APPENDIX F

Cost Estimates

TABLE F-1
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**
Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of low permeability soil cap over Upland Site Unit					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Temporary Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Import fill for site grading/preparation	c.y.	27,500	$18	$495,000	4
Place, grade, and compact imported fill	c.y.	27,500	$9	$247,500	1,4
LFG control layer installing pipe, welding, testing)	l.f.	7,350	$16	$117,600	1,5
LFG control layer - granular fill	c.y.	8,400	$25	$210,000	6
Place, grade, and compact low permeability layer	c.y.	47,500	$9.00	$427,500	7
Separation / Protection Layer	s.y.	50,610	$1.30	$65,793	8
Import fill for drainage and topsoil layers	c.y.	33,700	$18	$606,600	9
Estin Placement and grading of drainage and topsoil layers	c.y.	33,700	$9	$303,300	1,9
OSWER 9355.0-75, July 2000					
Hydroseeding capped area	ac	10	$4,000	$41,829	1
Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses;					
$100 per sample for data validation and management; $300 for LFG VOC analysis, $100 for LFG analyzer rental;					
and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2).					
Stormwater management system (incl. BNSF drainage)	LS	1	$100,000	$100,000	1
Passive vents for LFG system	LS	1	$25,000	$25,000	1
Installation of 8 groundwater monitoring wells	LS	1	$16,000	$16,000	10
Deed restrictions (institutional controls)	LS	1	$5,000	$5,000	1
Subtotal for Direct Capital Costs				***$2,700,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$50,000	1
Remedial Design	%	12		$324,000	11,14
Project Management	%	6		$162,000	12,14
Construction Management	%	8		$216,000	13,14
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	3		$81,000	1
Ecology Oversight	%	2		$54,000	1
Estimate of Taxes	%	9		$243,000	
Subtotal for Capital Indirect Costs				***$1,170,000***	
Subtotal for Capital Direct and Indirect Costs				***$3,870,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$967,500***	
Total for Direct and Indirect Capital Costs				**$4,837,500**	

Operation and Maintenance - Upland Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Groundwater and LFG Compliance Monitoring and Reporting						
Years 1 to 2 - Water Quality and LFG Monitoring (Quarterly)	Ea.	4	$12,700	$50,800	$97,204	15,16
Years 3 to 5 - Water Quality and LFG Monitoring (Semi-annually)	Ea.	2	$12,950	$25,900	$69,765	15,16
Subtotal for Operation and Maintenance Costs				***$166,969***		
Contingency on Operation and Maintenance Costs		25%		***$42,000***		
Total for Operation and Maintenance Costs				***$208,969***		
PRESENT WORTH OF ALTERNATIVE 1 - Upland Site Unit				**$5,050,000**		

TABLE F-1
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**
Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Dust control, street sweeping, erosion control measures
4 Based on creating 1.5% slope over 85% of Upland Site Area. [Assume 15% coverage by buildings/pavement (535,900 sf x 0.85 = 455,515 sf)] Assumed excess stabilized sediment is available after creating 2 ft cap, which provides an additional 13,750 CY to achieve desired slope. Assumed imported structural fill from clean borrow required for grade not achieved with the stabilized sediment.
5 Assumed perforated 2" HDPE SDR-11 on 75-ft centers under cap
6 Assumed granular fill material with a thickness of 6-inches under cap area (455,520 sf)
7 Assumed approximately 47,500 c.y. of stabilized sediment will be graded and compacted across 85% of the Upland Site Unit (455,520 sf)
8 Assumed non-woven geotextile, installed cost; throughout cap area (455,520 sf / 9 = 50610 CY)
9 Assumes 1 ft drainage layer, 1 ft topsoil over 455,520 sf area
10 Assumed installation occurs during shoreline stabilization; assumed $2,000 in labor and materials per well
11 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
12 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
13 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
14 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
15 Groundwater monitoring - 8 samples + 2 QA/QC per event; monitoring on quarterly basis for 2 years, semi-annually for 3 years, annually for 5 years. Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses; $100 per sample for data validation and management; $300 for LFG VOC analysis, $100 for LFG analyzer rental; and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2), and $7,500 per annum (years 3 through 5).
16 Present Worth Values calculated assuming a 3 percent discount rate.

TABLE F-2
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**
Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of shoreline stabilization					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Select removal and disposal of refuse along shoreline	c.y.	1,000	$96	$96,125	4
Placement of 3 ft of gravel/riprap for shoreline stabilization	c.y.	30,800	$38	$1,170,400	5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	5,100	$25	$127,500	5
Subtotal for Direct Capital Costs				***$1,430,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$70,000	1
Remedial Design	%	15		$214,500	1,6,9
Project Management	%	6		$85,800	7,9
Construction Management	%	8		$114,400	8,9
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	10		$143,000	1
Ecology Oversight	%	2		$28,600	1
Estimate of Taxes	%	9		$128,700	
Subtotal for Capital Indirect Costs				***$825,000***	
Subtotal for Capital Direct and Indirect Costs				***$2,255,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$563,750***	
Total for Direct and Indirect Capital Costs				**$2,818,750**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Natural Recovery Compliance Monitoring and Reporting						
Years 1 to 10 - Sediment Sampling (Yr 1, 5,10)	Ea.	1	$22,400	$22,400	$82,689	10,13
Bathymetric Survey of Subtidal MNR (same schedule as monitoring)						
Survey and letter report	Ea.	1	$8,000	$8,000	$29,532	11,13
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$29,401	12,13
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Design/Coordination/Permitting	LS	1	$5,000	$5,000		
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10,15,20 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Sum	1		$15,100	$42,314	13
Subtotal for Operation and Maintenance Costs				***$183,936***		
Contingency on Operation and Maintenance Costs		25%		***$46,000***		
Total for Operation and Maintenance Costs				***$229,936***		
PRESENT WORTH OF ALTERNATIVE 1 - Marine Site Unit				**$3,050,000**		

TABLE F-2
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 1 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 1: **Containment with Low Permeability Cap, Shoreline Stabilization, and Deep Subtidal Sediment MNR**
Scope of Work: Construct low-permeability cap in the Upland Site Unit; integrate stormwater and erosion control and LFG control; shoreline stabilization; and monitored natural recovery of subtidal sediments.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Assumed 1,000 c.y. of material to be excavated, hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
5 Assumes 3 ft of riprap and 0.5 ft of gravel over 276,946 sf of area for shoreline stabilization system
6 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
7 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
8 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
9 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
10 Monitoring sediment accumulation / recovery from 10 shallow sediment cores; plus 12 surface sediment samples collected for PCB analysis.
11 Assume bathymetry survey on same frequency as sediment monitoring.
12 Inspection assumes 6-hour travel/field effort and 4-hour report effort at $140/hr.
13 Present Worth Values calculated assuming a 3 percent discount rate.

TABLE F-3
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2: **Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**
Scope of Work: Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of low permeability soil cap over Upland Site Uni					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Temporary Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Import fill for site grading/preparation	c.y.	27,500	$18	$495,000	4
Place, grade, and compact imported fill	c.y.	27,500	$9	$247,500	1,4
LFG control layer installing pipe, welding, testing)	l.f.	7,350	$16	$117,600	1,5
LFG control layer - granular fill	c.y.	8,400	$25	$210,000	6
Place, grade, and compact low permeability layer	c.y.	47,500	$9.00	$427,500	7
Separation / Protection Layer (Scrim Reinforced Liner)	s.y.	50,610	$3.33	$168,531	8
Import fill for drainage and topsoil layers	c.y.	33,700	$18	$606,600	9
Placement and grading of drainage and topsoil layers	c.y.	33,700	$9	$303,300	1,9
Hydroseeding capped area	ac	10	$4,000	$41,829	1
Other Components of Cleanup Action Alternative					
Import and placement of sand for shoreline sand filter	c.y.	10,300	$26	$267,800	17
Stormwater management system (incl. BNSF drainage)	LS	1	$100,000	$100,000	1
Passive vents for LFG system	LS	1	$25,000	$25,000	1
Installation of 8 groundwater monitoring wells	LS	1	$16,000	$16,000	10
Deed restrictions (institutional controls)	LS	1	$5,000	$5,000	1
Subtotal for Direct Capital Costs				***$3,070,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$75,000	1
Remedial Design	%	12		$368,400	11,14
Project Management	%	6		$184,200	12,14
Construction Management	%	8		$245,600	13,14
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	3		$92,100	1
Ecology Oversight	%	2		$61,400	1
Estimate of Taxes	%	9		$276,300	
Subtotal for Capital Indirect Costs				***$1,343,000***	
Subtotal for Capital Direct and Indirect Costs				***$4,413,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$1,103,250***	
Total for Direct and Indirect Capital Costs				**$5,516,250**	

Operation and Maintenance - Upland Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Groundwater and LFG Compliance Monitoring and Reporting						
Years 1 to 2 - Water Quality and LFG Monitoring (Quarterly)	Ea.	4	$12,700	$50,800	$97,204	15,16
Years 3 to 5 - Water Quality and LFG Monitoring (Semi-annually)	Ea.	2	$12,950	$25,900	$69,765	15,16
Subtotal for Operation and Maintenance Costs				***$166,969***		
Contingency on Operation and Maintenance Costs		25%		***$42,000***		
Total for Operation and Maintenance Costs				***$208,969***		
PRESENT WORTH OF ALTERNATIVE 2 - Upland Site Unit				**$5,730,000**		

TABLE F-3
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2: **Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**
Scope of Work: Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Dust control, street sweeping, erosion control measures
4 Based on creating 1.5% slope over 85% of Upland Site Area. [Assume 15% coverage by buildings/pavement (535,900 sf x 0.85 = 455,515 sf)]
Assumed excess stabilized sediment is available after creating 2 ft cap, which provides an additional 13,750 CY to achieve desired slope.
Assumed imported structural fill from clean borrow required for grade not achieved with the stabilized sediment.
5 Assumed perforated 2" HDPE SDR-11 on 75-ft centers under cap
6 Assumed granular fill material with a thickness of 6-inches under cap area (455,520 sf)
7 Assumed approximately 47,500 c.y. of stabilized sediment will be graded and compacted across 85% of the Upland Site Unit (455,520 sf)
8 Assumed 20-mil scrim reinforced liner, installed cost; throughout cap area (455,520 sf / 9 = 50610 CY)
9 Assumed 1 ft drainage layer, 1 ft topsoil over 455,520 sf area
10 Assumed installation occurs during shoreline stabilization; assumed $2,000 in labor and materials per well
11 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
12 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
13 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
14 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
15 Groundwater monitoring - 8 samples + 2 QA/QC per event; monitoring on quarterly basis for 2 years, semi-annually for 3 years, annually for 5 years.
Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses; $100 per sample for data validation and management; $300 for LFG VOC analysis, $100 for LFG analyzer rental; and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2), and $7,500 per annum (years 3 through 5).
16 Present Worth Values calculated assuming a 3 percent discount rate.
17 Assumed 1 ft of sand placed over 276,950 sf of area beneath the shoreline stabilization system

TABLE F-4
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 - MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2: **Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**
Scope of Work: Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of shoreline stabilization					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Select removal and disposal of refuse along shoreline	c.y.	1,000	$96	$96,125	4
Placement of 3 ft of gravel/riprap for shoreline stabilization	c.y.	30,800	$38	$1,170,400	5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	5,100	$25	$127,500	5
Construction of thin layer subtidal sediment cap					
Placement of thin layer sand cap	c.y.	5,100	$35	$178,500	6
Subtotal for Direct Capital Costs				***$1,610,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$70,000	1
Remedial Design	%	15		$241,500	6,9
Project Management	%	6		$96,600	7,9
Construction Management	%	8		$128,800	8,9
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	10		$161,000	1
Ecology Oversight	%	2		$32,200	1
Estimate of Taxes	%	9		$144,900	
Subtotal for Capital Indirect Costs				***$915,000***	
Subtotal for Capital Direct and Indirect Costs				***$2,525,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$631,250***	
Total for Direct and Indirect Capital Costs				**$3,156,250**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Natural Recovery Compliance Monitoring and Reporting						
Years 1 to 10 - Sediment Sampling (Yr 1, 5,10)	Ea.	1	$22,400	$22,400	$82,689	10,13
Bathymetric Survey of Subtidal MNR (same schedule as monitoring)						
Survey and letter report	Ea.	1	$8,000	$8,000	$29,532	11,13
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$29,401	12,13
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Design/Coordination/Permitting	LS	1	$5,000	$5,000		
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Ea.	1		$15,100	$24,261	13
Subtotal for Operation and Maintenance Costs				***$165,883***		
Contingency on Operation and Maintenance Costs		25%		***$41,000***		
Total for Operation and Maintenance Costs				***$206,883***		
PRESENT WORTH OF ALTERNATIVE 2 - Marine Site Unit				**$3,360,000**		

TABLE F-4
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 2 - MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 2: **Containment with Low Permeability Cap with Liner, Shoreline Stabilization with Sand Filter, Sediment Cap, and MNR**
Scope of Work: Construct low-permeability soil cap in the Upland Site Unit with stabilized fine-grained sediments and scrim-reinforced liner; integrate stormwater and erosion control and LFG control; construct shoreline stabilization with shoreline sand filter; install thin-layer sand cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Assumed 1,000 c.y. of material to be excavated, hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
5 Assumes 3 ft of riprap and 0.5 ft of gravel over 276,946 sf of area for shoreline stabilization system
6 Assumed sediment capping area of 229,000 sf capped with 6 inches of sand (plus 20% additional for placement difficulty)
7 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
8 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
9 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
10 Monitoring sediment accumulation / recovery from 10 shallow sediment cores; plus 12 surface sediment samples collected for PCB analysis.
11 Assume bathymetry survey on same frequency as sediment monitoring.
12 Inspection assumes 6-hour travel/field effort and 4-hour report effort at $140/hr.
13 Present Worth Values calculated assuming a 3 percent discount rate.

TABLE F-5
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater diversion barrier system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of low permeability soil cap over Upland Site Unit					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Temporary Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Import fill for site grading/preparation	c.y.	27,500	$18	$495,000	4
Place, grade, and compact imported fill	c.y.	27,500	$9	$247,500	1,4
LFG control layer installing pipe, welding, testing)	l.f.	7,350	$16	$117,600	1,5
LFG control layer - granular fill	c.y.	8,400	$25	$210,000	6
Place, grade, and compact low permeability layer	c.y.	47,500	$9.00	$427,500	7
Installation of FML Layer	s.y.	50,610	$8.20	$415,002	8
Import fill for drainage and topsoil layers	c.y.	33,700	$18	$606,600	9
Placement and grading of drainage and topsoil layers	c.y.	33,700	$9	$303,300	1,9
Hydroseeding capped area	ac	10	$4,000	$41,829	1
Other Components of Cleanup Action Alternative					
Import and placement of sand for shoreline sand filter	c.y.	10,300	$26	$267,800	24
Stormwater management system (incl. BNSF drainage)	LS	1	$100,000	$100,000	1
Passive vents for LFG system	LS	1	$25,000	$25,000	1
Installation of 8 groundwater monitoring wells	LS	1	$16,000	$16,000	10
Deed restrictions (institutional controls)	LS	1	$5,000	$5,000	1
Construction of Groundwater Diversion Structure					
Installation of sheetpile cutoff wall	s.f.	10,200	$40.00	$408,000	11
Installation of upgradient groundwater interception trench	l.f.	1,350	$70	$94,500	11
Installation of oil/water separator	l.s.	1	$10,000	$10,000	12
Installation of sampling/access vaults	l.s.	3	$2,500	$7,500	13
Installation of outfall/tide gate	l.s.	1	$10,000	$10,000	1
Subtotal for Direct Capital Costs				***$3,840,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$50,000	1
Pre-Design Investigation/Evaluation	LS	1		$50,000	1
Remedial Design	%	10		$384,000	14,17
Project Management	%	5		$192,000	15,17
Construction Management	%	6		$230,400	16,17
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	3		$115,200	1
Ecology Oversight	%	2		$76,800	1
Estimate of Taxes	%	9		$345,600	
Subtotal for Capital Indirect Costs				***$1,484,000***	
Subtotal for Capital Direct and Indirect Costs				***$5,324,000***	
Contingency for Capital Direct and Indirect Costs	%	25		***$1,331,000***	
Total for Direct and Indirect Capital Costs				**$6,655,000**	

Operation and Maintenance - Upland Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Annual Inspection and cleaning of oil/water separator						
Inspection/cleaning	ea.	1	$1,000	$1,000	$14,877	18,20,23
Groundwater and LFG Compliance Monitoring and Reporting						
Years 1 to 2 - Water Quality and LFG Monitoring (Quarterly)	Ea.	4	$12,700	$50,800	$97,204	19,21,22,23
Years 3 to 5 - Water Quality and LFG Monitoring (Semi-annually)	Ea.	2	$12,950	$25,900	$69,765	19,21,22,23
Subtotal for Operation and Maintenance Costs				***$166,969***		
Contingency on Operation and Maintenance Costs		25%		***$42,000***		
Total for Operation and Maintenance Costs				***$208,969***		
PRESENT WORTH OF ALTERNATIVE 3 - Upland Site Unit				**$6,860,000**		

TABLE F-5
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Diversion Barrier System, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater diversion barrier system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Dust control, street sweeping, erosion control measures
4 Based on creating 1.5% slope over 85% of Upland Site Area. [Assume 15% coverage by buildings/pavement (535,900 sf x 0.85 = 455,515 sf)] Assumed excess stabilized sediment is available after creating 2 ft cap, which provides an additional 13,750 CY to achieve desired slope. Assumed imported structural fill from clean borrow required for grade not achieved with the stabilized sediment.
5 Assumed perforated 2" HDPE SDR-11 on 75-ft centers under cap
6 Assumed granular fill material with a thickness of 6-inches under cap area (455,520 sf)
7 Assumed approximately 47,500 c.y. of stabilized sediment will be graded and compacted across 85% of the Upland Site Unit (455,520 sf)
8 Assumed 60-mil HDPE liner, installed cost; throughout cap area (455,520 sf / 9 = 50610 CY)
9 Costs hydroseeding Upland Site Unit for short-term stabilization pending Site development
11 Assumed installation occurs during shoreline stabilization; assumed $2,000 in labor and materials per well
12 Assumed trench and steel sheetpile wall extend to bedrock, estimated to be 12 ft BGS, for an 850-ft alignment.
13 Assumes the installation of a 25-gpm coalescing plate oil/water separator.
14 Assumes the installation or access vaults at both ends of the interception trench and at the center to provide access for sampling and
15 maintenance of the interception trench.
16 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
17 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
18 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
19 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
20 Assumes annual inspection of oil/water separator for 20 years
21 Groundwater monitoring - 8 samples + 2 QA/QC per event; monitoring on quarterly basis for 2 years, semi-annually for 3 years, annually for 5 years.
22 Groundwater and LFG monitoring assumes 20 hrs. x $90 for sample collection; $500 per groundwater sample for analyses; $100 per sample for data validation and management; 300 for LFG VOC analysis, $100 for LFG analyzer rental; and other related costs at $500 per sampling event. Reporting costs assumed at $3,500 per quarter (years 1 and 2), and $7,500 per annum (years 3 through 5).

23 Present Worth Values calculated assuming a 3 percent discount rate.
24 Assumed 1 ft of sand placed over 276,950 sf of area beneath the shoreline stabilization system

TABLE F-6
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Interception, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater interception/diversion system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Construction of shoreline stabilization					
Mobilization/Demobilization	LS	1	$20,000	$20,000	1,2
Erosion and Sedimentation Controls	LS	1	$15,000	$15,000	1,3
Select removal and disposal of refuse along shoreline	c.y.	1,000	$96	$96,125	4
Placement of 3 ft of gravel/riprap for shoreline stabilization	c.y.	30,800	$38	$1,170,400	5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	5,100	$25	$127,500	5
Construction of engineered subtidal sediment cap					
Placement of engineered sand cap	c.y.	12,700	$35	$444,500	1
Subtotal for Direct Capital Costs				***$1,870,000***	
Capital Indirect Costs -					
Pre-Design Investigation/Evaluation	LS	1		$70,000	1
Remedial Design	%	15		$280,500	6,9
Project Management	%	6		$112,200	7,9
Construction Management	%	8		$149,600	8,9
Construction Completion Report	LS	1		$18,700	1
Permitting and Regulatory Compliance	%	10		$187,000	1
Ecology Oversight	%	2		$37,400	1
Estimate of Taxes	%	9		$168,300	
Subtotal for Capital Indirect Costs				***$1,023,700***	
Subtotal for Capital Direct and Indirect Costs				***$2,893,700***	
Contingency for Capital Direct and Indirect Costs	%	25		***$723,425***	
Total for Direct and Indirect Capital Costs				**$3,617,125**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Natural Recovery Compliance Monitoring and Reporting						
Years 1 to 10 - Sediment Sampling (Yr 1, 5,10)	Ea.	1	$22,400	$22,400	$82,689	9,12
Bathymetric Survey of Subtidal MNR (same schedule as monitoring)						
Survey and letter report	Ea.	1	$8,000	$8,000	$29,532	10,12
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$29,401	11,12
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Ea.	1		$10,860	$17,449	12
Subtotal for Operation and Maintenance Costs				***$159,071***		
Contingency on Operation and Maintenance Costs		25%		***$40,000***		
Total for Operation and Maintenance Costs				***$199,071***		
PRESENT WORTH OF ALTERNATIVE 3 - Marine Site Unit				**$3,820,000**		

TABLE F-6
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 3 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 3: **Two-Layer Upland Cap, Upgradient Groundwater Interception, Shoreline Stabilization with Sand Filter, Engineered Sediment Cap and Monitored Natural Recovery**

Scope of Work: Construct two-layer low-permeability cap (FML and soil) in the Upland Site Unit; integrate stormwater and erosion control and LFG control; construct upgradient groundwater interception/diversion system; construct shoreline stabilization with shoreline sand filter; install engineered sediment cap in the subtidal area; implement monitored natural recovery for subtidal sediment in areas not capped.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Assumed 1,000 c.y. of material to be excavated, hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
5 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
6 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
7 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
8 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
9 Monitoring sediment accumulation / recovery from 10 shallow sediment cores; plus 12 surface sediment samples collected for PCB analysis.
10 Assume bathymetry survey on same frequency as sediment monitoring.
11 Inspection assumes 6-hour travel/field effort and 4-hour report effort at $140/hr.
12 Present Worth Values calculated assuming a 3 percent discount rate.
13 Assumed 1 ft of sand placed over 276,950 sf of area beneath the shoreline stabilization system

TABLE F-7
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 4 – UPLAND SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 4: **Waste Removal**
Scope of Work: Excavation of existing landfill refuse and wood waste cover materials from Upland and Marine Site Units with disposal at a Subtitle D solid waste landfill facility. Regrading of upland, reconfigure and stabilize the new shoreline.

Capital Cost Item - Upland Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Excavation of Upland Refuse					
Mobilization/Demobilization	LS	1	$40,000	$40,000	1,2
Erosion and Sedimentation Controls	LS	1	$100,000	$100,000	1,3
Mass excavation of upland refuse - by tracked excavators	c.y.	430,050	$12	$5,160,600	1,4
Disposal of Upland Refuse and Wood Debris					
On-shore handling and loading of waste material	c.y.	430,050	$2	$860,100	1
Stabilization, with fly ash of 10 % of excavated materials	c.y.	43,005	$15	$645,075	1
Transport (by rail) and Disposal at Rabanco	ton	709,583	$40	$28,383,300	1,5
Subtotal for Direct Capital Costs				***$35,190,000***	
Capital Indirect Costs -					
Remedial Design	%	6		$2,111,400	6,9
Project Management	%	4		$1,407,600	7,9
Construction Management	%	5		$1,759,500	8,9
Construction Completion Report	LS	1		$80,000	1
Permitting and Regulatory Compliance	%	2		$703,800	1
Ecology Oversight	%	1		$351,900	1
Estimate of Taxes	%	9		$3,167,100	
Subtotal for Capital Indirect Costs				***$9,581,300***	
Subtotal for Capital Direct and Indirect Costs				***$44,771,300***	
Contingency for Capital Direct and Indirect Costs	%	20		***$8,954,260***	
PRESENT WORTH OF ALTERNATIVE 4 - Upland Site Unit				**$53,730,000**	

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Excavation volume based on estimated depth of refuse and wood waste in Upland Site Unit.
Total Site area = 535,900 sf; Assumed approximately 1/3 of the Site excavated to 30 ft bgs, 1/3 to 20 ft bgs, and 1/3 to 15 bgs
For consistency in comparison of costs estimates, the export of the fine-grained sediment stored at the site is NOT considered in this total.
5 Assumed excavated materials hauled to Everett Intermodal Transfer Station, and disposed at Subtitle D facility
6 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
7 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
8 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
9 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000

TABLE F-8
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 4 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 4: **Waste Removal**
Scope of Work: Excavation of existing landfill refuse and wood waste cover materials from Upland and Marina Site Units with disposal at a Subtitle D solid waste landfill facility. Regrading of upland, reconfigure and stabilize the new shoreline.

Capital Cost Item - Marine Site Unit	Unit	Qty.	Unit Cost	Cost	Notes
Direct Capital Costs -					
Excavation of Marine Refuse					
Mobilization/Demobilization	LS	1	$40,000	$40,000	1,2
Erosion and Sedimentation Controls	LS	1	$100,000	$100,000	1,3
Mass excavation of and dredging of refuse and wood debris	c.y.	148,000	$16	$2,368,000	1,4
Disposal of Marine Refuse and Wood Debris					
On-shore handling and loading of waste material	c.y.	148,000	$2	$296,000	1
Stabilization, with fly ash of 10 % of refuse	c.y.	14,800	$15	$222,000	1
Transport (by rail) and Disposal at Rabanco	ton	244,200	$40	$9,768,000	1
Reconstruction of intertidal and subtidal habitat					
Placement of 1 ft of gravel on intertidal face	c.y.	7,100	$25	$177,500	1,5
Placement of 2 ft of riprap on intertidal face	c.y.	14,200	$38	$539,600	1,5
Placement of 6 inches of gravel (fish habitat) over riprap	c.y.	3,500	$25	$87,500	1,5
Placement of sand to reconstruct subtidal shoreline slopes	c.y.	42,500	$35	$1,487,500	1,6
Subtotal for Direct Capital Costs				***$15,090,000***	
Capital Indirect Costs -					
Construction Compliance monitoring	%	1		$150,900	1
Remedial Design	%	6		$905,400	7,11
Project Management	%	4		$603,600	8,11
Construction Management	%	6		$905,400	9,11
Construction Completion Report	LS	1		$40,000	1
Permitting and Regulatory Compliance	%	2		$301,800	1
Ecology Oversight	%	1		$150,900	1
Estimate of Taxes	%	9		$1,358,100	
Subtotal for Capital Indirect Costs				***$4,416,100***	
Subtotal for Capital Direct and Indirect Costs				***$19,506,100***	
Contingency for Capital Direct and Indirect Costs	%	25		***$4,876,525***	
Total for Direct and Indirect Capital Costs				**$24,382,625**	

Operation and Maintenance - Marine Site Unit	Unit	Qty. (Yearly)	Unit Cost	Annual Cost	Present Worth	Notes
Annual Inspection of Shoreline Stabilization						
Inspection and letter report	Ea.	1	$1,500	$1,500	$22,316	11,12
Maintenance of Shoreline Stabilization						
5 Year Repair / Replenishment						
Track excavator with operator	hrs.	16	$100	$1,600		
Miscellaneous materials/expenses	LS	1	$1,000	$1,000		
Years 5,10,15,20 - Sand / gravel (300 CY per event)	Ea.	1	$7,500	$7,500		
	Ea.	1		$10,100	$28,303	12
Subtotal for Operation and Maintenance Costs				***$50,619***		
Contingency on Operation and Maintenance Costs		25%		***$13,000***		
Total for Operation and Maintenance Costs				***$63,619***		
PRESENT WORTH OF ALTERNATIVE 4 - Marine Site Unit				**$24,450,000**		

TABLE F-8
REMEDIAL ACTION COST ESTIMATE – ALTERNATIVE 4 – MARINE SITE UNIT
CORNWALL AVENUE LANDFILL SITE
BELLINGHAM, WASHINGTON

Alternative 4: **Waste Removal**
Scope of Work: Excavation of existing landfill refuse and wood waste cover materials from Upland and Marina Site Units with disposal at a Subtitle D solid waste landfill facility. Regrading of upland, reconfigure and stabilize the new shoreline.

Notes

1 Cost estimates based on professional judgment and experience on other similar projects.
2 Includes work plans/submittals, temporary fencing, temporary facilities.
3 Street sweeping, erosion control measures
4 Excavation volume based on the following estimate of refuse and wood waste in Marine Site Unit.
Shoreline through the intertidal zone: Area =184,600 sf; excavation depth decreases from 30 to 5 ft heading away from shore.
Shallow subtidal zone: Area = 173,700; dredging depth decreases from 5 to 2 ft heading away from shore.
Deep subtidal zone: Area = 148,100; dredging depth decreases from 2 to 0 ft heading away from shore.
Assumes subtidal excavation is conducted from a barge-based clamshell; intertidal excavation conducted by land based equipment.
5 Assumed the recreated intertidal zone will be approximately 19,000 sf
6 Material quantities estimated based on creating 10H:1V slope in intertidal zone and 5H:1V below to base of excavation
7 Remedial Design includes preparation of construction plans and specifications, preparation of engineer's estimate of probable cost, and bidding support
8 Project management includes bid/contract administration, cost and performance reporting, planning and coordination.
9 Construction management includes submittal review, change order review, design modifications, construction schedule tracking.
10 Estimated cost based on: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA 540-R-00-002, OSWER 9355.0-75, July 2000
11 Assumes 20 annual inspections; 6-hour travel/field effort and 4-hour report effort at $140/hr.
12 Present Worth Values calculated assuming a 3 percent discount rate.