APPENDIX S
Remedial Alternatives Cost Estimate

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APPENDIX S
REMEDIAL ALTERNATIVE COST ESTIMATES

This appendix presents FS-level cost estimates for each of the ten remedial alternatives evaluated for the Marine Area of the Site. The cost estimate for each alternative includes construction costs, professional/technical services costs, monitoring costs, and a 30% contingency.

The cost estimates were developed using a combination of published engineering reference manuals (i.e., RS Means Heavy Construction Cost Data Manual), construction cost estimates solicited from applicable vendors and contractors, actual bids and costs incurred on projects with similar construction elements and professional engineering judgment. An independent engineering cost estimate was prepared for the major structural elements that are necessary to implement the range of remedial alternatives in the FS. As identified in the FS Report, the accuracy of the cost estimate is assumed to be -30% to +50% as per EPA's FS cost estimate guidance (EPA 2000).

The cost estimate for Alternatives 1 through 5 are detailed in Table S-1. The cost estimate for Alternatives 6 through 10 are detailed in Table S-2. A description of individual cost items comprising each of the alternatives is presented in Table S-3. The unit cost assumptions used to develop the remedial alternative cost estimates are presented in Table S-4. Quantity estimates for Alternatives 1 through 5 are presented in Table S-5 and quantity estimate for Alternatives 6 through 10 are presented in Table S-6.

Attachment S-1 contains the independent engineering cost estimate report for the major structural elements that are necessary to implement in the range of remedial alternatives in the FS. Attachment S-2 contains opinion of preliminary cost for ground improvements.

Attachments:

Table S-1. Alternatives 1 through 5 Cost Estimate
Table S-2. Alternatives 6 through 10 Cost Estimate
Table S-3. Cost Items Descriptions
Table S-4. Basis for Unit Cost Used in the Development of Alternative Cost Estimates
Table S-5. Alternatives 1 through 5 Quantities
Table S-6. Alternatives 6 through 10 Quantities
Attachment S-1. Basis of Estimate by Moffatt & Nichol dated January 11, 2023
Attachment S-2. Opinion of Preliminary Cost for Ground Improvements

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Table S-1

Alternatives 1 through 5 Cost Estimate

Weyerhaeuser Mill A Former

Everett, Washington

Item No.	Item Identification[1]	Unit	Unit Cost[2]	Quantity[3]					Cost[4]				
				1	2	3	4	5	1	2	3	4	5
CONSTRUCTION													
1	Mobilization/Demobilization	Percent	5%	--	--	--	--	--	$ 5,893,952	$ 5,950,387	$ 6,100,481	$ 6,243,548	$ 6,627,044
2	Removal, Upland Transload and Temporary Stockpiling of Existing Armor	Cubic Yard	$ 44	20,750	20,750	20,750	20,750	20,750	$ 913,000	$ 913,000	$ 913,000	$ 913,000	$ 913,000
3	Procurement and Installation of South Terminal Toe Wall	Lump Sum	$ 5,700,000	1	1	1	1	1	$ 5,700,000	$ 5,700,000	$ 5,700,000	$ 5,700,000	$ 5,700,000
4	Removal of Existing Ro-Ro Berthing Pier and Installation of Upland Retaining Wall	Lump Sum	$ 52,300,000	1	1	1	1	1	$ 52,300,000	$ 52,300,000	$ 52,300,000	$ 52,300,000	$ 52,300,000
5	Ground Improvement for Upland Retaining Wall	Lump Sum	$ 8,800,000	1	1	1	1	1	$ 8,800,000	$ 8,800,000	$ 8,800,000	$ 8,800,000	$ 8,800,000
6	Removal of Existing Ro-Ro Berthing Pier, Installation of CDF Wall, and Surface Confinement of CDF	Lump Sum	$ 66,300,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
7	Ground Improvements for CDF Wall	Lump Sum	$ 22,000,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
8	Dredging of Contaminated Material	Cubic Yard	$ 24	326,560	326,560	336,986	372,320	399,470	$ 7,837,440	$ 7,837,440	$ 8,087,667	$ 8,935,680	$ 9,587,280
9	Dredging of Clean Material	Cubic Yard	$ 24	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
10	Post-Dredge Surface Sediment Sample Collection	Per Day	$ 3,230	6	6	6	7	7	$ 19,380	$ 19,380	$ 19,380	$ 22,610	$ 22,610
11	Post-Dredge Surface Sediment Sample Analysis	Per Sample	$ 5,000	55	55	55	64	70	$ 275,000	$ 275,000	$ 275,000	$ 320,000	$ 350,000
12	Upland Transload and Management of Dredged Contaminated Material	Cubic Yard	$ 15	326,560	326,560	336,986	372,320	399,470	$ 4,898,400	$ 4,898,400	$ 5,054,792	$ 5,584,800	$ 5,992,050
13	Transportation and Disposal of Dredged Contaminated Material at an Upland Landfill	Ton	$ 72	424,528	424,528	438,082	484,016	519,311	$ 30,566,016	$ 30,566,016	$ 31,541,900	$ 34,849,152	$ 37,390,392
14	Disposal and Management of Dredged Contaminated Material inside CDF	Cubic Yard	$ 20	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
15	Transportation and Disposal of Dredged Clean Material at an Open-Water Disposal Site	Cubic Yard	$ 4	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
16	Replacement of Ro-Ro Berthing Pier	Lump Sum	$ 6,000,000	1	1	1	1	1	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000	$ 6,000,000
17	Replacement/Reuse of Existing Armor	Cubic Yard	$ 44	1,200	1,200	1,200	1,200	1,200	$ 52,800	$ 52,800	$ 52,800	$ 52,800	$ 52,800
18	Import and Place Sand for Enhanced Natural Recovery (ENR)	Ton	$ 53	0	20,900	15,140	15,140	46,140	$ -	$ 1,107,700	$ 802,420	$ 802,420	$ 2,445,420
19	Import and Place Sand Cap	Ton	$ 53	0	0	35,720	0	0	$ -	$ -	$ 1,893,160	$ -	$ -
20	Import and Place Armor Rock	Ton	$ 72	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
21	Import and Place Sand to Backfill Dredged Area	Ton	$ 53	0	0	0	0	43,440	$ -	$ -	$ -	$ -	$ 2,302,320
22	Progress Bathymetric Surveys	Per Survey	$ 10,500	44	46	49	51	60	$ 462,000	$ 483,000	$ 514,500	$ 535,500	$ 630,000
23	Post-Construction Bathymetric Survey	Per Survey	$ 15,000	3	3	3	3	3	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000
24	Warning Signage	Lump Sum	$ 10,000	1	1	1	1	1	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
								Construction Subtotal	**$ 123,772,988**	**$ 124,958,123**	**$ 128,110,099**	**$ 131,114,510**	**$ 139,167,916**
								Contractor Overhead	$ 12,377,299	$ 12,495,812	$ 12,811,010	$ 13,111,451	$ 13,916,792
								Everett Sales Tax	$ 11,758,434	$ 11,871,022	$ 12,170,459	$ 12,455,878	$ 13,220,952
								Contingency	$ 44,372,616	$ 44,797,487	$ 45,927,471	$ 47,004,552	$ 49,891,698
								Construction Total	**$ 192,281,337**	**$ 194,122,444**	**$ 199,019,039**	**$ 203,686,391**	**$ 216,197,357**

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Item No.	Item Identification[1]	Unit	Unit Cost[2]	Quantity[3]					Cost[4]				
				1	2	3	4	5	1	2	3	4	5
PROFESSIONAL/TECHNICAL SERVICES													
1	Remedial Design	Percent	6%	--	--	--	--	--	$ 11,536,880	$ 11,647,347	$ 11,941,142	$ 12,221,183	$ 12,971,841
2	Construction Management	Percent	6%	--	--	--	--	--	$ 11,536,880	$ 11,647,347	$ 11,941,142	$ 12,221,183	$ 12,971,841
3	Project Management	Percent	5%	--	--	--	--	--	$ 9,614,067	$ 9,706,122	$ 9,950,952	$ 10,184,320	$ 10,809,868
4	Institutional Controls	Lump Sum	20,000	1	1	1	1	1	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
								Professional/Technical Services Total	**$ 32,707,827**	**$ 33,020,815**	**$ 33,853,237**	**$ 34,646,687**	**$ 36,773,551**
MONITORING													
1	Marine Area Monitoring Plan	Lump Sum	$ 50,000	1	1	1	1	1	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
2	Periodic Bathymetric Survey	Per Survey	$ 15,000	8	8	8	8	8	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000
3	Baseline Surface Sediment Sample Collection	Per Day	$ 3,230	9	9	9	8	8	$ 29,070	$ 29,070	$ 29,070	$ 25,840	$ 25,840
4	Periodic Surface Sediment Sample Collection	Per Event	Varies[5]	8	8	8	8	8	$ 232,560	$ 232,560	$ 232,560	$ 206,720	$ 206,720
5	Baseline Surface Sediment Sample Analysis	Per Sample	$ 5,000	88	88	88	79	73	$ 440,000	$ 440,000	$ 440,000	$ 395,000	$ 365,000
6	Periodic Surface Sediment Sample Analysis	Per Event	Varies[6]	8	8	8	8	8	$ 3,520,000	$ 3,520,000	$ 3,520,000	$ 3,160,000	$ 2,920,000
7	Monitoring of the CDF	Per Event	$ 25,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
8	Reporting	Per Event	$ 20,000	9	9	9	9	9	$ 180,000	$ 180,000	$ 180,000	$ 180,000	$ 180,000
								Monitoring Subtotal	**$ 4,571,630**	**$ 4,571,630**	**$ 4,571,630**	**$ 4,137,560**	**$ 3,867,560**
								Contingency	$ 1,371,489.0	$ 1,371,489.0	$ 1,371,489.0	$ 1,241,268.0	$ 1,160,268.0
								Monitoring Total	**$ 5,943,119**	**$ 5,943,119**	**$ 5,943,119**	**$ 5,378,828**	**$ 5,027,828**
TOTAL													
								Construction, Professional/Technical Services and Monitoring Total	**$ 230,932,283**	**$ 233,086,378**	**$ 238,815,395**	**$ 243,711,906**	**$ 257,998,736**

Notes:

[1] Refer to Table S-3 for the description of the cost items.

[2] Refer to Table S-4 for the basis for unit cost.

[3] Refer to Table S-5 for detailed quantities per SMA for Alternatives 1 through 5 and Table S-6 for Alternatives 6 through 10.

[4] The cost estimate is presented in 2022 dollars and is an opinion of construction cost made by Port's consultant. In providing opinions of construction cost, it is recognized that neither the Port nor Port's consultant has control over the costs of labor, equipment, materials or over contractors' methods of determining prices and bids. This opinion of construction cost is based on the Port consultant's reasonable professional judgment and experience. This estimate does not constitute a warranty, expressed or implied, that contractors' bids or negotiated prices of work will correspond with Port's budget or the opinion of construction cost prepared by Port's consultant. The accuracy of FS-level cost estimate is assumed to be -30% to +50% as per EPA's FS cost estimate guidance (EPA 2000).

[5] The per event cost for Item 4 - Periodic Surface Sediment Sample Collection is assumed to be the total cost of Item 3 - Baseline Surface Sediment Sample Collection for each alternative.

[6] The per event cost for Item 6 - Periodic Surface Sediment Sample Analysis is assumed to be the total cost of Item 5 - Baseline Surface Sediment Sample Analysis for each alternative.

MTCA = Model Toxics Control Act

CDF = Confined Disposal Facility

Ro-Ro = roll-on/roll-off

SMS = Sediment Management Standards

MNR = Monitored Natural Recovery

ENR = Enhanced Natural Recovery

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Table S-2

Alternatives 6 through 10 Cost Estimate

Weyerhaeuser Mill A Former

Everett, Washington

Item No.	Item Identification[1]	Unit	Unit Cost[2]	Quantity[3]					Cost[4]				
				6	7	8	9	10	6	7	8	9	10
CONSTRUCTION													
1	Mobilization/Demobilization	Percent	5%	--	--	--	--	--	$ 5,124,506	$ 5,180,416	$ 5,331,035	$ 5,474,102	$ 5,857,597
2	Removal, Upland Transload and Temporary Stockpiling of Existing Armor	Cubic Yard	$ 44	1,750	1,750	1,750	1,750	1,750	$ 77,000	$ 77,000	$ 77,000	$ 77,000	$ 77,000
3	Procurement and Installation of South Terminal Toe Wall	Lump Sum	$ 5,700,000	1	1	1	1	1	$ 5,700,000	$ 5,700,000	$ 5,700,000	$ 5,700,000	$ 5,700,000
4	Removal of Existing Ro-Ro Berthing Pier and Installation of Upland Retaining Wall	Lump Sum	$ 52,300,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
5	Ground Improvement for Upland Retaining Wall	Lump Sum	$ 8,800,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
6	Removal of Existing Ro-Ro Berthing Pier, Installation of CDF Wall, and Surface Confinement of CDF	Lump Sum	$ 66,300,000	1	1	1	1	1	$ 66,300,000	$ 66,300,000	$ 66,300,000	$ 66,300,000	$ 66,300,000
7	Ground Improvements for CDF Wall	Lump Sum	$ 22,000,000	1	1	1	1	1	$ 22,000,000	$ 22,000,000	$ 22,000,000	$ 22,000,000	$ 22,000,000
8	Dredging of Contaminated Material	Cubic Yard	$ 24	175,370	175,370	185,796	221,130	248,280	$ 4,208,880	$ 4,208,880	$ 4,459,107	$ 5,307,120	$ 5,958,720
9	Dredging of Clean Material	Cubic Yard	$ 24	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
10	Post-Dredge Surface Sediment Sample Collection	Per Day	$ 3,230	5	5	5	6	6	$ 16,150	$ 16,150	$ 16,150	$ 19,380	$ 19,380
11	Post-Dredge Surface Sediment Sample Analysis	Per Sample	$ 5,000	42	42	42	51	57	$ 210,000	$ 210,000	$ 210,000	$ 255,000	$ 285,000
12	Upland Transload and Management of Dredged Contaminated Material	Cubic Yard	$ 15	1,370	1,370	11,796	47,130	74,280	$ 20,550	$ 20,550	$ 176,942	$ 706,950	$ 1,114,200
13	Transportation and Disposal of Dredged Contaminated Material at an Upland Landfill	Ton	$ 72	1,781	1,781	15,335	61,269	96,564	$ 128,232	$ 128,232	$ 1,104,116	$ 4,411,368	$ 6,952,608
14	Disposal and Management of Dredged Contaminated Material inside CDF	Cubic Yard	$ 20	174,000	174,000	174,000	174,000	174,000	$ 3,480,000	$ 3,480,000	$ 3,480,000	$ 3,480,000	$ 3,480,000
15	Transportation and Disposal of Dredged Clean Material at an Open-Water Disposal Site	Cubic Yard	$ 4	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
16	Replacement of Ro-Ro Berthing Pier	Lump Sum	$ 6,000,000	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
17	Replacement/Reuse of Existing Armor	Cubic Yard	$ 44	1,200	1,200	1,200	1,200	1,200	$ 52,800	$ 52,800	$ 52,800	$ 52,800	$ 52,800
18	Import and Place Sand for Enhanced Natural Recovery (ENR)	Ton	$ 53	0	20,900	15,140	15,140	46,140	$ -	$ 1,107,700	$ 802,420	$ 802,420	$ 2,445,420
19	Import and Place Sand Cap	Ton	$ 53	0	0	35,720	0	0	$ -	$ -	$ 1,893,160	$ -	$ -
20	Import and Place Armor Rock	Ton	$ 72	0	0	0	0	0	$ -	$ -	$ -	$ -	$ -
21	Import and Place Sand to Backfill Dredged Area	Ton	$ 53	0	0	0	0	43,440	$ -	$ -	$ -	$ -	$ 2,302,320
22	Progress Bathymetric Surveys	Per Survey	$ 10,500	23	24	28	30	39	$ 241,500	$ 252,000	$ 294,000	$ 315,000	$ 409,500
23	Post-Construction Bathymetric Survey	Per Survey	$ 15,000	3	3	3	3	3	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000
24	Warning Signage	Lump Sum	$ 10,000	1	1	1	1	1	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
								Construction Subtotal	**$ 107,614,618**	**$ 108,788,728**	**$ 111,951,729**	**$ 114,956,140**	**$ 123,009,545**
								Contractor Overhead	$ 10,761,462	$ 10,878,873	$ 11,195,173	$ 11,495,614	$ 12,300,955
								Everett Sales Tax	$ 10,223,389	$ 10,334,929	$ 10,635,414	$ 10,920,833	$ 11,685,907
								Contingency	$ 38,579,840	$ 39,000,759	$ 40,134,695	$ 41,211,776	$ 44,098,922
								Construction Total	**$ 167,179,308**	**$ 169,003,288**	**$ 173,917,011**	**$ 178,584,363**	**$ 191,095,329**

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Item No.	Item Identification[1]	Unit	Unit Cost[2]	Quantity[3]					Cost[4]				
				6	7	8	9	10	6	7	8	9	10
PROFESSIONAL/TECHNICAL SERVICES													
1	Remedial Design	Percent	6%	--	--	--	--	--	$ 10,030,759	$ 10,140,197	$ 10,435,021	$ 10,715,062	$ 11,465,720
2	Construction Management	Percent	6%	--	--	--	--	--	$ 10,030,759	$ 10,140,197	$ 10,435,021	$ 10,715,062	$ 11,465,720
3	Project Management	Percent	5%	--	--	--	--	--	$ 8,358,965	$ 8,450,164	$ 8,695,851	$ 8,929,218	$ 9,554,766
4	Institutional Controls	Lump Sum	20,000	1	1	1	1	1	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
								Professional/Technical Services Total	**$ 28,440,482**	**$ 28,750,559**	**$ 29,585,892**	**$ 30,379,342**	**$ 32,506,206**
MONITORING													
1	Marine Area Monitoring Plan	Lump Sum	$ 50,000	1	1	1	1	1	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
2	Periodic Bathymetric Survey	Per Survey	$ 15,000	8	8	8	8	8	$ 120,000	$ 120,000	$ 120,000	$ 120,000	$ 120,000
3	Baseline Surface Sediment Sample Collection	Per Day	$ 3,230	9	9	9	8	8	$ 29,070	$ 29,070	$ 29,070	$ 25,840	$ 25,840
4	Periodic Surface Sediment Sample Collection	Per Event	Varies[5]	8	8	8	8	8	$ 232,560	$ 232,560	$ 232,560	$ 206,720	$ 206,720
5	Baseline Surface Sediment Sample Analysis	Per Sample	$ 5,000	88	88	88	79	73	$ 440,000	$ 440,000	$ 440,000	$ 395,000	$ 365,000
6	Periodic Surface Sediment Sample Analysis	Per Event	Varies[6]	8	8	8	8	8	$ 3,520,000	$ 3,520,000	$ 3,520,000	$ 3,160,000	$ 2,920,000
7	Monitoring of the CDF	Per Event	$ 25,000	10	10	10	10	10	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 250,000
8	Reporting	Per Event	$ 20,000	9	9	9	9	9	$ 180,000	$ 180,000	$ 180,000	$ 180,000	$ 180,000
								Monitoring Subtotal	**$ 4,821,630**	**$ 4,821,630**	**$ 4,821,630**	**$ 4,387,560**	**$ 4,117,560**
								Contingency	$ 1,446,489.0	$ 1,446,489.0	$ 1,446,489.0	$ 1,316,268.0	$ 1,235,268.0
								Monitoring Total	**$ 6,268,119**	**$ 6,268,119**	**$ 6,268,119**	**$ 5,703,828**	**$ 5,352,828**
TOTAL													
								Construction, Professional/Technical Services and Monitoring Total	**$ 201,887,910**	**$ 204,021,966**	**$ 209,771,022**	**$ 214,667,533**	**$ 228,954,363**

Notes:

[1] Refer to Table S-3 for the description of the cost items.

[2] Refer to Table S-4 for the basis for unit cost.

[3] Refer to Table S-5 for detailed quantities per SMA for Alternatives 1 through 5 and Table S-6 for Alternatives 6 through 10.

[4] The cost estimate is presented in 2022 dollars and is an opinion of construction cost made by Port's consultant. In providing opinions of construction cost, it is recognized that neither the Port nor Port's consultant has control over the costs of labor, equipment, materials or over contractors' methods of determining prices and bids. This opinion of construction cost is based on the Port consultant's reasonable professional judgment and experience. This estimate does not constitute a warranty, expressed or implied, that contractors' bids or negotiated prices of work will correspond with Port's budget or the opinion of construction cost prepared by Port's consultant. The accuracy of FS-level cost estimate is assumed to be -30% to +50% as per EPA's FS cost estimate guidance (EPA 2000).

[5] The per event cost for Item 4 - Periodic Surface Sediment Sample Collection is assumed to be the total cost of Item 3 - Baseline Surface Sediment Sample Collection for each alternative.

[6] The per event cost for Item 6 - Periodic Surface Sediment Sample Analysis is assumed to be the total cost of Item 5 - Baseline Surface Sediment Sample Analysis for each alternative.

MTCA = Model Toxics Control Act

CDF = Confined Disposal Facility

Ro-Ro = roll-on/roll-off

SMS = Sediment Management Standards

MNR = Monitored Natural Recovery

ENR = Enhanced Natural Recovery

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Table S-3

Cost Items Descriptions

Weyerhaeuser Mill A Former

Everett, Washington

Item No.	Item Identification	Unit	Item Description
CONSTRUCTION			
1	Mobilization/Demobilization	Percent	A percentage of construction items 2 through 24.
2	Removal, Upland Transload and Temporary Stockpiling of Existing Armor	Cubic Yard	Includes removal of existing armor to allow for dredging of the underlying contaminated sediment and wood debris, and temporary stockpiling of removed armor in the upland portions of the Site.
3	Procurement and Installation of South Terminal Toe Wall	Lump Sum	The toe wall is intended to protect the existing South Terminal wharf and armored slope to allow the full depth of contamination to be removed by dredging. The proposed toe wall is designed to allow for removal to the maximum estimated depth of contamination along the South Terminal pier face of the wall and will not support dredging to the Port's future navigational elevations. Additional details and assumptions for toe wall are presented in Attachment 1 of Appendix S.
4	Removal of Existing Ro-Ro Berthing Pier and Installation of Upland Retaining Wall	Lump Sum	Includes removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier located north of the South Terminal to allow for cleanup dredging, procurement and installation of upland retaining wall, excavation and fill for deadman installation, and managing existing utilities and obstructions in the upland area during installation of upland retaining wall. The upland retaining wall is intended to protect existing upland area adjacent to the shoreline at the South and Pacific Terminals to allow the full depth of contamination to be removed by dredging. The proposed toe wall is designed to allow for removal to the maximum estimated depth of contamination at the current bulkhead. Additional details and assumptions for upland retaining wall are presented in Attachment 1 of Appendix S.
5	Ground Improvement for Upland Retaining Wall	Lump Sum	The purpose of ground improvement is to provide seismic stability to the upland retaining wall and comply with the applicable building codes. Additional details and assumptions for ground improvement are presented in Attachment 2 of Appendix S.
6	Removal of Existing Ro-Ro Berthing Pier, Installation of CDF Wall, and Surface Confinement of CDF	Lump Sum	Includes removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier located north of the South Terminal to allow for cleanup dredging, procurement and installation of CDF wall, and covering the CDF area (following the placement of dredged material) with a layer of clean imported fill material overlain by the asphalt surface and stormwater management infrastructure for the asphalt surface to meet dredged material protection and permitting requirements. Purpose of the CDF is to create a confined disposal space for disposal of dredged material on Site. Additionally, the CDF provides containment for the in-place contaminated sediment and wood debris present within the footprint of the CDF. The proposed wall is designed to allow for removal to the maximum estimated depth of contamination along the proposed CDF face and will not support dredging to the Port's future navigational elevations. Additional details and assumptions for CDF wall are presented in Attachment 1 of Appendix S.
7	Ground Improvements for CDF Wall	Lump Sum	The purpose of ground improvement is to provide seismic stability to the CDF wall and comply with the applicable building codes. Additional details and assumptions for ground improvement are presented in Attachment 2 of Appendix S.
8	Dredging of Contaminated Material	Cubic Yard	Includes removal of contaminated sediment and wood debris and includes a 2-foot allowable overdredging allowance to ensure that removal is achieved. Dredging for berth deepening beyond the estimated depth of contamination is not included.
9	Dredging of Clean Material	Cubic Yard	Includes removal of clean sediment that is necessary for construction of a stable dredge slopes. Includes a 2-foot overdredging allowance.
10	Post-Dredge Surface Sediment Sample Collection	Per Day	Includes collection of sediment samples from post-dredge sediment surface to meet the compliance monitoring requirements of MTCA and SMS. For the full-removal remedy, post-dredge surface sediment samples will be collected to confirm that cleanup levels are met and for remedies containing a combination of removal and capping, post-dredge surface sediment samples will be collected to document contaminant concentrations left in place prior to placement of a cap. Assumes 2 samples will be collected per acre and up to 10 samples can be collected in a day.
11	Post-Dredge Surface Sediment Sample Analysis	Per Sample	Includes analysis of Site contaminants of concern (COCs) on a standard turn-around time.
12	Upland Transload and Management of Dredged Contaminated Material	Cubic Yard	Includes transload of dredged contaminated material from material barges directly into trucks and trailers (or containers) at the South Terminal. It is assumed that the necessary dewatering of dredged material will be accomplished on the material barges and the water will be released back to the marine waters in accordance with the requirements of the permits.
13	Transportation and Disposal of Dredged Contaminated Material at an Upland Landfill	Ton	Includes disposal of dredged contaminated material at a permitted upland landfill (e.g., RCRA Subtitle D landfill). Assumes a conversion rate of 1.3 tons/CY for contaminated sediment and wood debris.
14	Disposal and Management of Dredged Contaminated Material inside CDF	Cubic Yard	Includes disposal of dredged contaminated material inside the on Site CDF. Also includes management of material inside the CDF.
15	Transportation and Disposal of Dredged Clean Material at an Open-Water Disposal Site	Cubic Yard	Includes transportation and disposal of clean dredged material at the Port Gardner Open-Water Disposal Site.
16	Replacement of Ro-Ro Berthing Pier	Lump Sum	Includes replacement of existing pile-supported roll-on/roll-off berthing pier located north of the South Terminal that was demolished and removed.
17	Replacement/Reuse of Existing Armor	Cubic Yard	Includes reusing stockpiled armor to restore the armored slopes in the southern portion of the South Terminal that are not protected by the toe wall.
18	Import and Place Sand for Enhanced Natural Recovery (ENR)	Ton	Includes placement of a 6-inch layer of clean imported sand on top of the sediment surfaces within the ENR remedy areas. Assumes a conversion rate of 1.6 tons/CY for imported sand.
19	Import and Place Sand Cap	Ton	Includes placement of a 3-foot layer of clean imported sand on top of the sediment surfaces within the cap remedy areas. Assumes a conversion rate of 1.6 tons/CY for imported sand.
20	Import and Place Armor Rock	Ton	Includes placement of a 3-foot layer of clean imported armor rock on top of the sand cap surfaces in the armored cap remedy areas. Assumes a conversion rate of 1.8 tons/CY for imported armor rock.
21	Import and Place Sand to Backfill Dredged Area	Ton	Includes placement of sand within the dredged area to restore pre-existing mudline elevations.
22	Progress Bathymetric Surveys	Per Survey	Includes 2 progress survey per month of in-water dredging or material placement activities. Assumes that the entire Marine Area can be surveyed in a day. For the purposes of estimating total duration of in-water activities and total number of surveys required, a production rate of 800 CY/day and 20 work days in a month are assumed.
23	Post-Construction Bathymetric Survey	Per Survey	Includes 3 post-construction bathymetric surveys.
24	Warning Signage	Lump Sum	Includes installation of up to 10 warning signage within the upland portions of the Site.

Item No.	Item Identification	Unit	Item Description
PROFESSIONAL/TECHNICAL SERVICES			
1	Remedial Design	Percent	A percentage of Construction Total. Remedial Design includes pre-design collection and analysis of field data, engineering survey for design, and the various design components such as design analysis, plans, specifications, cost estimate, and schedule at the preliminary, intermediate, and final design phases.
2	Construction Management	Percent	A percentage of Construction Total. Construction Management includes review of submittals, design modifications, construction observation or oversight, documentation of quality control/quality assurance, and record drawings.
3	Project Management	Percent	A percentage of Construction Total. Project Management includes planning, community relations support during construction, bid and contract administration, permitting and legal services outside of institutional controls.
4	Institutional Controls	Lump Sum	Includes administrative cost and legal fees associated with Institutional Controls including proprietary controls (restrictive covenant/deed restrictions), governmental controls (notices in local zoning or building department records describing land use restrictions, commercial fishing bans and sports/recreational fishing limits posed by governmental agencies) and health advisories issued by applicable regulatory agencies.
MONITORING			
1	Marine Area Monitoring Plan	Lump Sum	A requirement of Ecology prior to performing monitoring.
2	Periodic Bathymetric Survey	Per Survey	Includes performing periodic surveys within areas with sand cap and armored cap remedies to evaluate long-term integrity of the remedy. It is assumed that surveys will be completed in years 1, 3, 5, 10, 15, 20, 25, 30 following the completion of cleanup action construction. It is assumed that post-construction bathymetric survey completed as part of the construction will be used as baseline survey.
3	Baseline Surface Sediment Sample Collection	Per Day	Includes collection of samples from existing sediment surface in areas with natural recovery (MNR and ENR) and sand cap remedies to establish baseline for periodic sampling. Samples will be collected prior to the placement of natural recovery or capping materials. Assumes 2 samples will be collected per acre and up to 10 samples can be collected in a day. Number of days required to complete the sampling event will vary for alternatives based on the acreage of area to be sampled (i.e., areas with MNR, ENR and sand cap remedies).
4	Periodic Surface Sediment Sample Collection	Per Event	Includes periodic collection of surface sediment samples from areas with natural recovery (MNR and ENR) and sand cap remedies to meet the compliance monitoring requirements of MTCA and SMS. For MNR and ENR remedies, surface sediment samples will be collected to evaluate the attenuation of contaminant concentrations over a period of time. For sand cap remedies, surface sediment samples will be collected to evaluate the effectiveness of the remedy in containing the underlying contaminated sediment. The assumptions for the number of samples to be collected and number of days required to complete a sampling event is same as Item No. 3 (Baseline Surface Sediment Sample Collection). Periodic sampling events will be completed in years 1, 3, 5, 10, 15, 20, 25, 30 following the completion of cleanup action construction.
5	Baseline Surface Sediment Sample Analysis	Per Sample	Includes analysis of Site contaminants of concern (COCs) on a standard turn-around time for samples collected during baseline sampling event. The assumption for the number of samples to be collected is described in Item No. 3 (Baseline Surface Sediment Sample Collection). The number of samples to be collected/analyzed per sampling event will vary for alternatives based on the acreage of area to be sampled (i.e., areas with MNR, ENR and sand cap remedies).
6	Periodic Surface Sediment Sample Analysis	Per Event	'Includes analysis of Site contaminants of concern (COCs) on a standard turn-around time for samples collected during periodic sampling event. Includes same assumptions as Item No. 5 (Baseline Surface Sediment Sample Analysis) for a sampling event. Periodic sampling events will be completed in years 1, 3, 5, 10, 15, 20, 25, 30 following the completion of cleanup action construction.
7	Monitoring of the CDF	Per Event	Includes cost to perform site visit, inspect conditions and evaluate structural integrity of the CDF. For the purposes of the FS, yearly monitoring events are assumed to be performed for a period of 10 years.
8	Reporting	Per Event	Includes preparation of a monitoring report to document results of baseline and each periodic event.

Notes:

MTCA = Model Toxics Control Act

CDF = Confined Disposal Facility

Ro-Ro = roll-on/roll-off
SMS = Sediment Management Standards
MNR = Monitored Natural Recovery
ENR = Enhanced Natural Recovery

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Table S-4

Basis for Unit Cost Used in the Development of Alternative Cost Estimates

Weyerhaeuser Mill A Former

Everett, Washington

Item	Item Description	Unit	Unit Cost	Basis for Unit Cost
CONSTRUCTION				
1	Mobilization/Demobilization	Percent	5%	Based on experience on other similar projects.
2	Removal, Upland Transload and Temporary Stockpiling of Existing Armor	Cubic Yard	$ 44	Unit cost to remove is assumed to be same as unit cost to dredge in Item No. 8 (Dredging of Contaminated Material), unit cost to transload is assumed to be same as unit cost transload in Item No. 12 (Transload and Management of Dredged Contaminated Material) and unit cost to stockpile is assumed to be $5/cubic yard.
3	Procurement and Installation of South Terminal Toe Wall	Lump Sum	$ 5,700,000	Refer to Attachment 1 of Appendix S. The Nucor/Skyline supplier estimate was utilitzed based on the Moffatt & Nichol recommendation that domestic supplies may be more readily available for the project.
4	Removal of Existing Ro-Ro Berthing Pier and Installation of Upland Retaining Wall	Lump Sum	$ 52,300,000	Refer to Attachment 1 of Appendix S. Note that the estimated cost for only the king pile combi-wall with steel tieback option was utilized because this alternative was the lowest cost of the options evaluated. The Nucor/Skyline supplier estimate was utilitzed based on the Moffatt & Nichol recommendation that domestic supplies may be more readily available for the project.
5	Ground Improvement for Upland Retaining Wall	Lump Sum	$ 8,800,000	Refer to Attachment 2 of Appendix S.
6	Removal of Existing Ro-Ro Berthing Pier, Installation of CDF Wall, and Surface Confinement of CDF	Lump Sum	$ 66,300,000	Refer to Attachment 1 of Appendix S. Note that the estimated cost for only the king pile combi-wall with steel tieback option was utilized because this alternative was the lowest cost of the options evaluated. The Nucor/Skyline supplier estimate was utilitzed based on the Moffatt & Nichol recommendation that domestic supplies may be more readily available for the project.
7	Ground Improvements for CDF Wall	Lump Sum	$ 22,000,000	Refer to Attachment 2 of Appendix S.
8	Dredging of Contaminated Material	Cubic Yard	$ 24	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
9	Dredging of Clean Material	Cubic Yard	$ 24	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
10	Post-Dredge Surface Sediment Sample Collection	Per Day	$ 3,230	Based on a quote received from a vendor (Gravity Consulting, LLC) in 2021 and is inclusive of 12 hours of boat captain, 12 hours of deckhand/scientist, and cost of vessel, power grab sampler, and RTK GPS navigation system. It is assumed that the cost for Port's representative are included in the Construction Management item. Unit cost is adjusted to 2022 dollars[1].
11	Post-Dredge Surface Sediment Sample Analysis	Per Sample	$ 5,000	Based on an estimate provided by a vendor (Analytical Resources, LLC of Tukwila, Washington).
12	Transload and Management of Dredged Contaminated Material	Cubic Yard	$ 15	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
13	Transportation and Disposal of Dredged Contaminated Material at an Upland Landfill	Ton	$ 72	Based on a quote received from Republic Services in 2022.
14	Disposal and Management of Dredged Contaminated Material inside CDF	Cubic Yard	$ 20	Unit cost to dispose dredge material from barges directly into CDF is assumed to be same as the unit cost to transload in Item No. 15 (Transload and Management of Dredged Contaminated Material) plus an additional unit cost of $5/cubic yard is included to manage sediment inside CDF.
15	Transportation and Disposal of Dredged Clean Material at an Open-Water Disposal Site	CY	$ 4	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
16	Replacement of Ro-Ro Berthing Pier	Lump Sum	$ 6,000,000	Based on a rough order of magnitude cost estimate provided by Moffatt & Nichol in 2022.
17	Replacement/Reuse of Existing Armor	Cubic Yard	$ 44	Unit cost is assumed to same as the unit cost for Item No. 2 (Removal, Upland Transload and Temporary Stockpiling of Existing Armor).
18	Import and Place Sand for Enhanced Natural Recovery (ENR)	Ton	$ 53	Based on average bid price dated 2009 for a similar project (Scott Paper Mill Site in Anacortes, Washington). Unit cost is adjusted to 2022 dollars[1].
19	Import and Place Sand Cap	Ton	$ 53	Unit cost to is assumed to be the same as the unit cost for Item No. 18 (Import and Place Sand for Enhanced Natural Recovery [ENR]).
20	Import and Place Armor Rock	Ton	$ 72	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
21	Import and Place Sand to Backfill Dredged Area	Ton	$ 53	Unit cost to is assumed to be the same as the unit cost for Item No. 18 (Import and Place Sand for Enhanced Natural Recovery [ENR]).
22	Progress Bathymetric Surveys	Per Survey	$ 10,500	Based on an estimate provided by a vendor (Tetra Tech) to complete the survey and prepare a working survey deliverables (no surveyor stamp).
23	Post-Construction Bathymetric Survey	Per Survey	$ 15,000	Based on an estimate provided by a vendor (Tetra Tech) to complete the survey and prepare a final stamped survey deliverables.
24	Warning Signage	Lump Sum	$ 10,000	Assumes $10,000 to install 10 warning signs.
PROFESSIONAL/TECHNICAL SERVICES				
1	Remedial Design	Percent	6%	Based on recommendations provided in Environmental Protection Agency's (EPA's) guide on feasibility study cost estimate - A Guide to Developing and Documenting Cost Estimates During the Feasibility Study dated July 2000.
2	Construction Management	Percent	6%	Based on recommendations provided in Environmental Protection Agency's (EPA's) guide on feasibility study cost estimate - A Guide to Developing and Documenting Cost Estimates During the Feasibility Study dated July 2000.
3	Project Management	Percent	5%	Based on recommendations provided in Environmental Protection Agency's (EPA's) guide on feasibility study cost estimate - A Guide to Developing and Documenting Cost Estimates During the Feasibility Study dated July 2000.
4	Institutional Controls	Lump Sum	20,000	Based on experience on other similar projects.

Item	Item Description	Unit	Unit Cost	Basis for Unit Cost
MONITORING				
1	Marine Area Monitoring Plan	Lump Sum	$ 50,000	Based on experience on other similar projects.
2	Periodic Bathymetric Survey	Per Survey	$ 15,000	Unit cost to is assumed to be the same as the unit cost for Item No. 23 (Post-Construction Bathymetric Survey).
3	Baseline Surface Sediment Sample Collection	Per Day	$ 3,230	Unit cost to complete sample collection is assumed to be the same as the unit cost for Item No. 10 (Post-Dredge Surface Sediment Sample Collection).
4	Periodic Surface Sediment Sample Collection	Per Event	Varies	Per event cost to complete periodic sediment sample collection is assumed to be same as the total cost to complete the baseline surface sediment sample collection event and will vary for each alternative based on the acreage of area to be sampled (i.e., areas with MNR, ENR and sand cap remedies).
5	Baseline Surface Sediment Sample Analysis	Per Sample	$ 5,000	Unit cost to complete sample analysis is assumed to be the same as the unit cost for Item No. 11 (Post-Dredge Surface Sediment Sample Analysis).
6	Periodic Surface Sediment Sample Analysis	Per Event	Varies	Per event cost to complete periodic sediment sample analysis is assumed to be same as the total cost to complete the baseline surface sediment sample analysis event and will vary for each alternative based on the acreage of area to be sampled (i.e., areas with MNR, ENR and sand cap remedies).
7	Monitoring of the CDF	Per Event	$ 25,000	A rough order of magnitude estimate to perform site visit, inspect conditions and evaluate structural integrity of the CDF.
8	Reporting	Per Event	$ 20,000	Based on experience on other similar projects.

Notes:

[1] Unit cost is adjusted to 2022 dollars using the following formula: FV = PV (1+r)n, where FV = 2022 Unit Cost, PV = Past Unit Cost, r = annual inflation rate, n = number of periods inflation held. Annual inflation rate is assumed to be 3 percent.

[2] Refer to Tables S-5 and S-6 for detailed quantities per SMA for each alternative.

[3] This cost estimate is presented in 2022 dollars and is an opinion of construction cost made by Port's consultant. In providing opinions of construction cost, it is recognized that neither the Port nor Port's consultant has control over the costs of labor, equipment, materials or over contractors' methods of determining prices and bids. This opinion of construction cost is based on the Port consultant's reasonable professional judgment and experience. This estimate does not constitute a warranty, expressed or implied, that contractors' bids or negotiated prices of work will correspond with Port's budget or the opinion of construction cost prepared by Port's consultant.

MTCA = Model Toxics Control Act

CDF = Confined Disposal Facility

Ro-Ro = roll-on/roll-off

SMS = Sediment Management Standards

MNR = Monitored Natural Recovery

ENR = Enhanced Natural Recovery

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Table S-5

Alternatives 1 through 5 Quantities

Weyerhaeuser Mill A Former

Everett, Washington

Area	Action	Area (Acres)	Dredge Contaminated (Includes 2-FT OD) (CY)	Contaminated Material Transport and Disposal (Ton)[1]			Import and Place (Ton)[1]				Remove Armor (CY)	Reuse Armor (CY)	Post-Dredge Samples (#)	Monitoring Samples Per Event (#)
				Total	Off-site Landfill	On-site CDF	Sand for ENR	Sand for Capping	Sand for Backfill	Armor				
ALTERNATIVE 1														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	MNR	5.7	--	--	--	--	--	--	--	--	--	--	--	12
SMA-1c	MNR	3.2	--	--	--	--	--	--	--	--	--	--	--	7
SMA-1d[2]	MNR	4.5	4,960	6,450	--	--	--	--	--	--	--	--	--	9
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	FR	6.0	151,190	196,550	--	--	--	--	--	--	19,000	--	13	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	MNR	2.8	--	--	--	--	--	--	--	--	--	--	--	6
Total		**70**	**326,560**	**424,520**	**424,520**	**0**	**0**	**0**	**0**	**0**	**20,750**	**1,200**	**55**	**88**
ALTERNATIVE 2														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d[2]	ENR	4.5	4,960	6,450	--	--	5,760	--	--	--	--	--	--	9
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	FR	6.0	151,190	196,550	--	--	--	--	--	--	19,000	--	13	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	ENR	2.8	--	--	--	--	3,620	--	--	--	--	--	--	6
Total		**70**	**326,560**	**424,520**	**424,520**	**0**	**20,900**	**0**	**0**	**0**	**20,750**	**1,200**	**55**	**88**
ALTERNATIVE 3														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d[2]	CAP	4.5	15,386	20,000	--	--	--	35,720	--	--	--	--	--	9
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	FR	6.0	151,190	196,550	--	--	--	--	--	--	19,000	--	13	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	ENR	2.8	--	--	--	--	3,620	--	--	--	--	--	--	6
Total		**70**	**336,986**	**438,070**	**438,070**	**0**	**15,140**	**35,720**	**0**	**0**	**20,750**	**1,200**	**55**	**88**

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Area	Action	Area (Acres)	Dredge Contaminated (Includes 2-FT OD) (CY)	Contaminated Material Transport and Disposal (Ton)[1]			Import and Place (Ton)[1]				Remove Armor (CY)	Reuse Armor (CY)	Post-Dredge Samples (#)	Monitoring Samples Per Event (#)
				Total	Off-site Landfill	On-site CDF	Sand for ENR	Sand for Capping	Sand for Backfill	Armor				
ALTERNATIVE 4														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d	FR	4.5	50,720	65,940	--	--	--	--	--	--	--	--	9	--
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	FR	6.0	151,190	196,550	--	--	--	--	--	--	19,000	--	13	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	ENR	2.8	--	--	--	--	3,620	--	--	--	--	--	--	6
Total		**70**	**372,320**	**484,010**	**484,010**	**0**	**15,140**	**0**	**0**	**0**	**20,750**	**1,200**	**64**	**79**
ALTERNATIVE 5														
SMA-1a	ENR	26.8	--	--	--	--	34,620	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d	FR	4.5	50,720	65,940	--	--	--	--	--	--	--	--	9	--
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	FR	6.0	151,190	196,550	--	--	--	--	--	--	19,000	--	13	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	FR/BF	2.8	27,150	35,300	--	--	--	--	43,440	--	--	--	6	--
Total		**70**	**399,470**	**519,310**	**519,310**	**0**	**46,140**	**0**	**43,440**	**0**	**20,750**	**1,200**	**70**	**73**

Notes:

[1] The following conversion rates were used to convert volume (CYs) to weight (Tons) of materials: Contaminated Dredged Material: 1.3 Tons/CY; Imported Sand: 1.6 Tons/CY and Imported Armor Rock: 1.8 Tons/CY.

[2] Under Alternatives 1 through 4, remedy selected for SMA-1d is MNR, ENR or Capping. However, dredging will be completed in SMA-1d to provide stable sideslopes for dredging completed in adjacent SMA-2a.

ENR = Enhanced Natural Recovery
MNR = Monitored Natural Recovery
CAP = Capping (3-ft thick)
CRA = A combination of removal and armored capping
CRC = A combination of removal and capping
FR = Full removal
BF = Backfilling
NA = No action
-- = No quantity applicable

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Table S-6

Alternatives 6 through 10 Quantities

Weyerhaeuser Mill A Former

Everett, Washington

Area	Action	Area (Acres)	Dredge Contaminated (Includes 2-FT OD) (CY)	Contaminated Material Transport and Disposal (Ton)[1]			Import and Place (Ton)[1]				Remove Armor (CY)	Reuse Armor (CY)	Post-Dredge Samples (#)	Monitoring Samples Per Event (#)
				Total	Off-site Landfill[2]	On-site CDF	Sand for ENR	Sand for Capping	Sand for Backfill	Armor				
ALTERNATIVE 6														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	MNR	5.7	--	--	--	--	--	--	--	--	--	--	--	12
SMA-1c	MNR	3.2	--	--	--	--	--	--	--	--	--	--	--	7
SMA-1d[3]	MNR	4.5	4,960	6,450	--	--	--	--	--	--	--	--	--	9
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	CC	6.0	--	--	--	--	--	--	--	--	--	--	--	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	MNR	2.8	--	--	--	--	--	--	--	--	--	--	--	6
Total		**70**	**175,370**	**227,970**	**1,770**	**226,200**	**0**	**0**	**0**	**0**	**1,750**	**1,200**	**42**	**88**
ALTERNATIVE 7														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d[3]	ENR	4.5	4,960	6,450	--	--	5,760	--	--	--	--	--	--	9
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	CC	6.0	--	--	--	--	--	--	--	--	--	--	--	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	ENR	2.8	--	--	--	--	3,620	--	--	--	--	--	--	6
Total		**70**	**175,370**	**227,970**	**1,770**	**226,200**	**20,900**	**0**	**0**	**0**	**1,750**	**1,200**	**42**	**88**
ALTERNATIVE 8														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d[3]	CAP	4.5	15,386	20,000	--	--	--	35,720	--	--	--	--	--	9
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	CC	6.0	--	--	--	--	--	--	--	--	--	--	--	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	ENR	2.8	--	--	--	--	3,620	--	--	--	--	--	--	6
Total		**70**	**185,796**	**241,520**	**15,320**	**226,200**	**15,140**	**35,720**	**0**	**0**	**1,750**	**1,200**	**42**	**88**

Area	Action	Area (Acres)	Dredge Contaminated (Includes 2-FT OD) (CY)	Contaminated Material Transport and Disposal (Ton)[1]			Import and Place (Ton)[1]				Remove Armor (CY)	Reuse Armor (CY)	Post-Dredge Samples (#)	Monitoring Samples Per Event (#)
				Total	Off-site Landfill[2]	On-site CDF	Sand for ENR	Sand for Capping	Sand for Backfill	Armor				
ALTERNATIVE 9														
SMA-1a	MNR	26.8	--	--	--	--	--	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d	FR	4.5	50,720	65,940	--	--	--	--	--	--	--	--	9	--
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	CC	6.0	--	--	--	--	--	--	--	--	--	--	--	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	ENR	2.8	--	--	--	--	3,620	--	--	--	--	--	--	6
Total		**70**	**221,130**	**287,460**	**61,260**	**226,200**	**15,140**	**0**	**0**	**0**	**1,750**	**1,200**	**51**	**79**
ALTERNATIVE 10														
SMA-1a	ENR	26.8	--	--	--	--	34,620	--	--	--	--	--	--	54
SMA-1b	ENR	5.7	--	--	--	--	7,380	--	--	--	--	--	--	12
SMA-1c	ENR	3.2	--	--	--	--	4,140	--	--	--	--	--	--	7
SMA-1d	FR	4.5	50,720	65,940	--	--	--	--	--	--	--	--	9	--
SMA-2a	FR	1.2	14,480	18,820	--	--	--	--	--	--	--	--	3	--
SMA-2b	FR	6.2	23,670	30,770	--	--	--	--	--	--	--	--	13	--
SMA-3	FR	2.0	8,380	10,890	--	--	--	--	--	--	--	--	5	--
SMA-4	NA	1.2	--	--	--	--	--	--	--	--	--	--	--	--
SMA-5	CC	6.0	--	--	--	--	--	--	--	--	--	--	--	--
SMA-6	FR	10.2	123,880	161,040	--	--	--	--	--	--	1,750	1,200	21	--
SMA-7	FR/BF	2.8	27,150	35,300	--	--	--	--	43,440	--	--	--	6	--
Total		**70**	**248,280**	**322,760**	**96,560**	**226,200**	**46,140**	**0**	**43,440**	**0**	**1,750**	**1,200**	**57**	**73**

Notes:

[1] The following conversion rates were used to convert volume (CYs) to weight (Tons) of materials: Contaminated Dredged Material: 1.3 Tons/CY; Imported Sand: 1.6 Tons/CY and Imported Armor Rock: 1.8 Tons/CY.

[2] Contaminated dredge material that cannot be accommodated into the on-site CDF will be disposed at an off-site permitted landfill.

[3] Under Alternatives 6 through 9, remedy selected for SMA-1d is MNR, ENR or Capping. However, dredging will be completed in SMA-1d to provide stable sideslopes for dredging completed in adjacent SMA-2a.

ENR = Enhanced Natural Recovery

MNR = Monitored Natural Recovery

CAP = Capping (3-ft thick)

CRA = A combination of removal and armored capping

CRC = A combination of removal and capping

FR = Full removal

BF = Backfilling

NA = No action

CC = Containment/Confined Disposal Facility (CDF)

-- = No quantity applicable

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ATTACHMENT S-1

Basis of Estimate by Moffatt & Nichol
dated January 11, 2023

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moffatt & nichol

Basis of Estimate

Mill A Clean Up - Port of Everett

221441

Location:	Everett, WA
Client Name:	Prepared for GeoEngineers, Inc.
Project:	Confined Disposal Facility Alternatives Feasibility in Support of Remediation Options for Mill A Clean Up
Submittal Stage:	Concept (Approximately 15% Design Level)
Issue Date:	11 January 2023

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1. Introduction

At the request of GeoEngineers, this document was compiled to provide a Basis of Estimate (BOE) summary report developed by Moffatt & Nichol (M&N) for the Port of Everett's Mill A Site Clean Up Project. The BOE is a baseline document which presents the costs, pricing methodology, and underlying assumptions used to create confined disposal facility (CDF) feasibility estimates and other marine structure cost estimates which informed a broader site-wide alternatives analysis for site cleanup.

CDF layout options for contaminated dredge sediments, reconstruction of an existing Roll-on/Roll-off (Ro/Ro) berth, other waterfront structures used to protect existing infrastructure during cleanup dredging, and corresponding high-level costs for each were developed for several arrangements. Figure 1 highlights the Mill A study area within the Port of Everett's South Terminal and Pacific Terminal areas.

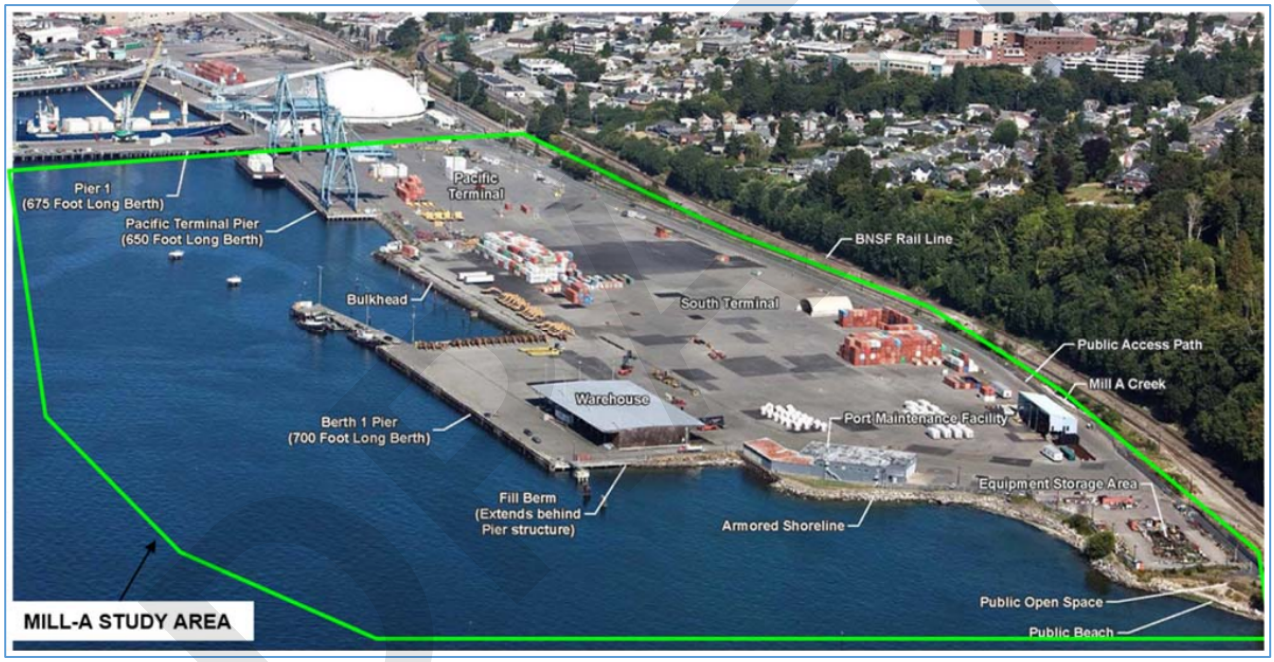

Figure 1 – Mill A Study Area

The estimating methods were consistent with industry standards used for developing concept-level estimates based upon experience, available material pricing, and representative labor and equipment costs required to execute work in an industrial marine setting. The BOE may be viewed as a working document depicting point-in-time estimates for various structural CDF and other marine structure arrangements that can be updated whenever new or revised information affecting the layouts becomes available. This document is therefore intended for planning purposes and is not intended to form part of a set of contract documents.

The assumptions, unit costs, and other back up information that make up the BOE are summarized in the cost estimate breakdowns included in Appendix A. The Opinions of Probable Costs presented in Appendix A represent the costs for procurement, construction, escalation,

and construction contingency. They do not include any associated costs for engineering design, permitting, construction management, and Port administration costs.

2. Background

GeoEngineers is developing a site-wide cleanup alternatives analysis. This document provides cost estimates for a series of new structures to support cleanup dredging near existing structures and containment options for contaminated material at the Mill A Site.

2.1. Structural Element Layouts

Figure 2 shows the layout of the Mill A site with various remedial structural elements labeled. North is located to the right. The structural options included a **South Terminal Toe Wall** to facilitate removal of contaminated material at the base of the existing wharf structure, an **Upland Retaining Wall** to protect the existing upland infrastructure while cleanup dredging is completed at the base of the existing bulkhead, reconstruction of a dolphin **Ro/Ro Berth**, and a **Containment/CDF Wall** of various lengths to enclose existing site contamination in place and store contaminated dredged material.

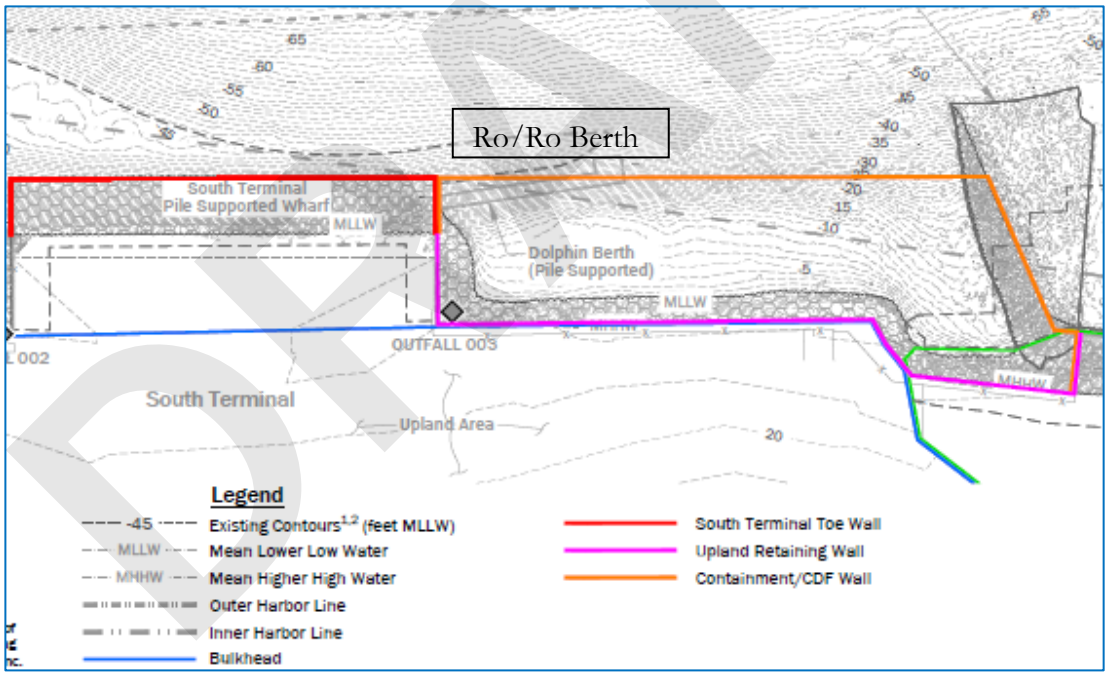

Figure 2 – Remedial Structural Element Layout

The structural options evaluated CDF footprints that are generally located between South Terminal and Pacific Terminal. With reference to Figure 2, M&N estimated different structural alternatives for the new facility as described below.

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Containment Systems

- 700-foot face offshore wall to contain contaminated material (parallel with containment/CDF wall alignment) constructed using king pile combi-wall with steel tiebacks, as shown below in Figure 3.
- 700-foot face offshore cellular sheet pile wall to contain contaminated material as shown below in Figure 4 (parallel with containment/CDF wall alignment).
- 920-foot face offshore wall to contain contaminated material (parallel with containment/CDF wall alignment) constructed using king pile combi-wall with steel tiebacks, as shown below in Figure 3.
- 920-foot face offshore cellular sheet pile wall to contain contaminated material as shown below in Figure 4 (parallel with containment/CDF wall alignment).

Retaining Wall

- 600-foot of inshore wall (parallel with upland retaining wall alignment) to protect the existing shoreline infrastructure during cleanup dredging constructed using king pile combi-wall with steel tiebacks, as shown below in Figure 3. Note that this retaining wall would be implemented as part of the 700-foot offshore walls described above.
- 1375 feet of inshore wall (parallel with upland retaining wall alignment) to protect the existing shoreline infrastructure during cleanup dredging constructed using king pile combi-wall with steel tiebacks, as shown below in Figure 3.

Ro/Ro Dolphin Berth

- Reconstruction of an existing Ro/Ro dolphin berth which would be required to be demolished to accomplish the cleanup dredging.

Toe Wall

- Installation of a sheet pile toe wall along the South Terminal berth to facilitate cleanup dredging and cleanup in front of the existing pile-supported wharf.

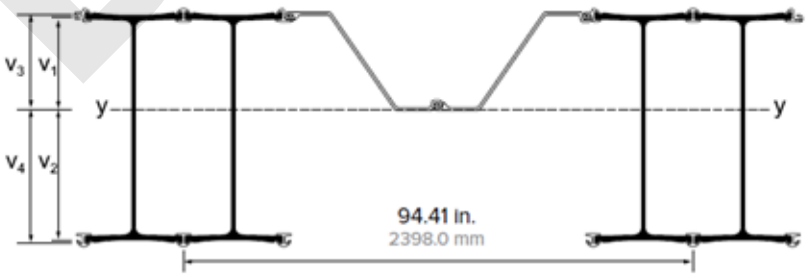

Figure 3 – Example King Pile Combi-Wall

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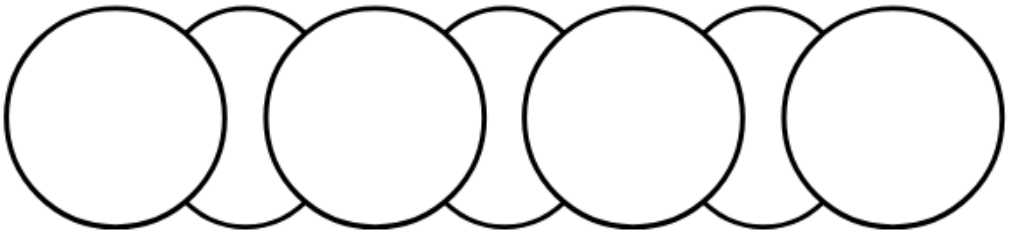

Figure 4 – Example Cellular Sheet Pile Wall Layout

2.2. Methodology

Unit costs for the primary elements of each alternative were derived from a combination of sources including material suppliers, recent bid tabulations, RSMeans unit prices adjusted for specific jobsite conditions, and escalation calculations to inflate costs from the previous estimation work completed by M&N for the Port. A construction contingency of 30% was applied to the costs to reflect the preliminary nature of the estimates and the conceptual design level of the wall elements.

3. Estimate Development

A primary step to develop each cost estimate was to determine the material quantities needed to construct each CDF, Ro/Ro dolphin berth, and retaining wall alternative. The sizing of the walls was typically determined using SAP2000 and LPile models. Soil pressure demands on the walls were provided by GeoEngineers. After calculating the demands and estimating element sizes, the demand-to-capacity ratios for different combi-wall and cellular wall variations were determined. Due to poor existing soil conditions and high seismic demands, the required wall elements tend to be at the highest range of the capacity spectrum offered by suppliers.

Two unit-prices for steel were available, one for domestically supplied material, and one for imported material. Domestic steel is available from Nucor/Skyline and European steel is available from JD Fields for the ArcelorMittal HZ-M /AZ wall system. The Nucor/Skyline combi-wall prices are generally higher than the ArcelorMittal king pile system but may be more readily available at the time of procurement. Note the comparison of prices in Figures A1, A2, and A3 in Appendix A.

All prices presented have been baselined to 2022 US Dollars. For planning purposes and to avoid unexpected budget shortfalls, use of the slightly higher domestic steel prices is recommended until a design is advanced beyond the conceptual level and the various funding sources can be identified.

4. Results

- With reference to Figure A1 in Appendix A, tied-back combi-wall CDF options were most economical compared to the cellular sheet pile wall CDF options. Preliminary analysis identifies that the tied-back combi-wall CDF options tend to require structural elements near

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the largest end of the capacity spectrum, which may limit flexibility to accommodate increased capacity requirements as the design process progresses.

- The cellular sheet pile wall options were found to have lower demand-to-capacity ratios compared to the combi-wall options and do not tend to require the largest available steel sections, thus allowing greater flexibility as design progresses to accommodate increased capacity requirements. They incorporated modest-diameter cells, but ultimately require greater quantities of steel and are more expensive than the combi-wall options. See Figure A2 in Appendix A.
- Both the combi-wall options and the cellular sheet pile alternatives are constructible by several Pacific Northwest marine contractors.
- If a CDF is not selected, an upland wall in front of the existing bulkhead along the 'upland retaining wall' alignment shown in Figure 2 was evaluated to protect the shoreline infrastructure during cleanup dredging. Refer to Figure A3 in Appendix A.
- Each of the cost estimates includes a new Toe Wall along the South Terminal berth as shown in Figure 2. The wall alignment remains the same in each alternative and did not require consideration of seismic loading according to the GeoEngineers soil loading recommendations; hence it incorporates smaller combi-wall elements compared to the CDF and upland retaining wall.
- Each of the cost estimates also includes the cost of replacing the Ro-Ro berth shown in Figure 2 because it will need to be demolished to support the remedial actions.

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Appendix A: Opinions of Probable Cost

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Bid Item	Description	Quantity	Unit	Updated 2016 Combi-Wall Confined Disposal Facility			
				700ft Combi Wall (Nucor/Skyline) Mill-A	700ft Combi Wall (JD Fields) Mill-A	920ft Combi Wall (Nucor/Skyline) Mill-A	920ft Combi Wall (JD Fields) Mill-A
				Extended Cost	Extended Cost	Extended Cost	Extended Cost
1.0	SITE SURVEY/DEMOLITION [2]	1	LS	$300,000	$300,000	$300,000	$300,000
2.0	STRUCTURAL WALLS	1	LS	$46,000,000	$36,400,000	$60,500,000	$47,800,000
3.0	EARTHWORK/ SITEWORK [3]	1	LS	$4,000,000	$4,000,000	$5,200,000	$5,200,000
4.0	SLOPE PROTECTION DURING CONSTRUCTION	1	LS	$200,000	$200,000	$300,000	$300,000
	Items 1.0 - 4.0 Subtotal			$50,500,000	$40,900,000	$66,300,000	$53,600,000
5.0	MOBILIZATION/ DEMOBILIZATION[1]	3	%	$1,600,000	$1,300,000	$2,100,000	$1,700,000
6.0	Ro-Ro BERTHING DOLPHINS	1	LS	$6,000,000	$6,000,000	$6,000,000	$6,000,000
7.0	SOUTH TERMINAL TOE WALL	1	LS	$5,700,000	$4,500,000	$5,700,000	$4,500,000
	Items 1.0 - 7.0 Subtotal			$63,800,000	$52,700,000	$80,100,000	$65,800,000
	Contingency		(30%)	$19,100,000	$15,800,000	$24,000,000	$19,700,000
	Subtotal with Contingency			$82,900,000	$68,500,000	$104,100,000	$85,500,000
	Everett Sales Tax		(9.9%)	$8,200,000	$6,800,000	$10,300,000	$8,500,000
	Total Project Cost (Rounded)			$91,100,000	$75,300,000	$114,400,000	$94,000,000
	Unit Project Cost (Rounded)			$79,000/LF	$65,000/LF	$82,000/LF	$68,000/LF
	Notes:						
	1. 2022 based on 3% of the base construction costs, 2016 based on 2%						
	2. Includes exsiting condtiontions, site plan survey and demolition						
	3. Includes structural fill above +9' MMLW, storm drainage, upland pavement and base course. Cost associated with dredging, handling and placement of dredge spoils is not included. It includes the excavation and fill for the deadman installation on the upland wall cost						
	4. Contract Administration, Inspection & Other Indirects, Geotechnical Engineering and Construction Support and Survey, Planning, Permitting, Design and Bid Documents not included						
	5. All costs shown are in 2022 USD and are rounded to the nearest one thousand dollar.						

Figure A1 – King Pile Combi-Wall Estimate

Bid Item	Description	Quantity	Unit	2022 Cellular Confined Disposal Facility			
				700ft Combi Wall (Nucor/Skyline) Mill-A	700ft Combi Wall (JD Fields) Mill-A	920ft Combi Wall (Nucor/Skyline) Mill-A	920ft Combi Wall (JD Fields) Mill-A
				Extended Cost	Extended Cost	Extended Cost	Extended Cost
1.0	SITE SURVEY/DEMOLITION [2]	1	LS	$300,000	$300,000	$400,000	$400,000
2.0	STRUCTURAL WALLS	1	LS	$69,800,000	$58,300,000	$91,800,000	$76,700,000
3.0	EARTHWORK/ SITEWORK [3]	1	LS	$4,900,000	$4,900,000	$6,500,000	$6,500,000
4.0	SLOPE PROTECTION DURING CONSTRUCTION	1	LS	$200,000	$200,000	$300,000	$300,000
	Items 1.0 - 4.0 Subtotal			$75,200,000	$63,700,000	$99,000,000	$83,900,000
5.0	MOBILIZATION/ DEMOBILIZATION[1]	3	%	$2,400,000	$2,000,000	$3,200,000	$2,700,000
6.0	Ro-Ro BERTHING DOLPHINS	1	LS	$6,000,000	$6,000,000	$6,000,000	$6,000,000
7.0	SOUTH TERMINAL TOE WALL	1	LS	$5,700,000	$4,500,000	$5,700,000	$4,500,000
	Items 1.0 - 7.0 Subtotal			$89,300,000	$76,200,000	$113,900,000	$97,100,000
	Contingency		(30%)	$26,800,000	$22,900,000	$34,200,000	$29,100,000
	Subtotal with Contingency			$116,100,000	$99,100,000	$148,100,000	$126,200,000
	Everett Sales Tax		(9.9%)	$11,500,000	$9,800,000	$14,700,000	$12,500,000
	Total Project Cost (Rounded)			$127,600,000	$108,900,000	$162,800,000	$138,700,000
	Unit Project Cost (Rounded)			$110,000/LF	$78,000/LF	$141,000/LF	$100,000/LF
	Notes:						
	1. 2022 based on 3% of the base construction costs, 2016 based on 2%						
	2. Includes exsiting condtiontions, site plan survey and demolition						
	3. Includes structural fill above +9' MMLW, storm drainage, upland pavement and base course. Cost associated with dredging, handling and placement of dredge spoils is not included. It includes the excavation and fill for the deadman installation on the upland wall cost						
	4. Contract Administration, Inspection & Other Indirects, Geotechnical Engineering and Construction Support and Survey, Planning, Permitting, Design and Bid Documents not included						
	5. All costs shown are in 2022 USD and are rounded to the nearest one thousand dollar.						

Figure A2 – Cellular Sheet Pile Wall Estimate

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Bid Item	Description	Quantity	Unit	2022 Upland Tied Back Combi-Wall			
				600ft Upland Wall (Nucor/Skyline) Mill-A/ Pacific Terminal	600ft Upland Wall (JD Fields) Mill-A/ Pacific Terminal	1375ft Upland wall (Nucor/Skyline) Mill-A /Pacific Terminal	1375ft Upland wall (JD Fields) Mill-A /Pacific Terminal
				Extended Cost	Extended Cost	Extended Cost	Extended Cost
1.0	SITE SURVEY/DEMOLITION [2]	1	LS	$200,000	$200,000	$500,000	$500,000
2.0	STRUCTURAL WALLS	1	LS	$19,800,000	$15,000,000	$45,200,000	$34,400,000
3.0	EARTHWORK/ SITEWORK [3]	1	LS	$2,700,000	$2,700,000	$6,200,000	$6,200,000
4.0	SLOPE PROTECTION DURING CONSTRUCTION	1	LS	$200,000	$200,000	$400,000	$500,000
	Items 1.0 - 4.0 Subtotal			$22,900,000	$18,100,000	$52,300,000	$41,600,000
5.0	MOBILIZATION/ DEMOBILIZATION [1]	3	%	$900,000	$700,000	$1,900,000	$1,700,000
6.0	Ro-Ro BERTHING DOLPHINS	1	LS	$6,000,000	$6,000,000	$6,000,000	$6,000,000
7.0	SOUTH TERMINAL TOE WALL	1	LS	$5,700,000	$4,500,000	$5,700,000	$4,500,000
	Items 1.0 - 7.0 Subtotal			$35,500,000	$29,300,000	$65,900,000	$53,800,000
	Contingency		(30%)	$10,700,000	$8,800,000	$19,800,000	$16,100,000
	Subtotal with Contingency			$46,200,000	$38,100,000	$85,700,000	$69,900,000
	Everett Sales Tax		(9.9%)	$4,600,000	$3,800,000	$8,500,000	$6,900,000
	Total Project Cost (Rounded)			$50,800,000	$41,900,000	$94,200,000	$76,800,000
	Unit Project Cost (Rounded)			$85,000/LF	$70,000/LF	$69,000/LF	$56,000/LF
	Notes:						
	1. 2022 based on 3% of the base construction costs, 2016 based on 2%						
	2. Includes exsiting condtiontions, site plan survey and demolition						
	3. Includes structural fill above +9' MMLW, storm drainage, upland pavement and base course. Cost associated with dredging, handling and placement of dredge spoils is not included. It includes the excavation and fill for the deadman installation on the upland wall cost						
	4. Contract Administration, Inspection & Other Indirects, Geotechnical Engineering and Construction Support and Survey, Planning, Permitting, Design and Bid Documents not included						
	5. All costs shown are in 2022 USD and are rounded to the nearest one thousand dollar.						

Figure A3 – Upland Retaining Wall Estimate

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Disclaimer

The cost estimate is an 'Opinion of Probable Cost' (OPC) made by a consultant. In providing opinions of construction cost, it is recognized that the consultant has no control over the cost of labor, equipment, materials or over the contractor's means and methods of determining constructability, pricing, or schedule. The opinion of construction cost is based on the consultant's reasonable professional judgement and experience and does not constitute a warranty, expressed or implied, that the contractor's bids, negotiated prices, or actual execution of the work will not vary from the OPC.

This report was prepared by Moffatt & Nichol for GeoEngineers, for a specific purpose and specific project using the standard care prevailing at the time the work was done and is provided for information only. The material contained within it reflects Moffatt & Nichol's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Moffatt & Nichol accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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ATTACHMENT S-2
Opinion of Preliminary Cost for Ground Improvements

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ATTACHMENT S-2
OPINION OF PRELIMINARY COST FOR GROUND IMPROVEMENTS

This attachment summarizes the opinion of preliminary cost analysis completed for ground improvement elements of the remedial alternatives under consideration for the Former Weyerhaeuser Mill A Marine Area (Site) located at the Port of Everett, Everett Washington. The ground improvement costs estimate are coordinated with the Moffatt & Nichol's (M&N's) preliminary design and cost estimate for structural elements of the proposed remedial alternatives. The structures evaluated by M&N and included in the range of remedial alternatives identified for the Site include a toe wall, upland retaining wall, and confined disposal facility (CDF) containment structure. Ground improvements are a necessary component for the upland retaining wall and the CDF containment structures and are the focus of this analysis.

Figure S-2-1 presents the general locations of the above structural elements anticipated for the remedial alternatives. The upland retaining wall, as highlighted in pink in Figure S-2-1, is located at the interface of upland and marine areas between the South and Pacific Terminals to protect the existing upland infrastructure while cleanup dredging is completed at the base of the existing bulkhead. The containment/CDF wall is located between the South and Pacific Terminals, as highlighted in orange in Figure S-2-1, to contain existing site contamination in place and store contaminated dredge material.

Subsurface Conditions

Per GeoEngineers preliminary geotechnical engineering memorandum dated May 25, 2016, the subsurface soils at the containment/CDF and upland retaining wall area generally consist of fill overlying native beach deposits that are underlain by glacially consolidated soils.

Fill generally consists of two types of material, that are: (1) wood debris that was associated with historical mill operations at the Site; and (2) hydraulic fill material placed as part of the development activities at the Site. Native beach deposits mainly consist of loose to dense sand. Glacially consolidated soils generally consist of dense to very dense sand or very stiff to hard clay.

The generalized subsurface condition at the containment/CDF and upland retaining wall area is presented in Figure T-2-2 along cross section A-A', the approximate location of which is shown in Figure S-2-1.

Ground Improvement with Rigid Inclusions Preliminary Cost Estimate

The estimated costs for the ground improvement elements were developed for the following structures identified in the Moffatt & Nichol 's memo "Basis of Estimate - Confined Disposal Facility Alternatives Feasibility in Support of Remediation Options for Mill A Clean Up" included in Attachment S-1.

- **Containment/CDF Wall Systems:** 920 feet of offshore wall (parallel with containment/CDF wall alignment) constructed using king pile combi-wall with steel tiebacks.
- **Upland Retaining Wall:** 1375 feet of inshore wall (parallel with upland retaining wall alignment) constructed using king pile combi-wall with steel tiebacks.

Ground improvement costs were developed only for the king pile combi-wall options identified by M&N for both the CDF and upland retaining wall as these structural elements were used by Geoengineers in the cost estimates for the remedial alternatives for the Site.

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As identified in the preliminary geotechnical engineering memorandum dated May 25, 2016, the soils above the glacially consolidated soils are considered liquefiable; and will cause ground deformations and slope failure. Rigid inclusions are assumed as the ground improvement method for the estimated costs to stiffen the liquefiable soils within the structural systems (e.g., the containment/CDF wall systems, and the upland retaining wall) and to mitigate the ground deformations and the risk of slope failure. Further refinement on the ground improvement approach will be completed as part of the design process for the structures.

Preliminary Rigid Inclusion Program

Rigid inclusions are generally unreinforced, grouted, or concrete columns installed using a continuous flight, hollow-stem auger attached to a set of leads supported by a crane or with a fixed-mast drill rig. The first step in the rigid inclusion placement process consists of drilling the auger into the ground to the specific tip elevation of the rigid inclusion. Concrete is then pumped through the hollow-stem during steady withdrawal of the auger, replacing the soils on the flights of the auger. One benefit of using the augercast method for rigid inclusion installation is that the auger provides support for the soils during the installation process, thus eliminating the need for temporary casing or drilling fluid.

For this project, the rigid inclusions were generally assumed for stabilization at both the containment/CDF and the upland retaining wall. The preliminary rigid inclusion concept assumed consists of:

- Two-foot-diameter rigid inclusions.
- A minimum of compressive strength at 28 days of 3,000 pounds per square inch (psi) for the rigid inclusion concrete mixture.

For the estimated ground improvement costs to support the king pile combi-wall with steel tiebacks, the ground improvement zone is assumed to be located behind the king pile combi-wall and extends to approximately 110 feet from the face of the combi-wall for both structures.

The post-improvement slope stability and lateral spreading was evaluated with the proposed preliminary rigid inclusion concept within the ground improvement zone under static, post-earthquake, and seismic (pseudo-static) conditions. Our analyses indicate that the rigid inclusion approach provides for a stable condition under both static and post-earthquake conditions and keep the lateral deformation under seismic condition to maintain the containment function for the CDF wall systems.

Preliminary Rigid Inclusion Cost Estimate

Based on conversation with the contractors regarding current pricing on construction of the proposed ground improvements, the preliminary cost estimate was estimated as $22,000,000 for the containment/CDF wall; and $8,800,000 for the upland retaining wall. Table S-2-1 presents the summary of the cost estimate for the preliminary rigid inclusion concept.

Attachments:

Table S-2-1. Ground Improvement with Rigid Inclusion Preliminary Cost Estimate

Figure S-2-1. Site Plan

Figure S-2-2. Containment/CDF and Upland Retaining Wall Area Generalized Subsurface Condition

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Table S-2-1

Ground Improvement with Rigid Inclusion Preliminary Cost Estimate

Weyerhaeuser Mill A Former

Everett, Washington

Item No.	Item Identification	Unit	Value (Cost)
Containment/CDF Wall (1,330 feet Long)[1]			
1	Approximate number of rigid inclusion per foot of wall	-	3.6
2	Approximate rigid inclusion depth	feet	100
3	Total length of rigid inclusions	feet	478,800
4	Unit price per foot of rigid inclusion	$	45.0
Total Rigid Inclusion Cost			**$ 22,000,000.00**
Upland Retaining Wall (1,375 feet Long)[2]			
1	Approximate number of rigid inclusion per foot of wall	-	1.6
2	Approximate rigid inclusion depth	feet	88
3	Total length of rigid inclusions	feet	193,600
4	Unit price per foot of rigid inclusion	$	45.0
Total Rigid Inclusion Cost			**$ 8,800,000.00**
TOTAL RIGID INCLUSION COST (CONTAINMENT/CDF WALL AND UPLAND RETAINING WALL)			
			$ 30,800,000.00

Notes:

[1] Refer to an area replacement ratio of 10 percent

[2] Refer to an area replacement ratio of 4.5 percent

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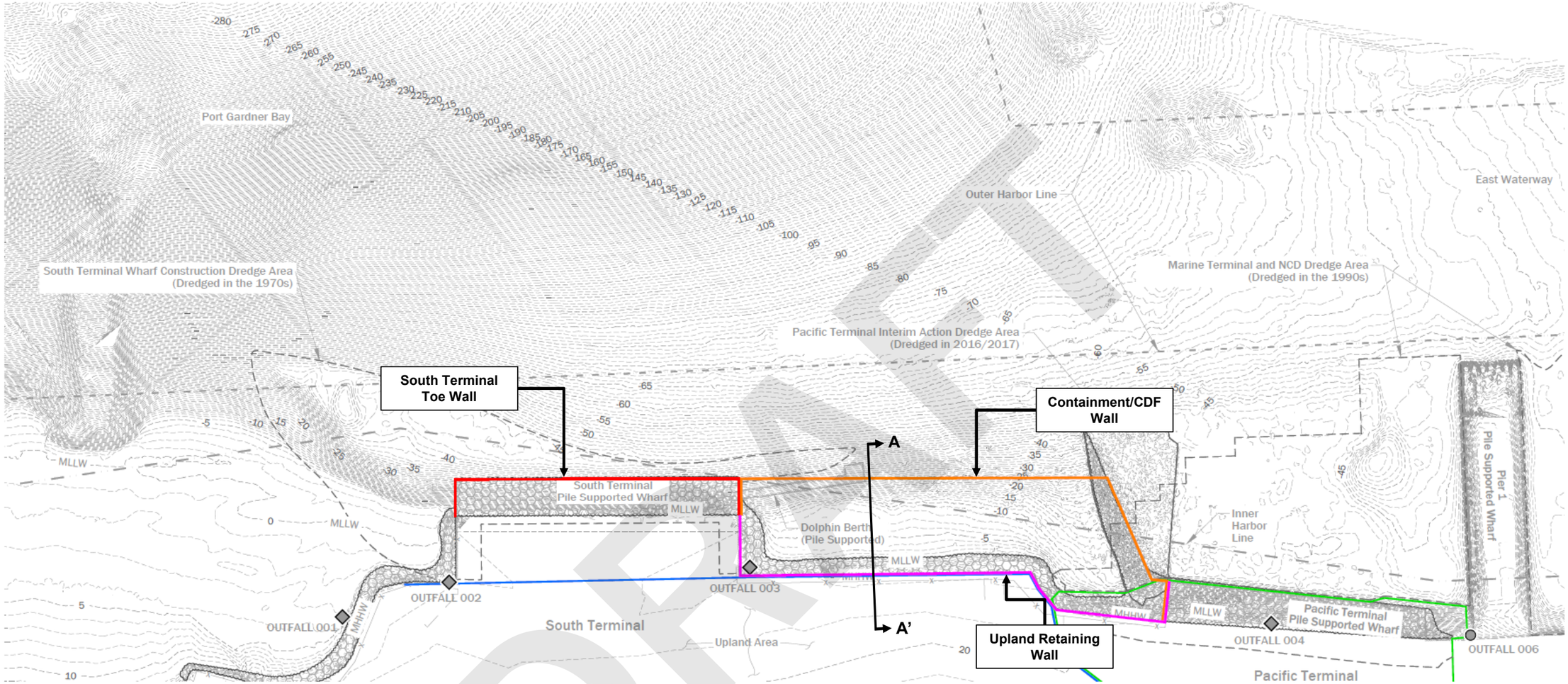

Legend

- -45 — Existing Contours[1,2] (feet MLLW)
- MLLW — Mean Lower Low Water
- MHHW — Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- South Terminal Toe Wall
- Upland Retaining Wall
- Containment/CDF Wall

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Site Plan

Port of Everett Mill A Site
Everett, Washington

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Figure S-2-1

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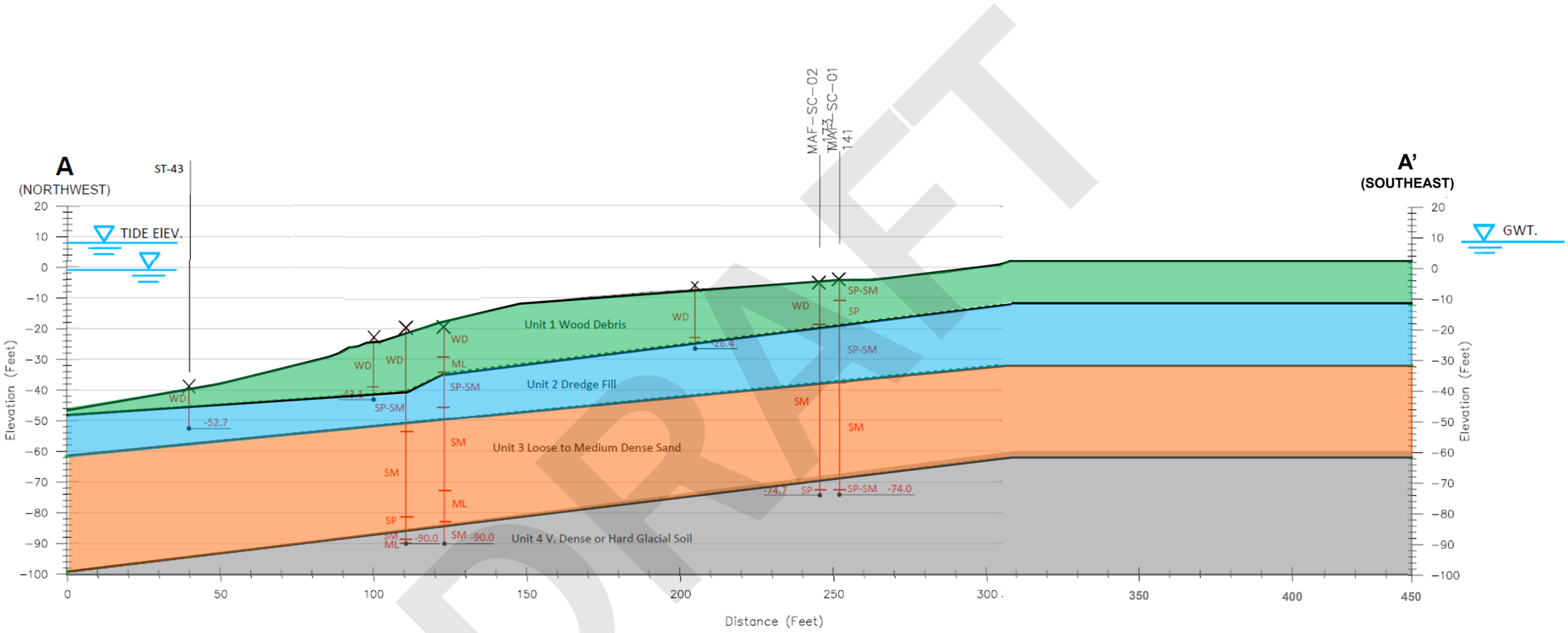

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Containment/CDF and Upland Retaining Wall Area
Generalized Subsurface Condition

Port of Everett Mill A Site
Everett, Washington

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Figure S-2-2

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