RMC	821		91		30		122						71			0	2,293	806	85	30												
	East			763		65		49	114			763	*763*	71																			
	West																																	
6	Neatline	Dredge, Backfill to Grade	4,678		87		87		173	113									6,578	1,527	244	57	4,678		173	87	260	--						
	East			341		3		6	9															341	9	6	15							
	West																																	
7	Neatline (east)	Dredge, Backfill/RMC	3,328		720		123		844	80	3,328		*3,328*	123	123			114	6,523	1,685	242	62						--						
	Neatline (west)		2,521		546		93		639	61													2,521		639	47	686							
	East			1,685		217		217	433			1,685	*1,685*	--		**83**	**31**																
	West			3,465		445		445	891															3,465	891	64	955							
8A	Neatline	Dredge, Backfill to Grade	10,931		202		202		405	263									1,259	147	47	5	10,931		405	202	607	--						
	East			125		2		4	6															125	6	2	9							
	West																																	
8B	Neatline	Dredge and Modified Cap, Backfill to Grade	8,724		1,454		323		1,777										2,364	372	88	14						--	8,724		8,724			
	East			415		209		104	313															415	313	8	8				0	65	248	--
	West																														0			
8C	Neatline	AST: Amended ENR	--		--																							17,030						
	East			--		--																												
	West			--		--																												
8D	Neatline (east)	Dredge, Backfill to Grade/RMC	5,676		210		210		420	137					121			0	476	0	18	0	5,676		420	105	526	--						
	Neatline (west)		3,273		121		121		242	79	3,273		*3,273*	121																				
	East			681		5		12	17															681	17	13	29							
	West			0		5		12	17			0	*0*	0																				
8E	Neatline	Dredge, Backfill to Grade	5,048		841		187		1,028	122									2,569	0	95	0	5,048		1,028	93	1,122	--						
	East			1,787		183		91	273															1,787	273	33	307							
	West																																	
8F	Neatline	Dredge, Backfill to Grade	6,690		1,363		248		1,611	161									0	0	0	0	6,690		1,611	124	1,734	--						
	East			3,776		325		132	458																									
	West																																	
8G	Neatline	AST: Amended ENR	--		--																							931						
	East			--		--																												
	West			--		--																												
8H	Neatline	ENR Placement	--		--																							12,607						
	East			--		--																												
	West			--		--																												
9A	Neatline	Dredge and Modified Cap, Backfill to Grade	3,551		592		132		723										2,459	476	91	18						--	3,551	0	3,551	5	71	--
	East			900		96		48	144															900	144	17	85				0			
	West																														0			
9B	Neatline	Dredge, Backfill to Grade	9,754		1,084		361		1,445	235									847	74	31	3	9,754		1,445	181	1,626	--						
	East			179		11		8	19															179	19	3	23							
	West																																	
9C	Neatline	Dredge, Backfill to Grade	3,948		366		146		512	95									0	0	0	0	3,948		512	73	585	--						
	East			0		--		20	20															0			0							
	West																																	
9D	Neatline	Dredge and Modified Cap	1,661		246		62		308										0	0	0	0						--	1,661	0	1,661			
	East			1,318		59		33	92																					0	1,318	1,318			
	West																													0	0	0			
9E	Neatline (east)	Dredge, Backfill to Grade/RMC	20,210		749		749		1,497	487					166			0	0	0	0	0	20,210		1,497	374	1,871	--						
	Neatline (west)		4,486		166		166		332	108	4,486		*4,486*	166																				
	East			200		1		3	4															200	4	4	8							
	West			0		1		3	4			0	*0*	0																				
9F	Neatline	Dredge, Backfill to Grade	9,526		1,411		353		1,764	229									0	0	0	0	9,526		1,764	176	1,941	--						
	East			984		89		50	139															984	139	18	158							
	West																																	
9G	Neatline	Dredge, RMC	15,096		3,254		559		3,813	363	15,096		*15,096*	559	559	**710**	**151**	969	4,216	887	156	33												
	East			8,139		1,061		301	1,362			8,139	*8,139*	--		**108**																		
	West																																	
9H	Neatline (east)	Dredge, Backfill to Grade/RMC	4,239		1,099		157		1,256	102					90			0	0	0	0	0	4,239		1,256	78	1,334							
	Neatline (west)		2,430		630		90		720	59	2,430		*2,430*	90																				
	East			0		0		0	0															0	0	0	0							
	West			--		--		0	0																									
9I	Neatline (east)	Dredge, Backfill to Grade/RMC	33,102		3,154		1,226		4,380	797					202			0	4,468	944	165	35	33,102		4,380	613	4,993							
	Neatline (west)		5,462		521		202		723	131	5,462		*5,462*	202																				
	East			1,942		101		146	247															1,942	247	36	283							
	West			--		--		0	0																									
9J	Neatline (east)	Dredge and Standard Cap, RMC	49,373		19,572		1,829		21,401						0	**1,378**	**491**	3,516	13,226	2,408	490	89							49,373	0	49,373	40	120	329
	East			26,514		6,181		982	7,163			26,514	*26,514*	--		**2,136**														0	0			
	West																																	
9K	Neatline	AST: Dredge and Utility Crossing Cover, RMC	5,456		715		202		917	131					205			0	5,359	1,554	198	58												
	East			2,209		163		82	245			2,209	*2,209*	205																				
	West																																	
9L	Neatline	AST: Amended ENR	--		--																							1,097						
	East			--		--																												
	West			--		--																												
9M		AST: Amended ENR	--		--																							1,610						
				--		--																												
10	Neatline	*No remedial action for 30%*																																
	East																																	
	West																																	
11	Neatline	Dredge, RMC	46,198		20,454		1,711		22,165	1,112	46,198		*46,198*	1,711	1,711	**1,587**	**544**	6,191	20,194	5,287	748	196												
	East			29,368		7,484		1,088	8,572			29,368	*29,368*	--		**4,060**																		
	West																																	
12	Neatline	Dredge, Backfill to Grade	6,671		371		247		618	161									10,189	2,009	377	74	6,671		618	124	741	--						
	East			1,361		37		56	93															1,361	93	25	118							
	West																																	
13	Neatline	*No remedial action for 30%*																										--						
	East																																	
	West																																	

Attachment N.1.4
LDW Middle Reach Detailed Quantities and Notes

	Remedial Action		Dredge Quantities								RMC Placement Quantities				Coarse Sand	Sloped RMC Placement Quantities		Gravel	*Perimeter RMC Area*				Backfill Placement Quantities					Required ENR/ Amended Cover	Cap Surface Area			Cap Daylight Volume		
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	*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)*	Total Surface Area Based-Volume (Neatline +Daylight) (CY)	*Total RMC Volume (CY)*	*3H:1V Daylight RMC Volume (CY)*	*Vertical Placement Tolerance Volume (CY)*	*Total Daylight RMC Volume (CY)*	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)*	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)
14A	Neatline	Dredge and Standard Cap, RMC	19,099		12,372		707		13,079						0			3,025	7,355	1,634	272	61						--	19,099	0	19,099	15	44	120
	East			14,169		4,199		525	4,724			14,169	*14,169*	--		**2,941**	**262**													0				
	West																													0				
14B	Neatline	Dredge and RMC	22,347		7,994		828		8,822		22,347		*22,347*	828	828			1,437	11,156	1,747	413	65						--	0		0			
	East			11,759		2,262		436	2,698			11,759	*11,759*	--		**1,219**	**218**												0	0	0			
	West																												0	0	0			
15A	Neatline	Dredge, RMC	8,642		1,731		320		2,051	208	8,642		*8,642*	320	320			571	2,158	269	80	10						--						
	East			4,570		580		169	749			4,570	*4,570*	--		**487**	**85**																	
	West			--		--																												
15B	Neatline	Dredge and Standard Cap	9,631		2,454		357		2,811										6,863	848	254	31						--	9,631	0	9,631	14	42	115
	East			4,784		574			574																				0	0	0			
	West			--		--																							0	0	0			
16	Neatline	Dredge, Backfill to Grade	3,460		128		128		256	83									2,158	269	80	10	3,460		256	64	320							
	East			1,253		7		15	21															1,253	21	23	45							
	West																																	
17	Neatline	Dredge, Backfill to Grade	7,187		266		266		532	173									5,874	1,250	218	46	7,187		532	133	665							
	East			646		12		26	38															646	38	12	49							
	West																																	
18	Neatline	Dredge, RMC	3,356		124		124		249	81	3,356		*3,356*	124	124			0	6,487	1,808	240	67						--						
	East			798		15		31	45			798	798																					
	West																																	
19	Neatline	Dredge, RMC	1,971		73		73		146	47	1,971		*1,971*	73	73	30	8	38	5,277	1,938	195	72												
	East			429		8		17	24			429	*429*	--																				
	West																																	
20A	Neatline	AST: Amended ENR on Rip Rap																										25,598						
	East																																	
	West																																	
20B	Neatline	Dredge and Modified Cap, Backfill to Grade	9,627		1,069		357		1,426										4,304	930	159	34	9,627		1,426	178	1,604		9,627		9,627			
	East			3,100		159		167	326															3,100	326	57	383				0			
	West																														0			
21A	Neatline	Dredge, Backfill to Grade	5,205		771		193		964	125									3,477	695	129	26	5,205		964	96	1,060							
	East			1,412		137		76	213															1,412	213	26	239							
	West																																	
21B	Neatline	ENR Placement																										41,672						
	East																																	
	West																																	
21C	Neatline	Dredge, Backfill to Grade	1,323		24		24		49	32									0	0	0	0	1,323		49	24	73							
	East			187		1		3	5															187	5	3	8							
	West																																	
22	Neatline	Dredge and Standard Cap, Backfill/RMC	101,308		39,913		3,752		43,665						7,000			3,040	60,712	13,390	2,249	496						--	101,308	0	101,308	119	358	985
	East			75,596		16,697		2,800	19,497			75,596	*75,596*	7,000																0				
	West			0		0		0	0			0	*0*	0		**4,503**	**0**												0	0	0			
23A	Neatline	Dredge and Standard Cap, Backfill	16,393		897		607		7,941										37,801	6,838	1,400	253						--	16,393	0	16,393	46	137	375
	Neatline			68,331		6,437																								68,331				
	East			9,767		649		362	1,011															9,767	1,011	181	634				0			
	West			0		0		0	0																									
23B	Neatline	ENR Placement																										2,179						
	East																																	
	West																																	
24A	Neatline	ENR Placement																										1,415						
	East																																	
	West																																	
24B	Neatline	Dredge, Backfill to Grade	2,928		217		108		325	70													2,928		325	54	380							
	East			0																				0										
	West																																	
24C	Neatline	Dredge, Backfill to Grade	12,887		3,875		477		4,352	310													12,887		4,352	239	4,591							
	East			0																				0										
	West																																	
24D	Neatline	Dredge, Backfill to Grade	8,618		2,672		319		2,991	207													8,618		2,991	160	3,151							
	East			0																				0										
	West																																	
24E	Neatline	Dredge, Backfill to Grade	3,767		488		140		628	91													3,767		628	70	698							
	East			0																				0										
	West																																	
24F	Neatline	Dredge, Backfill to Grade	4,217		234		156		390	102													4,217		390	78	469							
	East			0																				0										
	West																																	
24G	Neatline	Dredge, Backfill to Grade	4,080		680		151		831	98													4,080		831	76	907							
	East			0																				0										
	West																																	
24H	Neatline	Dredge, Backfill to Grade	5,704		317		211		528	137									3,669	804	136	30	5,704		528	106	634							
	East			404		16		24	40															404	40	7	48							
	West																																	
24I	Neatline	Dredge and Modified Cap, Backfill to Grade	2,502		371		93		463										1,046	314	39	12						--	2,502		2,502	5	40	--
	East			326		36		20	55															326	55	6	16				0			
	West																														0			
24J	Neatline	Dredge, Backfill to Grade	4,151		154		154		307	100									1,942	354	72	13	4,151		307	77	384							
	East			794		11		25	36															794	36	15	50							
	West																																	
25	Neatline	ENR Placement	--		--																							1,931						
	East			--		--																													
	West			--		--																													
26	Neatline	AST: Modified Cap on Grade	--		--																							--	1,794		1,794			
	East			--		--																									0				
	West			--		--																									0				
27A	Neatline	Dredge, Backfill to Grade	19,502		1,806		722		2,528	469									8,641	2,184	320	81	19,502		2,528	361	2,889							
	East			2,337		163		138	301															2,337	301	43	344							
	West																																	
27B	Neatline	ENR Placement	--		--																							40,483						
	East			--		--																													
	West			--		--																													
27C	Neatline	Dredge, Backfill to Grade	8,166		1,059		302		1,361	197									5,900	1,927	219	71	8,166		1,361	151	1,512							
	East			2,665		282		170	452															2,665	452	49	502							
	West																																	
27D	Neatline	ENR Placement																										8,125						
	East																																	
	West																																	
28	Neatline	ENR Placement																										7,417						
	East																																	
	West																																	
29	Neatline	Dredge, Backfill to Grade	3,576		66		66		132	86									5,237	1,758	194	65	3,576		132	66	199							
	East			650		4		8	12															650	12	12	24							
	West																																	
30A	Neatline	Standard Cap Only	--		--																								7,554	0	7,554			
	East			--		--																								0	0	0			
	West			--		--																								0	0	0			
30B	Neatline	Dredge and Standard Cap, RMC	54,798		4,492		2,030		6,522																				54,798	0	54,798			
	East			16,251		1,951		602	2,553			16,251	*16,251*	--	0	**655**	**301**	480	11,438	1,922	424	71							0	0	0	39	117	321
	West																												0	0	0			

Attachment N.1.4
LDW Middle Reach Detailed Quantities and Notes

	Remedial Action		Dredge Quantities								RMC Placement Quantities				Coarse Sand	Sloped RMC Placement Quantities		Gravel	*Perimeter RMC Area*				Backfill Placement Quantities					Required ENR/ Amended Cover	Cap Surface Area			Cap Daylight Volume		
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	*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)*	Total Surface Area Based-Volume (Neatline +Daylight) (CY)	*Total RMC Volume (CY)*	*3H:1V Daylight RMC Volume (CY)*	*Vertical Placement Tolerance Volume (CY)*	*Total Daylight RMC Volume (CY)*	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)*	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)
30C	Neatline	AST: Dredge and Standard Cap, RMC	30,581		11,516		1,133		12,649						0			4,693	6,617	1,362	245	50							30,581		30,581	19	56	154
	East			8,471		2,119		314	2,433			8,471	*8,471*	--		**4,765**	**157**												0				
	West			14,397		4,790			4,790																				0				
30D	Neatline	Dredge and Standard Cap, RMC	24,806		11,274		919		12,193						0			1,265	2,525	631	94	23						--	24,806	0	24,806			
	East																												See RAA 31B	0	0			
	West			6,064		2,016		225	2,241			6,064	*6,064*	--		**1,153**	**112**												0	0			
30E	Neatline	Dredge and Standard Cap, RMC	35,159		15,987		1,302		17,289						0			1,077	3,517	879	130	33						--	35,159		35,159			
	East																												See RAA 31B	0	0			
	West			7,215		2,441		267	2,708			7,215	*7,215*	--		**944**	**134**												0	0			
30F	Neatline	Dredge and Standard Cap, RMC	41,216		18,699		1,527		20,226						0			3,746	9,359	1,681	347	62						--	41,216		41,216			
	East			8,717		5,803		323	6,126			8,717	*8,717*	--		**3,787**	**161**												0	0	0	17	50	137
	West																												0	0	0			
30G	Neatline	Dredge and Standard Cap, RMC	60,015		33,103		2,223		35,326						0			6,495	11,272	3,544	417	131							60,015		60,015			
	East			26,864		8,861		995	9,856			26,864	*26,864*	--		**6,273**	**497**												0	0	0	23	68	186
	West																												0	0	0			
30H	Neatline	Dredge and Standard Cap, RMC	35,527		16,940		1,316		18,256						0			5,836	18,138	3,772	672	140							35,527		35,527			
	East			18,137		4,685		672	5,357			18,137	*18,137*	--		**5,794**	**336**												0	0	0	24	72	198
	West																												0	0	0			
31A	Neatline	ENR Placement																										6,714						
	East																																	
	West																																	
31B	Neatline	Dredge and Standard Cap	12,480		4,683		462		5,145																				12,480	0	12,480			
	East																												--	0	0			
	West																												0	0	0			
31C	Neatline	Dredge and Standard Cap	26,379		9,023		977		10,000																				26,379	0	26,379			
	East																											--	0	0	0			
	West																												0	0	0			
31D	Neatline	Dredge and Modified Cap	3,171		352		117		470										0	0	0	0						--	3,171	0	3,171			
	East																												0	--	0			
	West																												0	0	0			
32	Neatline	ENR Placement	--		--																							10,304						
	East			--		--																													
	West			--		--																													
33	Neatline	ENR Placement	--		--																							2,513						
	East			--		--																													
	West			--		--																													
34A	Neatline	Dredge, Backfill to Grade	7,040		1,474		261		1,735	169													7,040		1,735	130	1,865							
	East			5,835		1,035		216	1,251										6,658	1,619	247	60		5,835	1,251	108	1,359							
	West																																	
34B	Neatline	Dredge, Backfill to Grade, RMC	9,352		692		346		1,038	225	9,352		*9,352*	346									9,352		1,038	173	1,212							
	East			1,114		41		76	117			1,114	*1,114*	--	346	145	21	165	7,306	2,117	271	78												
	West																																	
35A	Neatline	Dredge, Backfill to Grade	12,642		234		234		468	304													12,642		468	234	702							
	East			508		4		9	13										6,163	1,217	228	45		508	13	9	23							
	West																																	
35B	Neatline	ENR Placement	--		--																							5,359						
	East			--		--																													
	West			--		--																													
36	Neatline	Dredge, Backfill to Grade	7,929		587		294		881	191													7,929		881	147	1,028							
	East			2,329		64		71	135										9,851	2,194	365	81		2,329	135	43	178							
	West																																	

Total Quantities Throughout Site								RMC Placement Quantities					Sloped RMC Placement Quantities			Perimeter RMC Area				Backfill Placement Quantities					ENR/ Amended ENR Surface Area	Cap Surface Area			Cap Daylight Volume		
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)	Total Surface Area Based-Volume (Neatline +Daylight) (CY)	Total RMC Volume (CY)	3H:1V Daylight RMC Volume (CY)	Vertical Placement Tolerance Volume (CY)	Total Daylight RMC Volume (CY)	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)	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)
958,534	**424,162**	**275,337**	**84,797**	**34,887**	**13,354**	**408,374**	**9,078**	**148,608**	**286,960**	***435,568***	***13,670***	**13,670**	**43,257**	**3,666**	**43,189**	**390,784**	**88,693**	**14,473**	**3,285**	**264,354**	**44,596**	**43,538**	**5,721**	**48,269**	**195,760**	**568,444**	**69,649**	**638,093**	**465**	**1,614**	**3,091**

	Remedial Action		Dredge/Excavation Volume Distribution					Coarse Sand (RMC)				Gravel Spalls (Daylight 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				
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	Open Water Dredging (CY)	Nearshore / Slope/ Slow Dredging (CY)	Restricted Access Dredging (CY)	Land-based Excavation (Shoreline/ Bank) (CY)	Tidally Restricted Dredging (CY)	Neatline + Daylight RMC (Open Water) (CY)	Neatline + Daylight RMC (Nearshore) (CY)	Neatline + Daylight RMC (Restricted Access) (CY)	Neatline + Daylight RMC (Tidally Restricted) (CY)	Daylight RMC (Open Water) (CY)	Daylight RMC (Restricted Access) (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)	ENR (Tidally Restricted) (CY)
1A	Neatline East West	Dredge, RMC	3,945	0	0	0	0	935	0	0	0	197	0	406	114	0	0	0	0	0	0	0	0	0	0					
1B	Neatline East West	Dredge and Standard Cap, RMC	5,508	0	0	0	0	513	0	0	0	42	0	372	105	0	0	0	0	0	0	0	0	0	0					
2	Neatline East West	Dredge, RMC	408	0	0	0	0	110	0	0	0	127	0	229	81	0	0	0	0	0	0	0	0	0	0					
3	Neatline East West	AST: ENR Placement (Berthing Area)	0	0	0	0	0																			0	0	206	0	0
4	Neatline East West	Dredge, RMC	616	0	0	0	0	172	0	0	0	166	0	284	94	0	0	0	0	0	0	0	0	0	0					
5A	Neatline East West	AST: Amended ENR	0	0	0	0	0																							
5B	Neatline East West	Dredge and Modified Cap, RMC	0	0	236	0	0	0	0	71	0	0	0	0	0	0	0	85	30	0	0	0	0	0	0					
6	Neatline East West	Dredge, Backfill to Grade	0	0	0	0	182							0	0	0	0	0	0	0	0	0	0	244	57					
7	Neatline (east) Neatline (west) East West	Dredge, Backfill/RMC	2,807	0	0	0	0	123	0	0	0	114	0	242	62	0	0	0	0	0	0	0	0	0	0					
8A	Neatline East West	Dredge, Backfill to Grade	0	82	41	0	288							0	0	9	1	5	1	0	0	0	0	33	4					
8B	Neatline East West	Dredge and Modified Cap, Backfill to Grade	0	2,090	0	0	0							0	0	88	14	0	0	0	0	0	0	0	0					
8C	Neatline East West	AST: Amended ENR	0	0	0	0	0																							
8D	Neatline (east) Neatline (west) East West	Dredge, Backfill to Grade/RMC	174	0	522	0	0	30	0	91	0	0	0	4	0	0	0	13	0	0	0	0	0	0	0					
8E	Neatline East West	Dredge, Backfill to Grade	325	0	976	0	0							24	0	0	0	71	0	0	0	0	0	0	0					
8F	Neatline East West	Dredge, Backfill to Grade	0	0	1,551	0	517							0	0	0	0	0	0	0	0	0	0	0	0					
8G	Neatline East West	AST: Amended ENR	0	0	0	0	0																							
8H	Neatline East West	ENR Placement	0	0	0	0	0																			0	47	93	0	327
9A	Neatline East West	Dredge and Modified Cap, Backfill to Grade	0	0	0	0	867							0	0	0	0	0	0	0	0	0	0	91	18					
9B	Neatline East West	Dredge, Backfill to Grade	0	732	0	0	732							0	0	16	1	0	0	0	0	0	0	16	1					
9C	Neatline East West	Dredge, Backfill to Grade	0	0	0	0	532							0	0	0	0	0	0	0	0	0	0	0	0					
9D	Neatline East West	Dredge and Modified Cap	0	0	0	0	400							0	0	0	0	0	0	0	0	0	0	0	0					
9E	Neatline (east) Neatline (west) East West	Dredge, Backfill to Grade/RMC	919	919	0	0	0	83	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
9F	Neatline East West	Dredge, Backfill to Grade	0	952	0	0	952							0	0	0	0	0	0	0	0	0	0	0	0					
9G	Neatline East West	Dredge, RMC	5,176	0	0	0	0	559	0	0	0	969	0	156	33	0	0	0	0	0	0	0	0	0	0					
9H	Neatline (east) Neatline (west) East West	Dredge, Backfill to Grade/RMC	1,976	0	0	0	0	90	0	0	0	0	0																	
9I	Neatline (east) Neatline (west) East West	Dredge, Backfill to Grade/RMC	0	2,675	0	0	2,675	0	101	0	101	0	0	0	0	83	17	0	0	0	0	0	0	83	17					
9J	Neatline (east) East West	Dredge and Standard Cap, RMC	28,564	0	0	0	0	0	0	0	0	3,516	0	490	89	0	0	0	0	0	0	0	0	0	0					
9K	Neatline East West	AST: Dredge and Utility Crossing Cover, RMC	1,162	0	0	0	0	205	0	0	0	0	0	198	58	0	0	0	0	0	0	0	0	0	0					
9L	Neatline East West	AST: Amended ENR	0	0	0	0	0																							
9M		AST: Amended ENR	0	0	0	0	0																							
10	Neatline East West	*No remedial action for 30%*																												
11	Neatline East West	Dredge, RMC	30,737	0	0	0	0	1,711	0	0	0	6,191	0	748	196	0	0	0	0	0	0	0	0	0	0					
12	Neatline East West	Dredge, Backfill to Grade	0	711	0	0	0							0	0	377	74	0	0	0	0	0	0	0	0					
13	Neatline East West	*No remedial action for 30%*	0	0	0	0	0																							

	Remedial Action		Dredge/Excavation Volume Distribution					Coarse Sand (RMC)				Gravel Spalls (Daylight 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				
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	Open Water Dredging (CY)	Nearshore / Slope/ Slow Dredging (CY)	Restricted Access Dredging (CY)	Land-based Excavation (Shoreline/ Bank) (CY)	Tidally Restricted Dredging (CY)	Neatline + Daylight RMC (Open Water) (CY)	Neatline + Daylight RMC (Nearshore) (CY)	Neatline + Daylight RMC (Restricted Access) (CY)	Neatline + Daylight RMC (Tidally Restricted) (CY)	Daylight RMC (Open Water) (CY)	Daylight RMC (Restricted Access) (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)	ENR (Tidally Restricted) (CY)
14A	Neatline East West	Dredge and Standard Cap, RMC	17,803	0	0	0	0	0	0	0	0	3,025	0	272	61	0	0	0	0	0	0	0	0	0					
14B	Neatline East West	Dredge and RMC	11,519	0	0	0	0	828	0	0	0	1,437	0	413	65	0	0	0	0	0	0	0	0	0					
15A	Neatline East West	Dredge, RMC	2,800	0	0	0	0	320	0	0	0	571	0	80	10	0	0	0	0	0	0	0	0	0					
15B	Neatline East West	Dredge and Standard Cap	3,385	0	0	0	0							254	31	0	0	0	0	0	0	0	0	0					
16	Neatline East West	Dredge, Backfill to Grade	139	0	139	0	0							40	5	0	0	40	5	0	0	0	0	0					
17	Neatline East West	Dredge, Backfill to Grade	0	570	0	0	0							0	0	218	46	0	0	0	0	0	0	0					
18	Neatline East West	Dredge, RMC	294	0	0	0	0	124	0	0	0	0	0	240	67	0	0	0	0	0	0	0	0	0					
19	Neatline East West	Dredge, RMC	170	0	0	0	0	73	0	0	0	38	0	195	72	0	0	0	0	0	0	0	0	0					
20A	Neatline East West	AST: Amended ENR on Rip Rap	0	0	0	0	0																						
20B	Neatline East West	Dredge and Modified Cap, Backfill to Grade	0	1,751	0	0	0							0	0	159	34	0	0	0	0	0	0	0					
21A	Neatline East West	Dredge, Backfill to Grade	0	0	1,177	0	0							0	0	0	0	129	26	0	0	0	0	0					
21B	Neatline East West	ENR Placement	0	0	0	0	0																		0	772	0	0	772
21C	Neatline East West	Dredge, Backfill to Grade	0	0	54	0	0							0	0	0	0	0	0	0	0	0	0	0					
22	Neatline East West	Dredge and Standard Cap, Backfill/RMC	63,162	0	0	0	0	7,000	0	0	0	3,040	0	2,249	496	0	0	0	0	0	0	0	0	0					
23A	Neatline Neatline East West	Dredge and Standard Cap, Backfill	8,952	0	0	0	0							1,400	253	0	0	0	0	0	0	0	0	0					
23B	Neatline East West	ENR Placement	0	0	0	0	0																		81	0	0	0	0
24A	Neatline East West	ENR Placement	0	0	0	0	0																		0	0	0	0	52
24B	Neatline East West	Dredge, Backfill to Grade	0	0	0	325	0																						
24C	Neatline East West	Dredge, Backfill to Grade	0	0	0	4,352	0																						
24D	Neatline East West	Dredge, Backfill to Grade	0	0	0	2,991	0																						
24E	Neatline East West	Dredge, Backfill to Grade	0	0	0	0	628																						
24F	Neatline East West	Dredge, Backfill to Grade	0	0	0	0	390																						
24G	Neatline East West	Dredge, Backfill to Grade	0	0	0	0	831																						
24H	Neatline East West	Dredge, Backfill to Grade	0	0	0	0	568							0	0	0	0	0	0	0	0	0	0	136	30				
24I	Neatline East West	Dredge and Modified Cap, Backfill to Grade	0	519	0	0	0							0	0	39	12	0	0	0	0	0	0	0	0				
24J	Neatline East West	Dredge, Backfill to Grade	0	343	0	0	0							0	0	72	13	0	0	0	0	0	0	0	0				
25	Neatline East West	ENR Placement	0	0	0	0	0																		0	0	72	0	0
26	Neatline East West	AST: Modified Cap on Grade	0	0	0	0	0																						
27A	Neatline East West	Dredge, Backfill to Grade	0	2,829	0	0	0							0	0	320	81	0	0	0	0	0	0	0	0				
27B	Neatline East West	ENR Placement	0	0	0	0	0																		0	0	1,499	0	0
27C	Neatline East West	Dredge, Backfill to Grade	0	0	1,360	0	453							0	0	0	0	164	54	0	0	0	0	55	18				
27D	Neatline East West	ENR Placement	0	0	0	0	0																		301	0	0	0	0
28	Neatline East West	ENR Placement	0	0	0	0	0																		0	0	275	0	0
29	Neatline East West	Dredge, Backfill to Grade	0	0	145	0	0							0	0	0	0	194	65	0	0	0	0	0	0				
30A	Neatline East West	Standard Cap Only	0	0	0	0	0																						
30B	Neatline East West	Dredge and Standard Cap, RMC	3,176	0	5,898	0	0	0	0	0	0	168	312	148	25	0	0	275	46	0	0	0	0	0	0				

Attachment N.1.4
LDW Middle Reach Detailed Quantities and Notes

	Remedial Action		Dredge/Excavation Volume Distribution					Coarse Sand (RMC)				Gravel Spalls (Daylight 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				
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	Open Water Dredging (CY)	Nearshore / Slope/ Slow Dredging (CY)	Restricted Access Dredging (CY)	Land-based Excavation (Shoreline/ Bank) (CY)	Tidally Restricted Dredging (CY)	Neatline + Daylight RMC (Open Water) (CY)	Neatline + Daylight RMC (Nearshore) (CY)	Neatline + Daylight RMC (Restricted Access) (CY)	Neatline + Daylight RMC (Tidally Restricted) (CY)	Daylight RMC (Open Water) (CY)	Daylight RMC (Restricted Access) (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)	ENR (Tidally Restricted) (CY)
30C	Neatline	AST: Dredge and Standard Cap, RMC	14,904	0	4,968	0	0	0	0	0	0	3,520	1,173	184	38	0	0	61	13	0	0	0	0	0	0					
	East																													
	West																													
30D	Neatline	Dredge and Standard Cap, RMC	14,433	0	0	0	0	0	0	0	0	1,265	0	94	23	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
30E	Neatline	Dredge and Standard Cap, RMC	19,997	0	0	0	0	0	0	0	0	1,077	0	130	33	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
30F	Neatline	Dredge and Standard Cap, RMC	26,351	0	0	0	0	0	0	0	0	3,746	0	347	62	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
30G	Neatline	Dredge and Standard Cap, RMC	45,182	0	0	0	0	0	0	0	0	6,495	0	417	131	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
30H	Neatline	Dredge and Standard Cap, RMC	23,613	0	0	0	0	0	0	0	0	5,836	0	672	140	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
31A	Neatline	ENR Placement	0	0	0	0	0																			0	0	249	0	0
	East																													
	West																													
31B	Neatline	Dredge and Standard Cap	0	5,145	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
31C	Neatline	Dredge and Standard Cap	0	10,000	0	0	0																							
	East																													
	West																													
31D	Neatline	Dredge and Modified Cap	0	470	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
32	Neatline	ENR Placement	0	0	0	0	0																			286	0	95	0	0
	East																													
	West																													
33	Neatline	ENR Placement	0	0	0	0	0																			93	0	0	0	0
	East																													
	West																													
34A	Neatline	Dredge, Backfill to Grade	0	2,986	0	0	0							0	0	247	60	0	0	0	0	0	0	0	0					
	East																													
	West																													
34B	Neatline	Dredge, Backfill to Grade, RMC	1,156	0	0	0	0	346	0	0	0	165	0	271	78	0	0	0	0	0	0	0	0	0	0					
	East																													
	West																													
35A	Neatline	Dredge, Backfill to Grade	0	482	0	0	0							0	0	228	45	0	0	0	0	0	0	0	0					
	East																													
	West																													
35B	Neatline	ENR Placement	0	0	0	0	0																			198	0	0	0	0
	East																													
	West																													
36	Neatline	Dredge, Backfill to Grade	0	1,016	0	0	0							0	0	365	81	0	0	0	0	0	0	0	0					
	East																													
	West																													

Open Water Dredging (CY)	Nearshore / Slope/ Slow Dredging (CY)	Restricted Access Dredging (CY)	Land-based Excavation (Shoreline/ Bank) (CY)	Tidally Restricted Dredging (CY)	Neatline + Daylight RMC (Open Water) (CY)	Neatline + Daylight RMC (Nearshore) (CY)	Neatline + Daylight RMC (Restricted Access) (CY)	Neatline + Daylight RMC (Tidally Restricted) (CY)	Daylight RMC (Open Water) (CY)	Daylight RMC (Restricted Access) (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)	ENR (Tidally Restricted) (CY)
339,352	34,271	17,068	7,669	10,015	13,223	184	162	101	41,704	1,485	10,560	2,421	2,220	481	1,037	239	0	0	0	0	656	144	959	818	2,489	0	1,151

	Remedial Action		Gravelly Sand Blended with Activated Carbon (Amended ENR) - RAA 5A, 8C, 8G. 9L, 9M, and 20A			Gravelly Sand Material (Backfill)						Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	Amended ENR (Nearshore) (CY)	Amended ENR (Restricted Access - Underpier) (CY)	Amended ENR (Tidally Restricted) (CY)	Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Restricted Access - Underpier) (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	Neatline	Dredge, RMC																					
	East																						
	West																						
1B	Neatline	Dredge and Standard Cap, RMC										475	517	853	0	0	0	0	0	0	0	0	0
	East																						
	West																						
2	Neatline	Dredge, RMC																					
	East																						
	West																						
3	Neatline	AST: ENR Placement (Berthing Area)																					
	East																						
	West																						
4	Neatline	Dredge, RMC																					
	East																						
	West																						
5A	Neatline	AST: Amended ENR	0	59	59																		
	East																						
	West																						
5B	Neatline	Dredge and Modified Cap, RMC										0	0		0	0		62	222		0	0	
	East																						
	West																						
6	Neatline	Dredge, Backfill to Grade				0	0	0	0	0	260												
	East					0	0	0	0	0	15												
	West																						
7	Neatline (east)	Dredge, Backfill/RMC																					
	Neatline (west)					686	0	0	0	0	0												
	East																						
	West					955	0	0	0	0	0												
8A	Neatline	Dredge, Backfill to Grade				0	121	61	0	0	425												
	East					0	2	1	0	0	6												
	West																						
8B	Neatline	Dredge and Modified Cap, Backfill to Grade										0	0		872	1,217		0	0		0	0	
	East					0	8	0	0	0	0												
	West																						
8C	Neatline	AST: Amended ENR	0	631	0																		
	East																						
	West																						
8D	Neatline (east)	Dredge, Backfill to Grade/RMC				131	0	394	0	0	0												
	Neatline (west)																						
	East					7	0	22	0	0	0												
	West																						
8E	Neatline	Dredge, Backfill to Grade				280	0	841	0	0	0												
	East					77	0	230	0	0	0												
	West																						
8F	Neatline	Dredge, Backfill to Grade				0	0	1,301	0	0	434												
	East																						
	West																						
8G	Neatline	AST: Amended ENR	0	34	0																		
	East																						
	West																						
8H	Neatline	ENR Placement																					
	East																						
	West																						
9A	Neatline	Dredge and Modified Cap, Backfill to Grade										0	0		0	0		0	0		136	466	
	East					0	0	0	0	0	85												
	West																						
9B	Neatline	Dredge, Backfill to Grade				0	813	0	0	0	813												
	East					0	11	0	0	0	11												
	West																						
9C	Neatline	Dredge, Backfill to Grade				0	0	0	0	0	585												
	East					0	0	0	0	0	0												
	West																						
9D	Neatline	Dredge and Modified Cap										0	0		0	0		0	0		62	185	
	East																						
	West																						
9E	Neatline (east)	Dredge, Backfill to Grade/RMC				936	936	0	0	0	0												
	Neatline (west)																						
	East					4	4	0	0	0	0												
	West																						
9F	Neatline	Dredge, Backfill to Grade				0	970	0	0	0	970												
	East					0	79	0	0	0	79												
	West																						
9G	Neatline	Dredge, RMC																					
	East																						
	West																						
9H	Neatline (east)	Dredge, Backfill to Grade/RMC				1,334	0	0	0	0	0												
	Neatline (west)																						
	East					0	0	0	0	0	0												
	West																						
9I	Neatline (east)	Dredge, Backfill to Grade/RMC				0	2,497	0	0	0	2,497												
	Neatline (west)																						
	East					0	141	0	0	0	141												
	West																						
9J	Neatline (east)	Dredge and Standard Cap, RMC										1,869	1,948	3,072	0	0	0	0	0	0	0	0	0
	East																						
	West																						
9K	Neatline	AST: Dredge and Utility Crossing Cover, RMC				0	0	0	0	0	0		404			0			0			0	
	East																						
	West																						
9L	Neatline	AST: Amended ENR	0	41	0																		
	East																						
	West																						
9M		AST: Amended ENR	0	0	60																		
10	Neatline	*No remedial action for 30%*																					
	East																						
	West																						
11	Neatline	Dredge, RMC																					
	East																						
	West																						
12	Neatline	Dredge, Backfill to Grade				0	741	0	0	0	0												
	East					0	118	0	0	0	0												
	West																						
13	Neatline	*No remedial action for 30%*																					
	East																						
	West																						

Attachment N.1.4
LDW Middle Reach Detailed Quantities and Notes

	Remedial Action		Gravelly Sand Blended with Activated Carbon (Amended ENR) - RAA 5A, 8C, 8G. 9L, 9M, and 20A			Gravelly Sand Material (Backfill)						Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	Amended ENR (Nearshore) (CY)	Amended ENR (Restricted Access - Underpier) (CY)	Amended ENR (Tidally Restricted) (CY)	Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Restricted Access - Underpier) (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)
14A	Neatline	Dredge and Standard Cap, RMC										722	751	1,181	0	0	0	0	0	0	0	0	0
	East																						
	West																						
14B	Neatline	Dredge and RMC																					
	East																						
	West																						
15A	Neatline	Dredge, RMC																					
	East																						
	West																						
15B	Neatline	Dredge and Standard Cap										371	399	650	0	0	0	0	0	0	0	0	0
	East																						
	West																						
16	Neatline	Dredge, Backfill to Grade				160	0	160	0	0	0												
	East					22	0	22	0	0	0												
	West																						
17	Neatline	Dredge, Backfill to Grade				0	665	0	0	0	0												
	East					0	49	0	0	0	0												
	West																						
18	Neatline	Dredge, RMC																					
	East																						
	West																						
19	Neatline	Dredge, RMC																					
	East																						
	West																						
20A	Neatline	AST: Amended ENR on Rip Rap		474	474																		
	East																						
	West																						
20B	Neatline	Dredge and Modified Cap, Backfill to Grade				0	1,604	0	0	0	0	0	0		178	357		0	0		0	0	
	East					0	383	0	0	0	0												
	West																						
21A	Neatline	Dredge, Backfill to Grade				0	0	1,060	0	0	0												
	East					0	0	239	0	0	0												
	West																						
21B	Neatline	ENR Placement																					
	East																						
	West																						
21C	Neatline	Dredge, Backfill to Grade				0	0	73	0	0	0												
	East					0	0	8	0	0	0												
	West																						
22	Neatline	Dredge and Standard Cap, Backfill/RMC										3,872	4,110	6,613	0	0	0	0	0	0	0	0	0
	East																						
	West																						
23A	Neatline	Dredge and Standard Cap, Backfill										607	607	911	0	0	0	0	0	0	0	0	0
	Neatline											2,576	2,667	4,172	0	0	0	0	0	0	0	0	0
	East					634	0	0	0	0	0												
	West																						
23B	Neatline	ENR Placement																					
	East																						
	West																						
24A	Neatline	ENR Placement																					
	East																						
	West																						
24B	Neatline	Dredge, Backfill to Grade				0	0	0	0	380	0												
	East					0	0	0	0	0	0												
	West																						
24C	Neatline	Dredge, Backfill to Grade				0	0	0	0	4,591	0												
	East					0	0	0	0	0	0												
	West																						
24D	Neatline	Dredge, Backfill to Grade				0	0	0	0	3,151	0												
	East					0	0	0	0	0	0												
	West																						
24E	Neatline	Dredge, Backfill to Grade				0	0	0	0	0	698												
	East					0	0	0	0	0	0												
	West																						
24F	Neatline	Dredge, Backfill to Grade				0	0	0	0	0	469												
	East					0	0	0	0	0	0												
	West																						
24G	Neatline	Dredge, Backfill to Grade				0	0	0	0	0	907												
	East					0	0	0	0	0	0												
	West																						
24H	Neatline	Dredge, Backfill to Grade				0	0	0	0	0	634												
	East					0	0	0	0	0	48												
	West																						
24I	Neatline	Dredge and Modified Cap, Backfill to Grade										0	0		144	318		0	0		0	0	
	East					0	16	0	0	0	0												
	West																						
24J	Neatline	Dredge, Backfill to Grade				0	384	0	0	0	0												
	East					0	50	0	0	0	0												
	West																						
25	Neatline	ENR Placement																					
	East																						
	West																						
26	Neatline	AST: Modified Cap on Grade										0	0		0	0		66	538		0	0	
	East																						
	West																						
27A	Neatline	Dredge, Backfill to Grade				0	2,889	0	0	0	0												
	East					0	344	0	0	0	0												
	West																						
27B	Neatline	ENR Placement																					
	East																						
	West																						
27C	Neatline	Dredge, Backfill to Grade				0	0	1,134	0	0	378												
	East					0	0	376	0	0	125												
	West																						
27D	Neatline	ENR Placement																					
	East																						
	West																						
28	Neatline	ENR Placement																					
	East																						
	West																						
29	Neatline	Dredge, Backfill to Grade				0	0	199	0	0	0												
	East					0	0	24	0	0	0												
	West																						
30A	Neatline	Standard Cap Only										280	280	420	0	0	0	0	0	0	0	0	0
	East																						
	West																						
30B	Neatline	Dredge and Standard Cap, RMC										724	751	1,178	0	0	0	1,344	1,395	2,187	0	0	0
	East																						
	West																						

Attachment N.1.4
LDW Middle Reach Detailed Quantities and Notes

	Remedial Action		Gravelly Sand Blended with Activated Carbon (Amended ENR) - RAA 5A, 8C, 8G. 9L, 9M, and 20A			Gravelly Sand Material (Backfill)						Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
RAA Number/ Letter	Neatline RAA or Side Slope (East or West)	Combined Remedial Actions (Neatline and Daylight)	Amended ENR (Nearshore) (CY)	Amended ENR (Restricted Access - Underpier) (CY)	Amended ENR (Tidally Restricted) (CY)	Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Restricted Access - Underpier) (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)
30C	Neatline	AST: Dredge and Standard Cap, RMC										863	891	1,390	0	0	0	288	297	463	0	0	0
	East																						
	West																						
30D	Neatline	Dredge and Standard Cap, RMC										919	919	1,378	0	0	0	0	0	0	0	0	0
	East																						
	West																						
30E	Neatline	Dredge and Standard Cap, RMC										1,302	1,302	1,953	0	0	0	0	0	0	0	0	0
	East																						
	West																						
30F	Neatline	Dredge and Standard Cap, RMC										1,543	1,576	2,426	0	0	0	0	0	0	0	0	0
	East																						
	West																						
30G	Neatline	Dredge and Standard Cap, RMC										2,245	2,290	3,520	0	0	0	0	0	0	0	0	0
	East																						
	West																						
30H	Neatline	Dredge and Standard Cap, RMC										1,340	1,388	2,172	0	0	0	0	0	0	0	0	0
	East																						
	West																						
31A	Neatline	ENR Placement																					
	East																						
	West																						
31B	Neatline	Dredge and Standard Cap										0	0	0	462	462	924	0	0	0	0	0	0
	East																						
	West																						
31C	Neatline	Dredge and Standard Cap										0	0	0	977	977	1,954	0	0	0	0	0	0
	East																						
	West																						
31D	Neatline	Dredge and Modified Cap										0	0		117	352		0	0		0	0	
	East																						
	West																						
32	Neatline	ENR Placement																					
	East																						
	West																						
33	Neatline	ENR Placement																					
	East																						
	West																						
34A	Neatline	Dredge, Backfill to Grade				0	1,865	0	0	0	0												
	East					0	1,359	0	0	0	0												
	West																						
34B	Neatline	Dredge, Backfill to Grade, RMC				1,212	0	0	0	0	0												
	East																						
	West																						
35A	Neatline	Dredge, Backfill to Grade				0	702	0	0	0	0												
	East					0	23	0	0	0	0												
	West																						
35B	Neatline	ENR Placement																					
	East																						
	West																						
36	Neatline	Dredge, Backfill to Grade				0	1,028	0	0	0	0												
	East					0	178	0	0	0	0												
	West																						

												Capping Materials (Open-Water)			Capping Materials (Nearshore)			Capping Materials (Restricted Access)			Capping Materials (Tidally Restricted)		
Amended ENR (Nearshore) (CY)	Amended ENR (Restricted Access - Underpier) (CY)	Amended ENR (Tidally Restricted) (CY)	Backfill (Open Water) (CY)	Backfill (Nearshore) (CY)	Backfill (Restricted Access) (CY)	Backfill (Restricted Access - Underpier) (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)
0	1,239	593	6,439	17,984	6,147	0	8,121	9,578	19,708	20,801	31,889	2,751	3,683	2,878	1,761	2,452	2,650	198	650	0

Attachment N.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, 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, PArt IA) 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 (AST B) is to be placed in RAAs 5A, 8C, 8G, 9L, 9M, and 20A as shown on the Drawings (Volume III, Part IA). 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.

7. Standard engineered cap is to be placed in RAAs 1B, 9J, 14A, 15B, 22, 23A, 30A, 30B through 30H, 31B, and 31C. The cap at RAA 30A will be placed on existing grade. 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 to 18-inch minimum thickness plus a 6-inch maximum overplacement allowance.

8. Modified engineered cap is to be placed in RAAs 5B, 8B, 9A, 9D, 20B, 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. odified 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).

9. Utility crossing cover (AST D) is to be placed in RAA 9K, as shown on the Drawings (Volume III, Part IA).

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

						Dredging Quantities							
SMA Sub Area	Combined Remedial Actions (Neatline and Side Slopes)	Slope Assumptions Description	Dredge Cut Thickness (ft)	Overdredge Allowance (ft)	Area of Daylight Cross Section (SF)	Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Neatline Volume (Not Including Overdredge; CY)	Daylight Volume (Not Including Overdredge; CY)	Neatline Overdredge Allowance Volume (No Side-Slopes) (CY)	Daylight Overdredge Allowance Volume (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-dredging (CY)
SMA 10A	Dredge and Backfill/RMC	2H:1V	6.0	1	36.0	1,443	826	321	97	53	31	502	35
SMA 10B			2.5	1	6.3	5,945	959	550	40	220	36	846	143
SMA 10C			3.5	1	12.3	4,425	528	574	59	164	20	816	107
SMA 10D			4.0	1	16.0	9,345	944	1,385	55	346	35	1,821	225
SMA 10E			6.0	1	36.0	11,577	1,675	2,573	200	429	62	3,263	279
SMA 10F			12.5	1	156.3	12,787	3,170	5,920	943	474	117	7,454	308
SMA 10G			8.0	1	64.0	8,558	2,792	2,536	443	317	103	3,399	206
SMA 10G	Amended ENR	--	--	--	--	--	--	--	--	--	--	--	--

Dredging Quantities							
Required Neatline Dredge Surface Area (No Side-Slopes) (SF)	Required Side-Slope Surface Area (SF)	Neatline Volume (Not Including Overdredge; CY)	Daylight Volume (Not Including Overdredge; CY)	Neatline Overdredge Allowance Volume (No Side-Slopes) (CY)	Daylight Overdredge Allowance Volume (CY)	Total Payable Dredge Volume (No Contingency Re-Dredging Included) (CY)	Contingency Re-dredging (CY)
54,079	**10,893**	**13,857**	**1,838**	**2,003**	**403**	**18,102**	**1,302**

	Backfill Placement Quantities					Perimeter RMC Area								
SMA Sub Area	Neatline Surface Area (SF)	Daylight Surface Area (SF)	Backfill Volume (Neatline+ Daylight - No Overdepth ; CY)	Vertical Placement Tolerance+ Overdepth Volume (CY)	Total Backfill Volume (CY)	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)	Nearshore/ Slope/Slow Dredging (CY)	Backfill (Nearshore) (CY)	RMC (Nearshore) (CY)	Inner Perimeter RMC (Nearshore) (CY)	Outer Perimeter RMC (Nearshore) (CY)	Amended ENR (Nearshore) (CY)
SMA 10A	51,112	5,006	418	3,118	16,672	19443	4563	720	169	502	16,672	655	720	169	--
SMA 10B			590							846					
SMA 10C			633							816					
SMA 10D			1,433							1,821					
SMA 10E			2,147							3,263					
SMA 10F			5,835							7,454					
SMA 10G			2,499							3,399					
SMA 10G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	77

Backfill Placement Quantities					Perimeter RMC Area									
Neatline Surface Area (SF)	Daylight Surface Area (SF)	Backfill Volume (Neatline+ Daylight - No Overdepth ; CY)	Vertical Placement Tolerance+ Overdepth Volume (CY)	Total Backfill Volume (CY)	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)	Nearshore / Slope/ Slow Dredging (CY)	Backfill (Nearshore) (CY)	RMC (Nearshore) (CY)	Inner Perimeter RMC (Nearshore) (CY)	Outer Perimeter RMC (Nearshore) (CY)	Amended ENR (Nearshore) (CY)
51,112	5,006	13,555	3,118	16,672	19,443	4,563	720	169	18,102	16,672	655	720	169	77

Attachment N.1.5
LDW Upper Reach SMA 10 Detailed Quantities and Notes

Notes:

1. 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.

2. 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 [Volume III, Part IB]). For 60% RD, the backfill volumes were assumed to be equal to the dredge volumes in the habitat areas and may be overestimated.

3. 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 (Volume III, Part IB).

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

5. Amended ENR is to be placed in SMA 10H as shown on the Drawings (Volume III, Part IB). 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.

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

Attachment N.1.6
LDW Middle Reach Production Rates and Durations

Summary Table

		Dredging/Excavation						Material Placement															
Item Description	**Unit**	**Open-Water Dredging**	**Nearshore/ Slope/ Slow Dredging**	**Tidally-Restricted Dredging**	**Restricted Access Dredging**	**Contingency Re-Dredging**	**Land-Based Excavation (Shoreline/Bank)**	**RMC: Neatline+ Daylight+ Stability+ Perimeter (Open-Water)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Nearshore/ Slope/ Slow)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Restricted Access)**	**ENR+ Perimeter RMC (Restricted Access - Underpier)**	**Gravelly Sand Backfill (Open-Water)**	**Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)**	**Gravelly Sand Backfill (Restricted Access)**	**Gravelly Sand Backfill (Land-Based Equipment)**	**Amended ENR (Restricted Access - Underpier)**	**Gravelly Sand For Cap Chemical Isolation Layer (Open-Water)**	**Gravel For Sloped RMC and Cap Filter Layer (Open-Water)**	**Quarry Spalls for Cap Erosion Protection Layer (Open-Water)**	**Gravelly Sand For Cap Chemical Isolation Layer (Nearshore/ Slope/ Slow)**	**Gravel For Cap Filter Layer (Nearshore/ Slope/ Slow)**	**Quarry Spalls for Cap Erosion Protection Layer (Nearshore/ Slope/ Slow)**	**Gravelly Sand For Cap Chemical Isolation Layer (Restricted Access)**	**Gravel For Sloped RMC and Cap Filter Layer (Restricted Access)**	**Quarry Spalls for Cap Erosion Protection Layer (Restricted Access)**	**Tidally-Restricted Placement**
Dredge Volume/Placement Volume	CY	339,352	34,271	10,015	17,068	9,078	7,669	26,203	3,844	2,256	2,489	6,439	17,984	6,147	8,121	1,239	19,708	20,801	73,592	2,751	3,683	2,878	1,761	2,452	4,136	13,072
Cycle Time	min	1.87	2.20	2.27	2.57	2.20	2.17	2.23	2.40	2.67	0.00	2.70	2.40	2.67	2.33	0.00	2.70	2.77	2.93	2.87	2.90	3.07	3.07	3.10	3.27	3.07
Daily Production Rate	CY/day	993	576	179	334	390	503	961	609	438	120	793	609	438	505	120	793	773	731	549	543	513	410	406	385	152
	CY/day (rounded)	990	580	180	330	390	500	960	610	440	120	790	610	440	500	120	790	770	730	550	540	510	410	410	390	150
Daily Cost per Unit Volume	$/CY-day	$35.92	$61.89	$135.00	$105.10	$91.43	$34.10	$29.12	$45.90	$62.52	$148.50	$35.25	$45.90	$62.52	$34.00	$148.50	$35.25	$36.17	$38.26	$50.96	$51.50	$54.51	$66.76	$67.41	$71.10	$167.20
No. Dredge/Placement Work Days	Days	342	59	56	51	23	15	27	7	6	21	8	30	14	16	11	25	27	101	6	7	6	5	7	11	86
No. Dredge/Placement Calendar Days	Days	399	69	65	60	27	18	32	8	7	25	9	35	16	19	13	29	32	118	7	9	7	6	9	13	100

Cycle Times

		Dredging/Excavation						Material Placement															
Item Description	**Unit**	**Open-Water Dredging**	**Nearshore/ Slope/ Slow Dredging**	**Tidally-Restricted Dredging**	**Restricted Access Dredging**	**Contingency Re-Dredging**	**Land-Based Excavation (Shoreline/Bank)**	**RMC: Neatline+ Daylight+ Stability+ Perimeter (Open-Water)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Nearshore/ Slope/ Slow)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Restricted Access)**	**ENR+ Perimeter RMC (Restricted Access - Underpier)**	**Gravelly Sand Backfill (Open-Water)**	**Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)**	**Gravelly Sand Backfill (Restricted Access)**	**Gravelly Sand Backfill (Land-Based Equipment)**	**Amended ENR (Restricted Access - Underpier)**	**Gravelly Sand For Cap Chemical Isolation Layer (Open-Water)**	**Gravel For Sloped RMC and Cap Filter Layer (Open-Water)**	**Quarry Spalls for Cap Erosion Protection Layer (Open-Water)**	**Gravelly Sand For Cap Chemical Isolation Layer (Nearshore/ Slope/ Slow)**	**Gravel For Cap Filter Layer (Nearshore/ Slope/ Slow)**	**Quarry Spalls for Cap Erosion Protection Layer (Nearshore/ Slope/ Slow)**	**Gravelly Sand For Cap Chemical Isolation Layer (Restricted Access)**	**Gravel For Sloped RMC and Cap Filter Layer (Restricted Access)**	**Quarry Spalls for Cap Erosion Protection Layer (Restricted Access)**	**Tidally-Restricted Placement**
Load Bucket	sec	20	24	24	30	24	26	20	22	22	--	26	22	22	20	--	26	26	28	30	30	32	32	32	34	32
Lift Load	sec	16	20	20	22	20	22	18	20	22	--	26	20	22	22	--	26	28	30	28	28	30	30	30	32	30
Swing Load	sec	16	18	18	22	18	22	20	20	22	--	22	20	22	20	--	22	22	22	24	24	24	26	26	26	26
Lower Load	sec	16	18	18	18	18	16	20	22	24	--	22	22	24	22	--	22	22	22	22	22	22	22	22	22	22
Dump/Place Load	sec	12	14	14	14	14	12	18	22	28	--	22	22	28	20	--	22	24	26	24	26	28	24	26	28	24
Return Swing	sec	10	12	12	16	12	10	12	12	12	--	12	12	12	10	--	12	12	12	12	12	12	12	12	12	12
Lower Bucket	sec	12	14	14	16	14	14	14	14	16	--	16	14	16	14	--	16	16	18	16	16	18	18	18	20	18
Lost Time (accelerating, positioning, stepping ahead, weather, hydraulics, bucket change, shifting anchors/silt curtains)	sec	10	12	16	16	12	8	12	12	14	--	16	12	14	12	--	16	16	18	16	16	18	20	20	22	20
Total Cycle Time	**sec**	**112**	**132**	**136**	**154**	**132**	**130**	**134**	**144**	**160**	**0.00**	**162**	**144**	**160**	**140**	**0.00**	**162**	**166**	**176**	**172**	**174**	**184**	**184**	**186**	**196**	**184**
	min	**1.87**	**2.20**	**2.27**	**2.57**	**2.20**	**2.17**	**2.23**	**2.40**	**2.67**	**0.00**	**2.70**	**2.40**	**2.67**	**2.33**	**0.00**	**2.70**	**2.77**	**2.93**	**2.87**	**2.90**	**3.07**	**3.07**	**3.10**	**3.27**	**3.07**

Daily Production Rate

		Dredging/Excavation						Material Placement															
Item Description	**Unit**	**Open-Water Dredging**	**Nearshore/ Slope/ Slow Dredging**	**Tidally-Restricted Dredging**	**Restricted Access Dredging**	**Contingency Re-Dredging**	**Land-Based Excavation (Shoreline/Bank)**	**RMC: Neatline+ Daylight+ Stability+ Perimeter (Open-Water)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Nearshore/ Slope/ Slow)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Restricted Access)**	**ENR+ Perimeter RMC (Restricted Access - Underpier)**	**Gravelly Sand Backfill (Open-Water)**	**Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)**	**Gravelly Sand Backfill (Restricted Access)**	**Gravelly Sand Backfill (Land-Based Equipment)**	**Amended ENR (Restricted Access - Underpier)**	**Gravelly Sand For Cap Chemical Isolation Layer (Open-Water)**	**Gravel For Sloped RMC and Cap Filter Layer (Open-Water)**	**Quarry Spalls for Cap Erosion Protection Layer (Open-Water)**	**Gravelly Sand For Cap Chemical Isolation Layer (Nearshore/ Slope/ Slow)**	**Gravel For Cap Filter Layer (Nearshore/ Slope/ Slow)**	**Quarry Spalls for Cap Erosion Protection Layer (Nearshore/ Slope/ Slow)**	**Gravelly Sand For Cap Chemical Isolation Layer (Restricted Access)**	**Gravel For Sloped RMC and Cap Filter Layer (Restricted Access)**	**Quarry Spalls for Cap Erosion Protection Layer (Restricted Access)**	**Tidally-Restricted Placement**
Cycle Time	min	1.87	2.20	2.27	2.57	2.20	2.17	2.23	2.40	2.67	--	2.70	2.40	2.67	2.33	--	2.70	2.77	2.93	2.87	2.90	3.07	3.07	3.10	3.27	3.07
Bucket Capacity	CY	8	5	4	4	4	4	8	5	4	--	8	5	4	4	--	8	8	8	5	5	5	4	4	4	4
Effective Bucket Capacity	%	70%	65%	65%	65%	65%	70%	75%	75%	75%	--	75%	75%	75%	70%	--	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
	CY	5.6	3.25	2.6	2.6	2.6	2.8	6	3.75	3	--	6	3.75	3	2.8	--	6	6	6	3.75	3.75	3.75	3	3	3	3
Shift Duration	hrs/day	10	10	4	10	10	10	10	10	10	4	10	10	10	10	4	10	10	10	10	10	10	10	10	10	4
No. of Shifts	No.	1	1	1	1	1	1	1	1	1	--	1	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	6	6	6	6	6	6	6	6	6	6	6	6
Running Time Efficiency	%	65%	65%	65%	55%	55%	65%	70%	65%	65%	--	70%	65%	65%	70%	--	70%	70%	70%	70%	70%	70%	70%	70%	70%	65%
Operational Delays Due to Vessel Traffic in the LDW	%	15%						15%				15%					15%	15%	15%							
Daily Production Rate (per Shift)	**cy/day**	**993**	**576**	**179**	**334**	**390**	**503**	**961**	**609**	**438**	**120**	**793**	**609**	**438**	**505**	**120**	**793**	**773**	**731**	**549**	**543**	**513**	**410**	**406**	**385**	**152**

Specific Durations

		Dredging/Excavation						Material Placement															
Item Description	**Unit**	**Open-Water Dredging**	**Nearshore/ Slope/ Slow Dredging**	**Tidally-Restricted Dredging**	**Restricted Access Dredging**	**Contingency Re-Dredging**	**Land-Based Excavation (Shoreline/Bank)**	**RMC: Neatline+ Daylight+ Stability+ Perimeter (Open-Water)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Nearshore/ Slope/ Slow)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Restricted Access)**	**ENR+ Perimeter RMC (Restricted Access - Underpier)**	**Gravelly Sand Backfill (Open-Water)**	**Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)**	**Gravelly Sand Backfill (Restricted Access)**	**Gravelly Sand Backfill (Land-Based Equipment)**	**Amended ENR (Restricted Access - Underpier)**	**Gravelly Sand For Cap Chemical Isolation Layer (Open-Water)**	**Gravel For Sloped RMC and Cap Filter Layer (Open-Water)**	**Quarry Spalls for Cap Erosion Protection Layer (Open-Water)**	**Gravelly Sand For Cap Chemical Isolation Layer (Nearshore/ Slope/ Slow)**	**Gravel For Cap Filter Layer (Nearshore/ Slope/ Slow)**	**Quarry Spalls for Cap Erosion Protection Layer (Nearshore/ Slope/ Slow)**	**Gravelly Sand For Cap Chemical Isolation Layer (Restricted Access)**	**Gravel For Sloped RMC and Cap Filter Layer (Restricted Access)**	**Quarry Spalls for Cap Erosion Protection Layer (Restricted Access)**	**Tidally-Restricted Placement**
Total Dredge Volume/Placement Volume	CY	339,352	34,271	10,015	17,068	9,078	7,669	26,203	3,844	2,256	2,489	6,439	17,984	6,147	8,121	1,239	19,708	20,801	73,592	2,751	3,683	2,878	1,761	2,452	4,136	13,072
No. Dredge/Placement Work Days	Days	342	59	56	51	23	15	27	7	6	21	8	30	14	16	11	25	27	101	6	7	6	5	7	11	86
No. Dredge/Placement Work Hours	hrs	3420	590	224	510	230	150	270	70	60	84	80	300	140	160	44	250	270	1010	60	70	60	50	70	110	344
Total Dredge/Placement Duration (Work Days)	**Days**	**546**						**421**																		
No. Dredge/Placement Calendar Days	Days	399	69	65	60	27	18	32	8	7	25	9	35	16	19	13	29	32	118	7	9	7	6	9	13	100
Total Dredge/Placement Duration (Calendar Days)	**Days**	**638**						**494**																		

Daily Unit Costs

		Dredging/Excavation						Material Placement															
Item Description	**Unit**	**Open-Water Dredging**	**Nearshore/ Slope/ Slow Dredging**	**Tidally-Restricted Dredging**	**Restricted Access Dredging**	**Contingency Re-Dredging**	**Land-Based Excavation (Shoreline/Bank)**	**RMC: Neatline+ Daylight+ Stability+ Perimeter (Open-Water)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Nearshore/ Slope/ Slow)**	**ENR+ RMC: Neatline+ Daylight+ Perimeter (Restricted Access)**	**ENR+ Perimeter RMC (Restricted Access - Underpier)**	**Gravelly Sand Backfill (Open-Water)**	**Gravelly Sand Backfill (Nearshore/ Slope/ Slow Backfilling)**	**Gravelly Sand Backfill (Restricted Access)**	**Gravelly Sand Backfill (Land-Based Equipment)**	**Amended ENR (Restricted Access - Underpier)**	**Gravelly Sand For Cap Chemical Isolation Layer (Open-Water)**	**Gravel For Sloped RMC and Cap Filter Layer (Open-Water)**	**Quarry Spalls for Cap Erosion Protection Layer (Open-Water)**	**Gravelly Sand For Cap Chemical Isolation Layer (Nearshore/ Slope/ Slow)**	**Gravel For Cap Filter Layer (Nearshore/ Slope/ Slow)**	**Quarry Spalls for Cap Erosion Protection Layer (Nearshore/ Slope/ Slow)**	**Gravelly Sand For Cap Chemical Isolation Layer (Restricted Access)**	**Gravel For Sloped RMC and Cap Filter Layer (Restricted Access)**	**Quarry Spalls for Cap Erosion Protection Layer (Restricted Access)**	**Tidally-Restricted Placement**
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	$ -	$ 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	$ 4,950	$ 4,950	$ -	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ -	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ 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	$ 2,475	$ 2,475	$ 4,950	$ -	$ 2,475	$ 2,475	$ -	$ -	$ -	$ 2,475	$ 2,475	$ -	$ -	$ -	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ 2,475	$ -	$ -	$ -	$ -
Flexi Floats (for shallower dredge areas- 1 for restricted access dredging and 1 for restricted access placement)	$/day	$ -	$ -	$ 1,980	$ 1,980	$ -	$ -	$ -	$ -	$ 1,980	$ 1,980	$ -	$ -	$ 1,980	$ -	$ 1,980	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,980	$ 1,980	$ 1,980	$ 1,980
Work Boat	$/day	$ 660	$ 660	$ 660	$ 660	$ 660	$ -	$ 660	$ 660	$ 660	$ 660	$ 660	$ 660	$ 660	$ -	$ 660	$ 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	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550
Telebelt (Underpier Placement Only)	$/day	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,280	$ -	$ -	$ -	$ -	$ 5,280	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Daily Subtotal Cost for Equipment	**$/day**	**$ 21,010**	**$ 21,010**	**$ 20,515**	**$ 20,515**	**$ 21,010**	**$ 10,450**	**$ 16,060**	**$ 16,060**	**$ 15,565**	**$ 10,945**	**$ 16,060**	**$ 16,060**	**$ 15,565**	**$ 10,450**	**$ 10,945**	**$ 16,060**	**$ 16,060**	**$ 16,060**	**$ 16,060**	**$ 16,060**	**$ 16,060**	**$ 15,565**	**$ 15,565**	**$ 15,565**	**$ 10,945**
FOG (15%)	$/day	$ 3,152	$ 3,152	$ 3,077	$ 3,077	$ 3,152	$ 1,568	$ 2,409	$ 2,409	$ 2,335	$ 1,642	$ 2,409	$ 2,409	$ 2,335	$ 1,568	$ 1,642	$ 2,409	$ 2,409	$ 2,409	$ 2,409	$ 2,409	$ 2,409	$ 2,335	$ 2,335	$ 2,335	$ 1,642
Daily Total Cost for Equipment	**$/day**	**$ 24,162**	**$ 24,162**	**$ 23,592**	**$ 23,592**	**$ 24,162**	**$ 12,018**	**$ 18,469**	**$ 18,469**	**$ 17,900**	**$ 12,587**	**$ 18,469**	**$ 18,469**	**$ 17,900**	**$ 12,018**	**$ 12,587**	**$ 18,469**	**$ 18,469**	**$ 18,469**	**$ 18,469**	**$ 18,469**	**$ 18,469**	**$ 17,900**	**$ 17,900**	**$ 17,900**	**$ 12,587**
	$/cy	**$ 24.34**	**$ 41.94**	**$ 70.67**	**$ 70.67**	**$ 61.95**	**$ 23.88**	**$ 19.23**	**$ 30.31**	**$ 40.85**	**$ 104.89**	**$ 23.28**	**$ 30.31**	**$ 40.85**	**$ 23.81**	**$ 104.89**	**$ 23.28**	**$ 23.88**	**$ 25.26**	**$ 33.65**	**$ 34.01**	**$ 36.00**	**$ 43.61**	**$ 44.04**	**$ 46.45**	**$ 104.89**
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	$ 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	$ 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	$ -	$ 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	$ 2,145	$ -	$ -	$ 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	$ 1,815	$ 1,815	$ -	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908	$ -	$ 908	$ 908	$ 908	$ 908	$ 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	$ 1,815	$ 1,815	$ -	$ 908	$ 908	$ 908	$ -	$ 908	$ 908	$ 908	$ -	$ -	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908	$ 908
Front-loader Operator	$/day	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 825	$ 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	$ 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
Daily Subtotal Cost for Labor	**$/day**	**$ 10,450**	**$ 10,450**	**$ 10,450**	**$ 10,450**	**$ 10,450**	**$ 4,675**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 4,758**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 4,675**	**$ 4,758**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**	**$ 8,635**
Travel / Per Diem Allowance (10%)	$/day	$ 1,045	$ 1,045	$ 1,045	$ 1,045	$ 1,045	$ 468	$ 864	$ 864	$ 864	$ 476	$ 864	$ 864	$ 864	$ 468	$ 476	$ 864	$ 864	$ 864	$ 864	$ 864	$ 864	$ 864	$ 864	$ 864	$ 864
Daily Total Cost for Labor	**$/day**	**$ 11,495**	**$ 11,495**	**$ 11,495**	**$ 11,495**	**$ 11,495**	**$ 5,143**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 5,233**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 5,143**	**$ 5,233**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**	**$ 9,499**
	$/cy	**$ 11.58**	**$ 19.95**	**$ 64.33**	**$ 34.43**	**$ 29.47**	**$ 10.22**	**$ 9.89**	**$ 15.59**	**$ 21.68**	**$ 43.61**	**$ 11.97**	**$ 15.59**	**$ 21.68**	**$ 10.19**	**$ 43.61**	**$ 11.97**	**$ 12.28**	**$ 12.99**	**$ 17.31**	**$ 17.49**	**$ 18.51**	**$ 23.14**	**$ 23.37**	**$ 24.65**	**$ 62.31**
Daily Total Cost for Equipment and Labor	**$/day**	**$ 35,657**	**$ 35,657**	**$ 35,087**	**$ 35,087**	**$ 35,657**	**$ 17,160**	**$ 27,968**	**$ 27,968**	**$ 27,398**	**$ 17,820**	**$ 27,968**	**$ 27,968**	**$ 27,398**	**$ 17,160**	**$ 17,820**	**$ 27,968**	**$ 27,968**	**$ 27,968**	**$ 27,968**	**$ 27,968**	**$ 27,968**	**$ 27,398**	**$ 27,398**	**$ 27,398**	**$ 22,085**
	$/cy	**$ 35.92**	**$ 61.89**	**$ 135.00**	**$ 105.10**	**$ 91.43**	**$ 34.10**	**$ 29.12**	**$ 45.90**	**$ 62.52**	**$ 148.50**	**$ 35.25**	**$ 45.90**	**$ 62.52**	**$ 34.00**	**$ 148.50**	**$ 35.25**	**$ 36.17**	**$ 38.26**	**$ 50.96**	**$ 51.50**	**$ 54.51**	**$ 66.76**	**$ 67.41**	**$ 71.10**	**$ 167.20**

Attachment N.1.6
LDW Middle Reach Production Rates and Durations

Project Quantities and Durations

Item Description	Totals
Dredge Volume (CY)	400,706
Contingency Re-Dredging Volume (CY)	9,078
Excavation Volume (CY)	7,669
Material Placement Volume (CY)	219,559
Total Dredge Duration (Work Days)	546
Total Material Placement Duration (Work Days)	421
Total Mob/Demob + Dredge/Material Placement Durations + Structural Work (Work Days)	1,027
Total Duration (Work Months)	33.8
Total Duration (Work Months) - Rounded	34
Total Dredge Duration (Calendar Days)	638
Total Material Placement Duration (Calendar Days)	494
Total Mob/Demob + Dredge/Material Placement Durations + Structural Work (Calendar Days)	1,198
Total Duration (Calendar Months)	39.4
Total Duration (Calendar Months) - Rounded	40

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 N.1.7
LDW Upper Reach SMA 10 Production Rates and Durations

Summary Table

Item Description	Unit	Dredging		Placement	
		Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	RMC (Required+ Inner + Outer)	Gravelly Sand Backfill and Amended ENR (Nearshore/ Slope/ Slow Backfilling)
Dredge Volume/Placement Volume	CY	18,102	1,302	1,544	16,749
Cycle Time	min	2.20	2.20	2.40	2.40
Daily Production Rate	CY/day	576	390	609	609
	CY/day (rounded)	580	390	610	610
Daily Cost per Unit Volume	$/CY-day	$61.89	$91.43	$45.90	$45.90
No. Dredge/Placement Work Days	Days	31	4	3	27
No. Dredge/Placement Calendar Days	Days	36	5	4	32

Cycle Times

Item Description	Unit	Dredging		Placement	
		Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	RMC (Required+ Inner + Outer)	Gravelly Sand Backfill and Amended ENR (Nearshore/ Slope/ Slow Backfilling)
Load Bucket	sec	24	24	22	22
Lift Load	sec	20	20	20	20
Swing Load	sec	18	18	20	20
Lower Load	sec	18	18	22	22
Dump/Place Load	sec	14	14	22	22
Return Swing	sec	12	12	12	12
Lower Bucket	sec	14	14	14	14
Lost Time (accelerating, positioning, stepping ahead, weather, hydraulics, bucket change, shifting anchors/silt curtains)	sec	12	12	12	12
Total Cycle Time	**sec**	**132**	**132**	**144**	**144**
	min	**2.20**	**2.20**	**2.40**	**2.40**

Daily Production Rate

Item Description	Unit	Dredging		Placement	
		Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	RMC (Required+ Inner + Outer)	Gravelly Sand Backfill and Amended ENR (Nearshore/ Slope/ Slow Backfilling)
Cycle Time	min	2.20	2.20	2.40	2.40
Bucket Capacity	CY	5	4	5	5
Effective Bucket Capacity	%	65%	65%	75%	75%
	CY	3.25	2.6	3.75	3.75
Shift Duration	hrs/day	10	10	10	10
No. of Shifts	No.	1	1	1	1
Work Days/Week	No.	6	6	6	6
Running Time Efficiency	%	65%	55%	65%	65%
Operational Delays Due to Vessel Traffic in the LDW	%	-	-	-	-
Daily Production Rate (per Shift)	**cy/day**	**576**	**390**	**609**	**609**

Attachment N.1.7
LDW Upper Reach SMA 10 Production Rates and Durations

Specific Durations

Item Description	Unit	Dredging		Placement	
		Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	RMC (Required+ Inner + Outer)	Gravelly Sand Backfill and Amended ENR (Nearshore/ Slope/ Slow Backfilling)
Total Dredge Volume/Placement Volume	CY	18,102	1,302	1,544	16,749
No. Dredge/Placement Work Days	Days	31	4	3	27
No. Dredge/Placement Work Hours	hrs	310	40	30	270
Total Dredge/Placement Duration (Work Days)	**Days**	**35**		**30**	
No. Dredge/Placement Calendar Days	Days	36	5	4	32
Total Dredge/Placement Duration (Calendar Days)	**Days**	**41**		**36**	

Daily Unit Costs

Item Description	Unit	Dredging		Placement	
		Nearshore/ Slope/ Slow Dredging	Contingency Re-Dredging	RMC (Required+ Inner + Outer)	Gravelly Sand Backfill and Amended ENR (Nearshore/ Slope/ Slow Backfilling)
Dredge or Excavator	$/day	$ 9,900	$ 9,900	$ 9,900	$ 9,900
Tug (2 for dredging and 1 for material placement)	$/day	$ 4,950	$ 4,950	$ 2,475	$ 2,475
Barge (1 for restricted access dredging, 2 for other dredging and 1 for material placement)	$/day	$ 4,950	$ 4,950	$ 2,475	$ 2,475
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
Front-end loader	$/day	$ 550	$ 550	$ 550	$ 550
Telebelt (Underpier Placement Only)	$/day	$ -	$ -	$ -	$ -
Daily Subtotal Cost for Equipment	**$/day**	**$ 21,010**	**$ 21,010**	**$ 16,060**	**$ 16,060**
FOG (15%)	$/day	$ 3,152	$ 3,152	$ 2,409	$ 2,409
Daily Total Cost for Equipment	**$/day**	**$ 24,162**	**$ 24,162**	**$ 18,469**	**$ 18,469**
	$/cy	**$ 41.94**	**$ 61.95**	**$ 30.31**	**$ 30.31**
Superintendent	$/day	$ 1,100	$ 1,100	$ 1,100	$ 1,100
Operator Foreman	$/day	$ 825	$ 825	$ 825	$ 825
Dredge or Excavator Operator	$/day	$ 825	$ 825	$ 825	$ 825
Deck Hands for Dredge (assumed 3)	$/day	$ 2,145	$ 2,145	$ 2,145	$ 2,145
Tug Operator (2 for dredging and 1 for material placement)	$/day	$ 1,815	$ 1,815	$ 908	$ 908
placement)	$/day	$ 1,815	$ 1,815	$ 908	$ 908
Front-loader Operator	$/day	$ 825	$ 825	$ 825	$ 825
Health and Safety and Quality Assurance	$/day	$ 1,100	$ 1,100	$ 1,100	$ 1,100
Daily Subtotal Cost for Labor	**$/day**	**$ 10,450**	**$ 10,450**	**$ 8,635**	**$ 8,635**
Travel / Per Diem Allowance (10%)	$/day	$ 1,045	$ 1,045	$ 864	$ 864
Daily Total Cost for Labor	**$/day**	**$ 11,495**	**$ 11,495**	**$ 9,499**	**$ 9,499**
	$/cy	**$ 19.95**	**$ 29.47**	**$ 15.59**	**$ 15.59**
Daily Total Cost for Equipment and Labor	**$/day**	**$ 35,657**	**$ 35,657**	**$ 27,968**	**$ 27,968**
	$/cy	**$ 61.89**	**$ 91.43**	**$ 45.90**	**$ 45.90**

Attachment N.1.7
LDW Upper Reach SMA 10 Production Rates and Durations

Project Quantities and Durations

Item Description	Totals
Dredge /Excavation Volume (CY)	18,102
Contingency Re-Dredging Volume (CY)	1,302
Material Placement Volume (CY)	18,293
Total Dredge Duration (Work Days)	35
Total Material Placement Duration (Work Days)	30
Total Dredge/Material Placement Durations (Work Days)	65
Total Duration (Work Months)	2.1
Total Duration (Work Months) - Rounded	3.0
Total Dredge Duration (Calendar Days)	41
Total Material Placement Duration (Calendar Days)	36
Total Dredge/Material Placement Durations (Calendar Days)	76
Total Duration (Calendar Months)	2.5
Total Duration (Calendar Months) - Rounded	3.0

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

Bid Item No.	Specs Section No.	Item	Quantity	Unit	Min Unit Cost	Max Unit Cost	Bracketed Avg Unit Cost[1]	Probable Unit Cost[2]	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost[2]	Duration (days)
SCHEDULE A - Structures													
OVER AND IN-WATER STRUCTURES													
	ST05 (RAA 23) - Pile Demolition: Timber Mooring Dolphin Pile Clusters, Steel Pile Mooring Dolphins												
		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	
		Subtotal							**$ 104,000**	**$ 193,000**	**$ 148,500**	**$ 170,775**	**12**
	ST05 (RAA 23) - Pile Replacement: Steel Pile Mooring Dolphins												
		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
		Subtotal							**$ 540,000**	**$ 760,000**	**$ 650,000**	**$ 747,500**	**5**
	ST06 (RAAs 20B and 20C) - Pile Demolition: Timber Mooring Dolphin Pile Clusters, Timber Piles, Steel Pile Mooring Dolphins												
		Remove CreosoteTimber 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 CreosoteTimber 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	
		Subtotal							**$ 19,813**	**$ 37,338**	**$ 38,219**	**$ 43,952**	**6**
	ST06 (RAAs 20B and 20C) - Pile Replacement: Steel Piles and Steel Pile Mooring Dolphins												
		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
		Subtotal							**$ 340,000**	**$ 510,000**	**$ 425,000**	**$ 488,750**	**6**
	ST14 (RAAs 21 and 22) - Pile Demolition: Timber Piles												
		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	
		Subtotal							**$ 15,619**	**$ 29,666**	**$ 39,867**	**$ 45,848**	**3**
	ST14 (RAAs 21 and 22) - Pile Replacement: Steel Piles												
		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
		Subtotal							**$ 182,000**	**$ 338,000**	**$ 260,000**	**$ 299,000**	**7**

Bid Item No.	Specs Section No.	Item	Quantity	Unit	Min Unit Cost	Max Unit Cost	Bracketed Avg Unit Cost[1]	Probable Unit Cost[2]	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost[2]	Duration (days)
	ST15 (RAAs 21 and 22) - Pile Demolition: Timber Mooring Dolphin Pile Clusters												
		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	
		Subtotal							**$ 18,250**	**$ 27,150**	**$ 23,767**	**$ 27,332**	**3**
	ST15 (RAAs 21 and 22) - Pile Replacement: Steel Pile Mooring Dolphins												
		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
		Subtotal							**$ 108,000**	**$ 152,000**	**$ 130,000**	**$ 149,500**	**1**
	(RAA 8F) - Derelict Timber Pier												
		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 (Sub C)	46	Ton	$ 324.00	$ 432.00	$ 360.00	$ 360.00	$ 14,985	$ 19,980	$ 16,650	$ 16,650	
		Subtotal							**$ 90,985**	**$ 139,580**	**$ 114,450**	**$ 129,120**	**10**
	(RAA 8H) - Derelict Timber Wharf												
		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 (Sub D)	26	Ton	$ 150.00	$ 210.00	$ 180.00	$ 207.00	$ 3,864	$ 5,410	$ 4,637	$ 5,332	
		Subtotal							**$ 68,864**	**$ 105,410**	**$ 87,137**	**$ 100,207**	**8**
	(RAAs 24B, 24C, 24D) - Derelict Timber Wharf												
		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	97	EA	$ 1,000.00	$ 2,000.00	$ 1,500.00	$ 1,725.00	$ 97,000	$ 194,000	$ 145,500	$ 167,325	30
		Creosote Timber Piling and Pier Processing and Disposal (Sub C)	240	Ton	$ 324.00	$ 432.00	$ 360.00	$ 360.00	$ 77,760	$ 103,680	$ 86,400	$ 86,400	
		Subtotal							**$ 249,760**	**$ 402,680**	**$ 321,900**	**$ 357,225**	**36**
					Total				**$ 1,737,291**	**$ 2,694,824**	**$ 2,238,840**	**$ 2,559,208**	**97**

Attachment N.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[1]	Probable Unit Cost[2]	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost[2]	Duration (days)
SCHEDULE B - Outfalls													
Plug and Abandon, Temporary Bypass, Temporary Support, Extension and Bank Protection													
	OF27 (RAAs 24B, 24C, 24D) - Temporary Diversion												
		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
		Subtotal							**$ 277,170**	**$ 346,462**	**$ 311,816**	**$ 358,588**	**365**
	OF28 (RAAs 24B, 24C, 24D) - Temporary Diversion												
		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
		Subtotal							**$ 106,615**	**$ 133,269**	**$ 119,942**	**$ 137,933**	**365**
		Total							**$ 383,785**	**$ 479,731**	**$ 431,758**	**$ 496,522**	**730**
											Subtotal	**$ 3,055,730**	
											TOTAL	**$ 3,055,730**	**827**

Bid Item No.	Specs Section No.	Item	Quantity	Unit	Min Unit Cost	Max Unit Cost	Bracketed Avg Unit Cost[1]	Probable Unit Cost[2]	Min Total Cost	Max Total Cost	Bracketed Avg Total Cost	Probable Total Cost[2]	Duration (days)
SCHEDULE C - BULKHEADS													
	WALL 1 (RAA 24B, 24C, 24D) - North Bank Sheet Piles with Tieback Anchors												
		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
		Subtotal							**$ 1,828,000**	**$ 2,388,000**	**$ 2,149,200**	**$ 2,471,580**	**90**
	WALL 2 (RAA 24B, 24C, 24D) - Inlet East Mouth Cofferdam												
		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								$ 326,000	163
		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
		Subtotal							**$ 947,000**	**$ 1,525,500**	**$ 1,372,950**	**$ 1,904,893**	**53**
		Total							**$ 2,775,000**	**$ 3,913,500**	**$ 3,522,150**	**$ 4,376,473**	**143**
											Subtotal	$ 7,432,203	
											50% Contingency	$ 3,716,101	
											TOTAL	**$ 11,148,304**	**240**

[1] Bracketed Average is calculated average with outliers omitted.
[2] Probable Cost is Bracketed Average plus 15% bump.

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