E.1 Removal Action Alternatives Cost Estimate Details

This appendix summarizes the cost estimate details for each of the Mine Rock and Portal Removal Action Alternatives for the Draft Engineering Evaluation /Cost Analysis (EE/CA) for the Ross Adams mine site (Site) located near the southern end of Prince of Wales Island, Alaska. The Mine Rock and Portal Alternatives are described in further detail in Section 6 of the EE/CA. The EE/CA established a total of five Mine Rock Alternatives and four Portal Alternatives, which are considered to be well-established remedies because they have been established in the past at similar sites and/or for similar conditions. Comparison of the total project costs for each alternative is analyzed in Section 6. There are no costs associated with the No Action alternatives and therefore these are not discussed within the appendix. The Mine Rock Alternatives and Portal Alternatives, as described in Section 6 of the EE/CA, are summarized as follows:

Mine Rock Alternatives:

- Alternative M-1 – No Action Alternative
- Alternative M-2 – In Place Stabilization with Stormwater and Institutional Controls
- Alternative M-3 – Cover in Place
- Alternative M-4 – Excavation, Consolidation and Cover at Mine Affected Areas
- Alternative M-5 – Excavation, Consolidation in Open Pit Repository at 900-Foot Level

Portal Alternatives:

- Alternative P-1 – No Action Alternative
- Alternative P-2 – Close Upper Mine Openings and Gate at 300-Foot Level Portal
- Alternative P-3 – Close Upper Mine Openings and Rock Backfill at 300-Foot Level Portal
- Alternative P-4 – Close Upper Mine Openings and Concrete Bulkhead at 300-Foot Level Portal

This appendix provides summary details and assumptions for the direct capital, indirect capital, and monitoring/maintenance costs for each alternative. The assumptions and cost estimates were made based on engineering judgment from experience with similar mine reclamation projects, local resources and contacts from contractors in the region, experience and knowledge of existing Site conditions, and other resources. The assumptions are referenced and cited where applicable and details explaining the basis or reasoning is usually described.

COST ESTIMATE DETAILS FOR

Mine Rock Alternative M-2: **In Place Stabilization with Stormwater and Institutional Controls**

Table E - 1 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-2

Direct Capital Costs- Unique to Alternative M-2					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Labor (Personnel)					
1	Mobilization & Lodging for Earthwork Crew	$50,076	LS	1	$50,076
1	Mobilization & Lodging for Engineering Support (includes labor)	$58,001	LS	1	$58,001
1	Mobilization & Lodging for Radiation Support (includes labor)	$72,010	LS	1	$72,010
Construction Cost: Cover and Stabilize in Place - ALL AREAS					
2	300-Foot Level Stabilize in Place/Pile Grading (Equipment and Labor)	$37,835	LS	1	$37,835
2	700-Foot Level Stabilize in Place/Pile Grading (Equipment and Labor)	$3,286	LS	1	$3,286
2	900-Foot Level Stabilize in Place/Pile Grading (Equipment and Labor)	$7,628	LS	1	$7,628
2	OSA Stabilize in Place/Pile Grading (Equipment and Labor)	$516	LS	1	$516
3	Stormwater Controls 300-Foot Level	$7,273	LS	1	$7,273
3	Stormwater Controls 700-Foot Level	$9,611	LS	1	$9,611
3	Stormwater Controls 900-Foot Level	$14,797	LS	1	$14,797
3	Stormwater Controls Open Pit	$1,137	LS	1	$1,137
Site Preparation					
4	Fuel Tank Storage, Secondary Containment	$15,000	LS	1	$15,000
4	Vegetation Removal (Equipment and Labor)	$35,100	LS	1	$35,100
4	Temporary Stormwater Controls	$2,000	Per Area	5	$10,000
4	Chipping	$2,000	Per Area	5	$10,000
Institution Controls					
4	Signage	$5,000	LS	1	$5,000
4	Barriers	$2,000	Per Area	5	$10,000
Total Capital Cost Summary (Unique to All Alternative 2)					
Summary of Direct Capital Costs (Unique to Alternative M-2)					$347,270

Table E - 2 Summary of Direct Capital Costs Common to all Mine Rock Alternatives

Direct Capital Costs - Common to All Alternatives					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Construction Equipment					
1	Mobilization of Equipment to Site	$9,000	LS	1	$9,000
1	Demobilization of Equipment to Site	$9,000	LS	1	$9,000
Removal of Waste Rock in Dock Areas					
2	Removal of Ore Rock from Intertidal Zone	$16,000	LS	1	$16,000
Temporary Construction of Dock					
3	Dock Engineering, Construction, and Removal	$45,500	LS	1	$45,500
Road Work Construction					
3	Road Improvements (includes turnouts, regrading, widening for all roads)	$40,425	LS	1	$40,425
Miscellaneous Wastes and Debris Removal Offsite					
4	Earthwork and Soil Removal Oversight/Construction	$44,100	LS	1	$44,100
4	Barge Mobilization/Demobilization	$18,000	LS	1	$18,000
4	Solid Waste Disposal Costs (accepted waste)	$54,216	LS	1	$54,216
4	Solid Waste Disposal Costs (vehicles)	$10,000	LS	1	$10,000
Miscellaneous Items					
2	Miscellaneous	$92,230	LS	1	$92,230
Summary of Direct Capital Costs (Common to All Alternatives)					**$338,471**
Total Direct Capital Costs for Alternative M-2					**$685,741**

Table E - 3 Indirect Cost Summary for Mine Rock Alternative M-2

Capital Indirect Cost Summary					
Item #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost (2014 dollars)***
	Additional Indirect Capital Costs	**Alternative M-2**			
		Capital Cost			**$762,285**
1	Engineering Design	DC	%	10	$76,228
2	Permitting	$25,000	LS	1	$25,000
3	Regulatory Compliance	DC	%	4	$30,491
4	Construction QA and Management	DC	%	8	$60,983
5	Owners Management	DC	%	15	$114,343
6	Direct Capital Cost Contingency	DC	%	20	$152,457
Total Capital Indirect Costs:					**$459,502**

Indirect Cost Assumptions
"Engineering Design" is assumed to be 10% of total capital cost. This is includes engineering design, civil drawings, and project management. This is a typical value used for mine reclamation projects.
"Permitting" is assumed to be a lump sum of $25,000. This cost includes future permits required for construction at the Site. This is a typical amount estimated for this type of mine reclamation project."
"Regulatory Compliance" is assumed to be 4% of the total capital cost. This is a typical value used for mine reclamation projects.
"Construction QA and Management" is assumed to be 8% of total direct capital cost. This is a typical value used for mine reclamation projects.
"Owners Management" is assumed to be 15% of the total direct capital cost. This is a typical value used for mine reclamation projects.
"Direct Capital Cost Contingency" is assumed to be 20% of total capital cost. This allows for unforeseen or unknown events that may occur during the lifetime of the project.

Table E - 4 Annual Monitoring and Maintenance (M&M) Cost Summary for Mine Rock Alternative M-2

Sheet #	Item	Unit Cost	Units	Quantity	Cost
Annual M&M Costs					
Annual Inspection and Maintenance (Years 1-3)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$5,700	Trip	1	$5,700
	Maintenance				
	Maintenance Equipment Mobilization	$9,000	Trip	1	$9,000
	Annual Maintenance Allowance (Per Area)	$2,000	Area	5	$10,000
Subtotal Inspection and Maintenance Costs					**$30,300**
	Contingency		%	25	$7,575
	Subtotal				$37,875
Present Worth M&M (Years 1,2 and 3)					**$105,306**
Sheet #	**Item**	**Unit Cost**	**Units**	**Quantity**	**Cost**
Future M&M Costs					
Annual Inspection and Maintenance (Years 5, 10, 15, 20, 25, and 30)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$5,700	Trip	1	$5,700
	Maintenance				
	Maintenance Equipment Mobilization	$3,500	Trip	1	$3,500
	Annual Maintenance Allowance (Per Area)	$2,000	Areas	5	$10,000
Subtotal Inspection and Maintenance Costs					$24,800
	Contingency		%	25	$6,200
	Subtotal				$31,000
Present Worth M&M (Years 5,10,15,20,25, and 30)					**$100,383**
Present Worth M&M Costs					**$205,690**

Table E - 5 Cost Details for Annual Monitoring and Maintenance (M&M) for Mine Rock Alternative M-2

Required Crews Alternative M-2		
Crew Type	**# of Crew**	**Days**
USFS Field Crew	2	2
Areas	5	

M&M Mobilization Cost Details for Alternative M-2									
Mobilization for Inspection Crew									
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	2	$3,000	LS	1	$3,000
Hotel in Ketchikan	$200	Per Person	2	Per Night	2	$800	LS	1	$800
Total for Mobilization Costs Per Annual Inspection									**$3,800**
M&M Labor Cost Details for Alternative M-2									
Annual Inspection Labor and Equipment Costs									
Travel Time	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time On Site (8 hour fixed)	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time at Site (2 hours per Area)	$100	Per Person	2	2 Hours Per Area	10	$2,000	LS	1	$2,000
Equipment Costs (field supplies)	$500	Per Trip	1	-	1	$500	LS	1	$500
Total for Labor Costs Per Annual Inspection									**$5,700**
M&M Assumptions for Alternative									
Annual inspections by 2 USFS employees (assume $1000 per person, per day) for first three years (year 1, 2, 3) and every five years after until 30 years (year 5, 10, 15, 30); this assumes a roundtrip flight for each day and lodging in Ketchikan.									
Maintenance Equipment Mobilization on Annual M&M Cost Summary Table is assumed to be $9,000 per trip for year 1 through year 3; and $3,500 per trip for years 5, 10, 15, 20, 25, and 30; this assumes that heavy equipment mobilization may be required during the first three annual allowances ($9,000 RT barge with loading/unloading labor included); the $3,500 during the future visits (years 5, 10, 15, 20, 25, and 30) allows for unexpected costs during the future five-year visits.									
Areas include OSA, 300-ft, 700-ft, 900-ft, and Open Pit.									
Minor maintenance (cover, signs, etc.) is $2000 per year, per area.									
Labor for inspection assumes 8 hours for travel, 8 hours onsite, and 2 hours additional per area.									

Table E - 6 Engineering Economic Analysis Details for Mine Rock Alternative M-2

Economic Analysis for Present Worth of M&M (Years 1,2 and 3)								
Discount Rate	i	0.039						
Years	n	3						
Annual Cost	F	$37,875						
								Total Present Worth M&M (3 years)
Present Worth	P	$105,306						$105,306
Economic Analysis for Present Worth of M&M (Years 5-30)								
Discount Rate	i	0.039	0.039	0.039	0.039	0.039	0.039	
Years	n	5	10	15	20	25	30	
Annual Cost	F	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	
								Total Present Worth M&M (30 years)
Present Worth	P	$25,603	$21,145	$17,463	$14,423	$11,912	$9,838	$100,383

Table E - 7 Summary of Cost Estimate for Mine Rock Alternative M-2

Item	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$108,077	LS	1	$114,561
Radiation Safety, Decon and Monitoring	$72,010	LS	1	$76,331
Site Preparation	$70,100	LS	1	$74,306
Common Elements	$338,471	LS	1	$358,779
Stabilize In Place	$82,083	LS	1	$87,008
Institutional Controls	$15,000	LS	1	$15,000
SUBTOTAL DIRECT CAPITAL COST				**$725,986**
Stormwater, Erosion, and Dust Controls		**%**	**5%**	**$36,299**
TOTAL DIRECT CAPITAL COST				**$762,285**
INDIRECT CAPITAL COSTS				
Engineering Design		**%**	10%	$76,228
Permitting	$25,000	LS	1	$25,000
Regulatory Compliance		**%**	4%	$30,491
Construction QA and Management		**%**	8%	$60,983
Owners Management		**%**	15%	$114,343
Direct Capital Cost Contingency		**%**	20%	$152,457
TOTAL INDIRECT CAPITAL COST				**$459,502**
TOTAL CAPITAL COST (Indirect + Direct)				**$1,221,787**
Monitoring and Maintenance Present Worth (30 year)				**$205,690**
Total Project Cost (Adjusted to 2014)				**$1,427,477**

Note: A discount rate of 3.9% was used in the engineering economic analysis. Unit costs are in 2011 dollars and construction related costs have been adjusted to 2014 using historical cost indices (RSMeans, 2014).

Table E - 8 Mobilization Cost Details for Mine Rock Alternative M-2 - Earthwork Crew

Required Crews Alternative M-2		
Crew Type	**# of Crew**	**Days**
Earthwork Crew	4	43
Engineering Support	1	43
Radiation Support	1	43

Mobilization Cost Details for Alternative M-2									
Lodging / Travel Labor for Earthwork Crew									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	4	Per day, assume 3	**3**	$2,400	LS	1	$2,400
Lodging at island (estimate per person/night)	$250	Per Person	4	Per night	43	$43,076	LS	1	$43,076
Travel Time	$25	Per Person	4	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Mobilization for Earthwork Crew									
Floatplane to Site (per person, RT)	$750	Per Person	4	Roundtrip	1	$3,000	LS	1	$3,000
								Total for Earthwork	**$50,076**

Table E - 9 Mobilization Cost Details for Mine Rock Alternative M-2 - Engineering Crew

Lodging / Travel Labor for Engineer									
Item	***Unit Cost***	***Adjusted Details 1 Unit***	***Detail 1 Multiplier***	***Adjusted Details 2 Unit***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per day, assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	43	$10,769	LS	1	$10,769
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Labor While At Site for Engineering									
Field Engineer Labor	$100	Per Person	1	Per Hour	10	$1,000	Days	43.0758	$43,076
Mobilization for Engineering									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	1	Roundtrip	1	$456	LS	1	$456
Floatplane to Site (per person, RT)	$750	Per Person	1	One way	2	$1,500	LS	1	$1,500
Contingency	$750	Per Person	1	One way	0	$0	LS	1	$ -
						Total for Engineers			**$58,001**

Table E - 10 Mobilization Cost Details for Mine Rock Alternative M-2 - Radiation Support Crew

Lodging / Travel Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per night assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	43	$10,769	LS	1	$10,769
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Equipment Rentals and Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Radiation Technician Labor	$100	Hours	10	Per day	43	$43,076	hours	1	$43,076
Senior Staff	$185	Per Person	1	Per Hour	40	$7,400	LS	1	$7,400
RAD Equipment for Backpack Systems	$500	Per Week	6	# of Systems	1	$3,077	LS	1	$3,077
Misc. RAD Equipment	$500	Per Week	6	# of Systems	**1**	$3,077	LS	1	$3,077
Mobilization for Radiation Support									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	2	Roundtrip	1	$912	LS	1	$912
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	1	$1,500	LS	1	$1,500
Sub-total						**Total for Radiation**			**$72,010**

Table E - 11 Mobilization and Labor Assumptions for Mine Rock Alternative M-2

Mobilization Assumptions for Alternative M-2
Field crews include Earthwork, Engineering, and Radiation.
Assume for all field crew need 3 nights in Ketchikan hotel due to adverse weather conditions.
Assume for all field crew need 16 hours travel time, average travel time for every person.
Lodging in Kendrick Bay is based on actual incurred costs from 2009 ad 2010, barge or yacht Bulldog (60k for ~14 days) and Crane (~$2500 per night for 6 people); Includes Food, Lodging, Laundry etc.
Flights for engineering and radiation support are from Denver RT; Prices from kayak.com for summer months; Earthwork crew is assumed to be local.
Float plane for field personnel costs $750.00 per person per direction.
Travel time assumes roundtrip for each individual at 16 hours, delays due to weather, airlines, etc. travel to and from Site.
Labor at Site for field engineer and radiation support included; Earthwork Crew hours included in construction costs.
Assume 1 person would be responsible for all radiation protection measurements and guidance, including decontamination of vehicles/equipment prior to demobilization.
Responsibilities include providing radiation protection support for field engineers, scientists, laborers, field operators, equipment demobilization/mobilization.
Tasks include swipe testing of field equipment, supplies, personnel, anything to be removed off-site.
Tasks include GM-Probe testing of field equipment, supplies, personnel, anything to be removed off-site.
Tasks include taking notes and writing reports, data collection, equipment calibration checks, source checks, decontamination guidance.
Report writing for completion reports summarizing daily tasks and equipment checks.
Assume the field engineer labor rate is $100 per hour and radiation technicians are $100 per hour.
Assume senior radiation staff's purpose is to develop a RAD Safety training program, ~ 16 hours AND Site Visit 24 hours.
Assume field technicians will be working 12 hours a day.
Misc. RAD equipment includes alpha and beta counters necessary for vehicle and personnel scans; also includes extra backpack systems.
Radiation crew would be responsible for guiding remedial efforts during the day, and scanning people off site every day.

Table E - 12 Earthwork Details and Assumptions for Mine Rock Alternative M-2

Area	Stabilize In Place (cy)	Excavation Rate (cy/day)	Days	Total Days
OSA stabilized in place	118	800	0.1	0.1
300 stabilized in place	8,648	800	10.8	10.8
700 stabilized in place	751	800	0.9	0.9
900-N stabilized in place	1,562	800	2.0	2.0
900-S stabilized in place	182	800	0.2	0.2
I&L Spur to 900-Level WRD-N	1,200	800	1.5	1.5
		Subtotal	16	16

Alternative M-2 Earthwork Assumptions
Stabilize/In-pile Grading: Assume 300 HP @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day.
Assume work days are 10 hours
Assume an earthwork crew consists of one excavator (345/315) and one D-7R Dozer.
Material required stabilization is assumed to be the cut and fill volume (greater of the two), not the total volume of the affected area.

OSA- Stabilize In Place					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	0.1	$258
Cat 315 Excavator with Thumb	$115	$1,150	day	0.0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0.0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0.0	$0
D-7R Dozer with Winch	$175	$1,750	day	0.1	$258
980 Front End Loader	$145	$1,450	day	0.0	$0
Stabilize 118 cy					
Sub-total					$516

700-Foot Level- Stabilize In Place					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	1	$1,643
Cat 315 Excavator with Thumb	$115	$1,150	day	0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0	$0
D-7R Dozer with Winch	$175	$1,750	day	1	$1,643
980 Front End Loader	$145	$1,450	day	0	$0
Stabilize 1660 cy					
Sub-total					$3,286

Table E - 12 Earthwork Details and Assumptions for Mine Rock Alternative M-2 (cont'd)

300-Foot Level- Stabilize In Place					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	11	$18,918
Cat 315 Excavator with Thumb	$115	$1,150	day	0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0	$0
D-7R Dozer with Winch	$175	$1,750	day	11	$18,918
980 Front End Loader	$145	$1,450	day	0	$0
Stabilize 12146 cy					
Sub-total					$37,835

900-Foot Level North and South WRD- Stabilize In Place					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	2	$3,814
Cat 315 Excavator with Thumb	$115	$1,150	day	0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0	$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	0	$0
D-7R Dozer with Winch	$175	$1,750	day	2	$3,814
980 Front End Loader	$145	$1,450	day	0	$0
North (N) ; South (S)					
Stabilize 1562 (N) ; 183 (S) cy					
Sub-total					$7,628

Table E - 13 Cost Estimate of Stormwater Control Quantities for Mine Rock Alternative M-2

Alternative M-2 Cost Estimate for Stormwater Control Quantities					
Design Feature	***300-Foot Level***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rip Rap Volume	498	$13.03	cy	498	$6,490
Geotextile	746	$1.05	sy	746	$783
				Subtotal for 300-Foot Level Stormwater Controls	**$7,273**
Design Feature	***700-Foot Level***				
Rip Rap Volume	658	$13.03	cy	658	$8,575
Geotextile	987	$1.05	sy	987	$1,036
				Subtotal for 700-Foot Level Stormwater Controls	**$9,611**
Design Feature	***900-Foot Level***				
Rip Rap Volume	1,013	$13.03	cy	1,013	$13,201
Geotextile	1,520	$1.05	sy	1,520	$1,596
				Subtotal for 900-Foot Level Stormwater Controls	**$14,797**
Design Feature	***900-Foot Open Pit***				
Rip Rap Volume	83	$13.03	cy	83	$1,082
Geotextile	53	$1.05	sy	53	$56
				Subtotal for 900-Foot Level Open Pit Stormwater Controls	**$1,137**

Stormwater Control Quantities Assumptions
Assumptions: 2' thick throughout channel and 2' vertical up WRD embankment, D_{50} of 12", geotextile along upstream face only unit weight of 1.75 tons/cy, geotextile along bottom of rock, allowing water to flow freely over WRD but protecting open pit
Geotextile unit cost price includes installation and delivery; rip-rap unit cost price includes installation and material costs.
Geotextile will be placed beneath the rip-rap to maintain separation between the rip-rap and underlying rock/soil. The geotextile will be used in the stream channel to avoid scour and migration of rock/soils into the rip-rap.
Pricing information from usfabricsinc.com comes in (15' x 300') 500 yd rolls @ $1.05/ yd^2 for US 205 Non-woven Geotextile; http://www.usfabricsinc.com/products/us-205nw
Stormwater Control Quantities estimated per area, per alternative by Caleb Stock for stream rip-rap and stabilization
Rip-rap assumed to come from on-site material, based on estimates from SE Roadbuilders' quotes.

Table E - 14 Cost Estimate Details and Assumptions for Vegetation Removal for Mine Rock Alternative M-2

Vegetation Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
D-7R Dozer with Winch	$175	hr	90	$15,750
Cat 315 Excavator with Thumb	$115	hr	90	$10,350
A25 Volvo Articulated Dump Truck	$100	hr	90	$9,000
			Subtotals Vegetation Removal	**$35,100**
Vegetation Removal Assumptions				
Assume nine workdays with a dozer, excavator, and dump truck for all vegetation removal.				

Table E - 15 Equipment Mobilization Cost Details and Assumptions for Mine Rock Alternative M-2

Mobilization Cost Details				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
Barge from Ketchikan to Site (includes round trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
De- Mobilization				
Return Trip Barge from Site (includes round trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
Mobilization Assumptions				
Assume barge would be able to take ALL required rental equipment; there is a 1200-ton, 1500 ton, and 3000 ton Barge available for the same pricing.				
Price of every size barge is $375/hour; trip to Site and back is 16 hours.				
Cost includes loading and unloading for equipment operators.				
Cost are based on discussions with Olsen Marine Inc., out of Ketchikan, AK.				

Table E - 16 Miscellaneous Cost Details and Assumptions for Mine Rock Alternative M-2

Miscellaneous Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Portable Toilet (4)	$400	Day	43	$17,230
Kubota (2 purchased)	$18,000	LS	2	$36,000
Field Pickup (2 purchased)	$10,000	LS	2	$20,000
Miscellaneous Engineering Equipment	$10,000	LS	1	$10,000
Barge for Misc. Equipment	$9,000	RT	1	$9,000
Subtotals of Miscellaneous Costs				**$92,230**
Assumptions				
Assume 2 Kubotas purchased.				
Assume 2 used pickups at $10,000 each will be purchased.				
Assume additional round trip barge required for additional supplies; $9,000 RT with loading/unloading as a contingency in the event that additional equipment is needed or equipment needs replacement				
Dock Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Miscellaneous Costs				
Field Labor Removal	$100	cy	80	$8,000
Move to OSA	$100	cy	80	$8,000
Subtotals of Miscellaneous Costs				**$16,000**
Assumptions				
Assume dock area will be remediated by field laborer, at 5 cy per hour, @ $100.				
Same cost for moving to OSA.				

Table E - 17 Road and Dock Work Cost Details and Assumptions for Mine Rock Alternative M-2

Road Construction Cost Estimates					
Road Reconstruction Segment	***Days***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Field Engineer	6	$100	hr	60	$6,000
Cat 315 Excavator with Thumb	6	$115	hr	60	$6,900
D-7R Dozer with Winch	6	$175	hr	60	$10,500
A25 Volvo Articulated Dump Truck	6	$100	hr	60	$6,000
Volume of Fill		$2.45	cy	4,500	$11,025
Subtotal for Road Construction Cost Estimate					**$40,425**
Dock Ramp Construction Estimate					
Road Reconstruction Segment		**Unit Cost**	***Units***	**Quantity**	***Cost***
Construction of Barge Landing		$35,000	LS	1	$35,000
Engineering Design		10%	%	1	$3,500
Permitting		10%	%	1	$3,500
Deconstruction of Dock		10%	%	1	$3,500
Subtotal for Dock Ramp Construction					**$45,500**
Road Assumptions					
Assume material quantities are based on half of the roads requiring construction at 1-foot thickness, and imported onsite.					
Assume 6 days of road construction at 10-hour days, using engineer, excavator, dozer, and truck.					
Assume hourly cost as specified in rental equipment.					
Onsite material based on quantities of each piece of equipment per day removing onsite material.					
Volume of fill is based on prices for one hour and quantities/rates of equipment. $2.45/cy					
Dock Assumptions					
Dock is minimum $35,000 for construction for increased traffic; based on estimate from KRM.					
Assume 10% for permitting and engineering design.					
Assume 10% for dock deconstruction.					

Table E - 18 Solid Waste and Debris s Costs Details and Assumptions for Mine Rock Alternative M-2

Solid Waste and Debris Removal Cost Details									
Solid Waste Removal Oversight/Construction									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Oversight of Solid Waste Removal (engineer)	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
Cat 315 Excavator with Thumb	$115	Per Hour	10	Per Day	14	$16,100	LS	1	$16,100
A25 Volvo Articulated Dump Truck	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
								Sub-total	$44,100
Barge Mobilization/Demobilization									
Barge Mobilization/Demobilization	$9,000	Roundtrip	1	# of Barges	2	$18,000	LS	1	$18,000
								Sub-total	$18,000
Solid and Hazardous Waste Disposal Costs for Acceptable Material									
Landfill Costs / Hazardous Waste	$300	Per Ton	47	n/a	1	$14,216	LS	1	$14,216
Secondary Containment	$10,000	LS	1	n/a	1	$10,000	LS	1	$10,000
Shipping Containers	$10,000	LS	3	n/a	1	$30,000	LS	1	$30,000
								Sub-total	$54,216
Solid Waste Disposal Costs for Scrap Metal at Junk Yard									
Scrap Metal Costs	$2,000	Per Vehicle	5	n/a	1	$10,000	LS	1	$10,000
								Sub-total	$10,000
								Total	**$126,316**

Solid Waste Assumptions
Assume oversight of removal is performed by engineer familiar with clean-up plan, ($100 per hour, 10-hour days).
Assume haul truck and excavator for removal of all solid waste debris.
Assume hazardous waste tipping fee is $300/ton based on typical tipping fees in California.
Assume 14 days for all solid waste to be removed.
Assume barge is $9000 per trip, roundtrip is assumed from Ketchikan to Kendrick Bay; assume 2 barges required; one for equipment and one for wastes.
Total weight of solid waste is estimated in spreadsheet based on EPA typical densities of various wastes; source: *http://www.epa.vic.gov.au/bus/erep/docs/wastematerials-densities-data.pdf*

Table E - 19 On-Site Rip Rap and Rock Mulch Materials Cost Details for Mine Rock Alternative M-2

On-Site Rip-Rap Production		
Estimated Quantity of 6–inch Material Required (cy)	Estimated Production Rate (cy/hour)	Total Days (8 hr)
3768	40	11.8

Cover Material Production Costs				
	Unit Cost	***Units***	***Quantity***	***Cost***
Screening Plant	$670	Day	11.8	$7,889
Cat 315 Excavator with Thumb	$1,750	Day	11.8	$20,606
Cat 315 Excavator with Thumb	$1,750	Day	11.8	$20,606
			Total Cost	$49,102

On-Site Rip-Rap and Rock Mulch Unit Rate			
Estimated Quantity of material (cy)	Total Cost	Units	Unit Rate
3768	$49,102	**$/cy**	**$13.03**

Table E - 20 Total Estimated Days for Mine Rock Alternative M-2

Task	Estimated Time (days)
Stabilize In Place	14
Solid Waste Removal	14
Road Construction	6
Vegetation Removal	9
Total Days	**43**

COST ESTIMATE DETAILS FOR
Mine Rock Alternative M-3: **Cover In Place**

Table E - 21 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-3

Direct Capital Costs - Unique to Alternative M3					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization of Cover Materials					
1	On-Site Cover Material Costs (includes excavation, screening, and placement) w/10% contingency for difficulty	$309,274	LS	1	$309,274
Mobilization/Labor (Personnel)					
2	Mobilization & Lodging for Earthwork Crew	$244,553	LS	1	$244,553
2	Mobilization & Lodging for Engineering Support (includes labor)	$170,087	LS	1	$170,087
2	Mobilization & Lodging for Radiation Support (includes labor)	$196,906	LS	1	$196,906
Construction Cost: Cover and Stabilize in Place - OSA					
3	Cover and Pile Grading (Equipment and Labor)	$44,112	LS	1	$44,112
3	Revegetation/Reclamation of OSA	$20,000	LS	1	$20,000
Construction Cost: Cover and Stabilize in Place - 300-ft Level Mine Rock					
3	Cover and Pile Grading (Equipment and Labor)	$188,804	LS	1	$188,804
4	Revegetation/Reclamation of 300-Foot Level	$20,000	LS	1	$20,000
Construction Cost: Cover and Stabilize in Place - 700-ft Level Mine Rock					
3	Cover and Pile Grading (Equipment and Labor)	$94,847	LS	1	$94,847
4	Rock Armor	$8,874	LS	1	$8,874
Construction Cost: Cover and Stabilize in Place - 900-ft Level					
3	Cover and Pile Grading (Equipment and Labor)	$115,757	cy	1	$115,757
4	Rock Armor	$10,881	cy	1	$10,881
I&L Spur Removal					
3	Removal and Placement in Open Pit (Equipment and Labor)	$18,775	LS	1	$18,775
Cover and Stabilize in Place - Haul Roads					
3	Cover and Pile Grading (Equipment and Labor)	$63,944	LS	1	$63,944

Table E - 21 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-3 (cont'd)

Site Preparation					
	Fuel Tank Storage, Secondary Containment	$15,000	LS	1	$15,000
5	Vegetation Removal (Equipment and Labor) at OSA and 300-Foot Level	$70,200	LS	1	$70,200
5	Temporary Stormwater Controls	$2,000	Per Area	5	$10,000
5	Chipping	$2,000	Per Area	5	$10,000
Institution Controls					
5	Signage	$5,000	LS	1	$5,000
5	Barriers	$2,000	Per Area	5	$10,000
Total Capital Cost Summary (Unique to All Alternative M-3)					
Summary of Direct Capital Costs (Unique to Alternative M-3) w/On-Site Cover Material					**$1,627,015**

Table E - 22 Summary of Direct Capital Costs Common to all Mine Rock Alternatives

Direct Capital Costs - Common to All Alternatives					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Construction Equipment					
1	Mobilization of Equipment to Site	$9,000	LS	1	$9,000
1	Demobilization of Equipment to Site	$9,000	LS	1	$9,000
Removal of Waste Rock in Dock Areas					
2	Removal of Ore Rock from Intertidal Zones	$16,000	LS	1	$16,000
Temporary Construction of Dock					
3	Dock Engineering, Construction, and Removal	$45,500	LS	1	$45,500
Road Work Construction					
3	Road Improvements (includes turnouts, regrading, widening for all roads)	$79,625	LS	1	$79,625
Miscellaneous Wastes and Debris Removal Offsite					
4	Earthwork and Soil Removal Oversight/Construction	$44,100	LS	1	$44,100
4	Barge Mobilization/Demobilization	$18,000	LS	1	$18,000
4	Solid Waste Disposal Costs (accepted waste)	$54,216	LS	1	$54,216
4	Solid Waste Disposal Costs (vehicles)	$10,000	LS	1	$10,000
Miscellaneous Items					
2	Miscellaneous	$128,098	LS	1	$128,098
Summary of Direct Capital Costs (Common to All Alternatives)					**$413,539**
Total Direct Capital Costs for Alternative M-3 w/ On-Site Material					**$2,040,554**

Table E - 23 Indirect Cost Summary for Mine Rock Alternative M-3

Capital Indirect Cost Summary					
Item #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
	Additional Indirect Capital Costs	**Scenario:**			**On-site Material**
		Scenario Capital Cost:			**$2,270,192**
1	Engineering Design	DC	%	10	$227,019
2	Permitting	$125,000	LS	1	$125,000
3	Regulatory Compliance	DC	%	4	$90,808
4	Construction QA and Management	DC	%	8	$181,615
5	Closure Documentation	DC	%	4	$90,808
6	Owners Management	DC	%	15	$340,529
7	Direct Capital Cost Contingency	DC	%	20	$454,038
Total Capital Indirect Costs:					**$1,509,817**

Additional Indirect Cost Assumptions
"Engineering Design" is assumed to be 10% of total capital cost. This includes engineering design, civil drawings, and project management. This is a typical value used for mine reclamation projects.
"Permitting" is assumed to be a lump sum of $25,000. This cost includes future permits required for construction at the Site. This is a typical amount estimated for this type of mine reclamation project.
"Regulatory Compliance" is assumed to be 4% of the total capital cost. This is a typical value used for mine reclamation projects.
"Construction QA and Management" is assumed to be 8% of total direct capital cost. This is a typical value used for mine reclamation projects.
"Owners Management" is assumed to be 15% of the total direct capital cost. This is a typical value used for mine reclamation projects.
"Direct Capital Cost Contingency" is assumed to be 20% of total capital cost. This allows for unforeseen or unknown events that may occur during the lifetime of the project.

Table E - 24 Annual Monitoring and Maintenance (M&M) Cost Summary for Mine Rock Alternative M-3

	Item	*Unit Cost*	*Units*	*Quantity*	*Cost*
Annual M&M Costs					
Annual Inspection and Maintenance (Years 1-3)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$5,700	Trip	1	$5,700
	Maintenance				
	Maintenance Equipment Mobilization	$9,000	Trip	1	$9,000
	Annual Maintenance Allowance (Per Area)	$2,000	Area	5	$10,000
Subtotal Inspection and Maintenance Costs					**$30,300**
	Contingency		%	25	$7,575
Present Worth M&M (Years 1,2 and 3)					**$105,306**
	Item	**Unit Cost**	**Units**	**Quantity**	**Cost**
Future M&M Costs					
Annual Inspection and Maintenance (Years 5,10,15,20,25,30)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$5,700	Trip	1	$5,700
	Maintenance				
	Maintenance Equipment Mobilization	$3,500	Trip	1	$3,500
	Annual Maintenance Allowance (Per Area)	$2,000	Area	5	$10,000
Subtotal Inspection and Maintenance Costs					$24,800
	Contingency		%	25	$6,200
	Subtotal				$31,000
Present Worth M&M (Years 5, 10, 15, 20, 25, and 30)					**$100,383**
Present Worth M&M Costs					**$205,690**

Table E - 25 Cost Details for Annual Monitoring and Maintenance (M&M) for Mine Rock Alternative M-3

Required Crews Alternative M-3		
Crew Type	**# of Crew**	**Days**
USFS Field Crew	2	2
Areas	5	

M&M Mobilization Cost Details for Alternative M-3									
Mobilization for Inspection Crew									
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	2	$3,000	LS	1	$3,000
Hotel in Ketchikan	$200	Per Person	2	Per Night	2	$800	LS	1	$800
Total for Mobilization Costs Per Annual Inspection									**$3,800**
M&M Labor Cost Details for Alternative M-3									
Annual Inspection Labor and Equipment Costs									
Travel Time	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time On Site (8 hour fixed)	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time at Site (2 hours per Area)	$100	Per Person	2	2 Hours Per Area	10	$2,000	LS	1	$2,000
Equipment Costs (field supplies)	$500	Per Trip	1	-	1	$500	LS	1	$500
Total for Mobilization Costs Per Annual Inspection									**$5,700**
M&M Assumptions for Alternative									
Annual inspections by 2 USFS employees (assume $1000 per person, per day) for first three years (year 1, 2, 3) and every five years after until 30 years (year 5, 10, 15, 30); this assumes a roundtrip flight for each day and lodging in Ketchikan.									
Maintenance Equipment Mobilization on Annual M&M Cost Summary Table is assumed to be $9,000 per trip for year 1 through year 3; and $3,500 per trip for years 5, 10, 15, 20, 25, and 30; this assumes that heavy equipment mobilization may be required during the first three annual allowances ($9,000 RT barge with loading/unloading labor included); the $3,500 during the future visits (years 5, 10, 15, 20, 25, and 30) allows for unexpected costs during the future five-year visits.									
Areas include OSA, 300-ft, 700-ft, 900-ft, and Open Pit.									
Minor maintenance (cover, signs, etc.) is $2000 per year, per area.									
Labor for inspection assumes 8 hours for travel, 8 hours onsite, and 2 hours additional per area.									

Table E - 26 Engineering Economic Analysis Details for Mine Rock Alternative M-3

Economic Analysis for Present Worth of M&M (Years 1,2 and 3)								
Discount Rate	i	0.039						
Years	n	3						
Annual Cost	F	$37,875						
								Total Present Worth M&M (3 years)
Present Worth	P	$105,306						$105,306
Economic Analysis for Present Worth of M&M (Years 5-30)								
Discount Rate	i	0.039	0.039	0.039	0.039	0.039	0.039	
Years	n	5	10	15	20	25	30	
Annual Cost	F	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	
								Total Present Worth M&M (30 years)
Present Worth	P	$25,603	$20,145	$17,463	$14,423	$11,912	$9,838	$100,383

Table E - 27 Summary of Cost Estimate for Mine Rock Alternative M-3

Item	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$414,640	LS	1	$439,518
Health and Safety	$196,906	LS	1	$208,721
Site Preparation	$105,200	LS	1	$111,512
Common Elements	$413,539	LS	1	$438,351
Cover Material	$309,274	LS	1	$327,831
Cover and Stabilize In Place	$585,995	LS	1	$621,155
Institutional Controls	$15,000	LS	1	$15,000
SUBTOTAL DIRECT CAPITAL COST				**$2,162,087**
Stormwater, Erosion, and Dust Controls		**%**	**5%**	**$108,104**
TOTAL DIRECT CAPITAL COST				**$2,270,192**
INDIRECT CAPITAL COSTS				
Engineering Design		**%**	10%	$227,019
Permitting	$125,000	LS	1	$125,000
Regulatory Compliance		**%**	4%	$90,808
Construction QA and Management		**%**	8%	$181,615
Closure Documentation		**%**	4%	$90,808
Owners Management		**%**	15%	$340,529
Direct Capital Cost Contingency		**%**	20%	$454,038
TOTAL INDIRECT CAPITAL COST				**$1,509,817**
TOTAL CAPITAL COST (Indirect + Direct)				**$3,780,009**
Monitoring and Maintenance Present Worth (30 year)				**$205,690**
Total Project Cost (Adjusted to 2014)				**$3,985,698**

Note: A discount rate of 3.9% was used in the engineering economic analysis. Unit costs are in 2011 dollars and construction related costs have been adjusted to 2014 using historical cost indices (RSMeans, 2014).

Table E - 28 On-Site Cover Material Cost Details and Assumptions for Mine Rock Alternative M-3

Cover Material Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
On-Site Cover Material Costs	$13.40	cy	20977	$309,274
Cover Material Assumptions				
On-site material cost is based on estimate for 2" screening plant rates, and required equipment and quantities.				
Off-site materials assumed to be $70 per cubic yard, based on tech memo's highest rate to be conservative.				

Table E - 29 Mobilization Cost Details for Mine Rock Alternative M-3 - Earthwork Crew

Required Crews Alternative M-3		
Crew Type	**# of Crew**	**Days**
Earthwork Crew	7	133
Engineering Support	1	133
Radiation Support	1	133

Mobilization Cost Details for Alternative M-3									
Lodging / Travel Labor for Earthwork Crew									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	7	Per day, assume 3	**3**	$4,200	LS	1	$4,200
Lodging at island (estimate per person/night)	$250	Per Person	7	Per night	133	$232,303	LS	1	$232,303
Travel Time	$25	Per Person	7	Per hour, assume 16	**16**	$2,800	LS	1	$2,800
Mobilization for Earthwork Crew									
Floatplane to Site (per person, RT)	$750	Per Person	7	Roundtrip	1	$5,250	LS	1	$5,250
								Total for Earthwork	**$244,553**

Table E - 30 Mobilization Cost Details for Mine Rock Alternative M-3 - Engineering Crew

Lodging / Travel Labor for Engineer									
Item	***Unit Cost***	***Adjusted Details 1 Unit***	***Detail 1 Multiplier***	***Adjusted Details 2 Unit***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per day, assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	133	$33,186	LS	1	$33,186
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Labor While At Site for Engineering									
Field Engineer Labor	$100	Per Person	1	Per Hour	10	$1,000	Days	133	$132,745
Mobilization for Engineering									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	1	Roundtrip	1	$456	LS	1	$456
Floatplane to Site (per person, RT)	$750	Per Person	1	One way	2	$1,500	LS	1	$1,500
Contingency	$750	Per Person	1	One way	0	$0	LS	1	$0
Sub-total						**Total for Engineers**			**$170,087**

Table E - 31 Mobilization Cost Details for Mine Rock Alternative M-3 - Radiation Support Crew

Lodging / Travel Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per night assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	133	$33,186	LS	1	$33,186
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Equipment Rentals and Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Radiation Technician Labor	$100	Per Person	1	Per day	133	$13,274	hours	10	$132,745
Senior Staff	$185	Per Person	1	Per Hour	40	$7,400	LS	1	$7,400
RAD Equipment for Backpack Systems	$500	Per Week	19	# of Systems	1	$9,482	LS	1	$9,482
Misc. RAD Equipment	$500	Per Week	19	# of Systems	**1**	$9,482	LS	1	$9,482
Mobilization for Radiation Support									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	2	Roundtrip	1	$912	LS	1	$456
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	1	$1,500	LS	1	$1,500
Sub-total						**Total for Radiation**			**$196,906**

Table E - 32 Mobilization and Labor Assumptions for Mine Rock Alternative M-3

Mobilization Assumptions for Alternative M-3
Field crews include Earthwork, Engineering, and Radiation.
Assume for all field crew need 3 nights in Ketchikan hotel due to adverse weather conditions.
Assume for all field crew need 16 hours travel time, average travel time for every person.
Lodging in Kendrick Bay is based on actual incurred costs from 2009 and 2010, barge or yacht Bulldog (60k for ~14 days) and Crane (~$2500 per night for 6 people); Includes Food, Lodging, Laundry etc.
Flights for engineering and radiation support are from Denver RT; Prices from kayak.com for summer months; Earthwork crew is assumed to be local.
Floatplane for field personnel costs $750 per person per direction.
Travel time assumes roundtrip for each individual at 16 hours, delays due to weather, airlines, etc. travel to Site.
Labor at Site for field engineer and radiation support included; Earthwork Crew hours included in construction costs.
Assume 1 person would be responsible for all radiation protection measurements and guidance, including decontamination of vehicles/equipment prior to demobilization.
Responsibilities include providing radiation protection support for field engineers, scientists, laborers, field operators, equipment demobilization/mobilization.
Tasks include swipe testing of field equipment, supplies, personnel, anything to be removed off-site.
Tasks include GM-Probe testing of field equipment, supplies, personnel, anything to be removed off-site.
Tasks include taking notes and writing reports, data collection, equipment calibration checks, source checks, decontamination guidance.
Report writing for completion reports summarizing daily tasks and equipment checks.
Assume the field engineer labor rate is $100 per hour and radiation technicians are $100 per hour.
Assume senior staff's purpose is to develop a RAD Safety training program, ~ 16 hours AND Site Visit 24 hours.
Assume field technicians will be working 12 hours a day.
Misc. RAD equipment includes alpha and beta counters necessary for vehicle and personnel scans; also includes extra backpack systems.
Radiation crew would be responsible for guiding remedial efforts during the day, and scanning people off site every day.

Table E - 33 Earthwork Details and Assumptions for Mine Rock Alternative M-3

Area	Stabilize In Place (cy)	Excavation Rate (cy/day)	Days	Cover Required (cy)	Hauling Rate (cy/day)	Days	Cover Required (cy)	Cover Placement Rate (cy/day)	Days	Total Days
From On-Site Stockpile to Staging Area	-	800	0.0	20,977	1267	16.6	-			17
OSA stabilized in place	118	800	0.1	3,256	1267	2.6	3,256	800	4.1	7
300 stabilized in place	8,648	800	10.8	7,827	926	8.5	7,827	800	9.8	29
700 stabilized in place	757	800	0.9	2,724	266	10.2	2,724	800	3.4	15
900-N stabilized in place	1,562	800	2.0	2,949	404	7.3	2,949	800	3.7	13
900-S stabilized in place	182	800	0.2	392	404	1.0	392	800	0.5	2
Mine Road 700-900	-	800	0.0	1,552	404	3.8	776	800	1.0	5
Road OSA-300	-	800	0.0	3,200	926	3.5	1,600	800	2.0	5
Road 300-900	-	800	0.0	2,908	926	3.1	1,454	800	1.8	5
I&L Spur to 900-Level WRD-N	1,200	800	1.5	1,200	404	3.0				4
		Subtotal	**16**		**Subtotal**	**43**		**Subtotal**	**26**	
							Total Earthwork Days			**85**

Alternative M-3 Earthwork Assumptions
Stabilize/In-pile Grading: Assume 300 HP @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day.
Placement of Cover Material: Assume 300 HP @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day.
Assume cover of Haul Road segments is 1-foot after excavation of material.
Assume workdays are 10 hours.
Assume an earthwork crew consists of 2 excavator (345/315) 2 trucks (A25 Volvo), D-7R Dozer, 980 Front End Loader.
Material required stabilization is assumed to be the cut and fill volume (greater of the two), not the total volume of the affected area.
ALL Hauling Rates are based on average speeds and distances from each segment of road and assuming 20 cy (Volvo A40D) trucks.

Table E - 33 Earthwork Details and Assumptions for Mine Rock Alternative M-3 (cont'd)

OSA- Stabilize In Place, Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	7	$11,876
Cat 315 Excavator with Thumb	$115	$1,150	day	7	$7,804
A25 Volvo Articulated Dump Truck	$100	$1,000	day	7	$6,786
A25 Volvo Articulated Dump Truck	$100	$1,000	day	7	$6,786
D-7R Dozer with Winch	$175	$1,750	day	3	$5,938
980 Front End Loader	$145	$1,450	day	3	$4,920
Stabilize 118 cy					
Haul & Cover 3256 cy					
Sub-total					$44,112

700-Foot Level- Stabilize In Place, Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	15	$25,536
Cat 315 Excavator with Thumb	$115	$1,150	day	15	$16,781
A25 Volvo Articulated Dump Truck	$100	$1,000	day	15	$14,592
A25 Volvo Articulated Dump Truck	$100	$1,000	day	15	$14,592
D-7R Dozer with Winch	$175	$1,750	day	7	$12,768
980 Front End Loader	$145	$1,450	day	7	$10,579
Stabilize 1660 cy					
Haul & Cover 2724 cy					
Sub-total					$94,847

Table E - 33 Earthwork Details and Assumptions for Mine Rock Alternative M-3 (cont'd)

900-Foot Level North and South WRD- Stabilize In Place, Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	15	$25,593
Cat 315 Excavator with Thumb	$115	$1,150	day	15	$16,818
A25 Volvo Articulated Dump Truck	$100	$1,000	day	15	$14,624
A25 Volvo Articulated Dump Truck	$100	$1,000	day	15	$14,624
D-7R Dozer with Winch	$175	$1,750	day	14	$24,116
980 Front End Loader	$145	$1,450	day	14	$19,982
Stabilize 1562 (N); 183 (S) cy					
Haul & Cover 3341 (Total) cy					
Sub-total					$115,757

I&L Haul Road- Excavate and Haul to 900-Foot Level WRD					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	4	$7,823
Cat 315 Excavator with Thumb	$115	$1,150	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	4	$4,470
D-7R Dozer with Winch	$175	$1,750	day		$0
980 Front End Loader	$145	$1,450	day	4	$6,482
Excavate & Haul 1200 cy					
Sub-total					$18,775

Table E - 33 Earthwork Details and Assumptions for Mine Rock Alternative M-3 (cont'd)

300-Foot Level- Stabilize In Place, Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	29	$50,832
Cat 315 Excavator with Thumb	$115	$1,150	day	29	$33,404
A25 Volvo Articulated Dump Truck	$100	$1,000	day	29	$29,047
A25 Volvo Articulated Dump Truck	$100	$1,000	day	29	$29,047
D-7R Dozer with Winch	$175	$1,750	day	15	$25,416
980 Front End Loader	$145	$1,450	day	15	$21,059
Stabilize 12146 cy					
Haul & Cover 7827 cy					
Sub-total					$188,804

Mine Haul Roads- Excavate and Cover 1'					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	15	$26,643
Cat 315 Excavator with Thumb	$115	$1,150	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	15	$15,225
D-7R Dozer with Winch	$175	$1,750	day		$0
980 Front End Loader	$145	$1,450	day	15	$22,076
Excavate 7660 cy					
Haul & Cover 3830 cy					
Sub-total					$63,944

Table E - 34 Cost Estimate and Assumptions of Stormwater Control Quantities for Mine Rock Alternative M-3

Alternative M-3 Cost Estimate for Stormwater Control Quantities					
Design Feature	***300-Foot Level***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rip Rap Volume	498	$13.03	cy	498	$6,490
Geotextile	746	$1.05	sy	746	$783
				Subtotal for 300-Foot Level Stormwater Controls	**$7,273**
Design Feature	***700-Foot Level***				
Rip Rap Volume	658	$13.03	cy	658	$8,575
Geotextile	987	$1.05	sy	987	$1,036
				Subtotal for 700-Foot Level Stormwater Controls	**$9,611**
Design Feature	***900-Foot Level***				
Rip Rap Volume	1,013	$13.03	cy	1,013	$13,201
Geotextile	1,520	$1.05	sy	1,520	$1,596
				Subtotal for 900-Foot Level Stormwater Controls	**$14,797**
Design Feature	***900-Foot Open Pit***				
Rip Rap Volume	83	$13.03	cy	83	$1,082
Geotextile	53	$1.05	sy	53	$56
				Subtotal for 900-Foot Level Open Pit Stormwater Controls	**$1,137**

Stormwater Control Quantities Assumptions
Assumptions: 2' thick throughout channel and 2' vertical up WRD embankment, D_{50} of 12", geotextile along upstream face only unit weight of 1.75 tons/cy, geotextile along bottom of rock, allowing water to flow freely over WRD but protecting open pit.
Geotextile unit cost price includes installation and delivery; rip-rap unit cost price includes installation and material costs.
Geotextile will be placed beneath the rip-rap to maintain separation between the rip-rap and underlying rock/soil. The geotextile will be used in the stream channel to avoid scour and migration of rock/soils into the rip-rap.
Pricing information from usfabricsinc.com comes in (15' x 300') 500 yd^2 rolls @ $1.05/ yd^2 for US 205 Non-woven Geotextile; http://www.usfabricsinc.com/products/us-205nw.
Stormwater Control Quantities estimated per area, per alternative by Caleb Stock for stream rip-rap and stabilization.
Rip-rap assumed to come from on-site material, based on estimates from SE Roadbuilders' quotes.

Table E - 35 Cost Estimate Details and Assumptions for Vegetation Removal and Reclamation for Mine Rock Alternative M-3

Vegetation Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
D-7R Dozer with Winch	$175	hr	180	$31,500
Cat 315 Excavator with Thumb	$115	hr	180	$20,700
A25 Volvo Articulated Dump Truck	$100	hr	180	$18,000
Subtotals Vegetation Removal				**$70,200**
Vegetation Removal Assumptions				
Assume 18 work days with a dozer, excavator, and dump truck for all vegetation removal				

Reclamation/Revegetation				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
300-Foot Level	$20,000	LS	1	$20,000
OSA	$20,000	LS	1	$20,000
Subtotals Reclamation and Revegetation				**$40,000**
Reclamation and Revegetation Assumptions				
Assume $20,000 per area for vegetation and reclamation of areas which mine rock is removed.				
Assume the cost includes reclamation/revegetation of areas disturbed during construction.				

Table E - 36 Cost Estimate Details and Assumptions for Rock Armor for Mine Rock Alternative M-3

Alternative M-3 Cost Estimate for Rock Armor Quantities (Stabilized in Place)					
Design Feature	***700-Foot Level***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rock Mulch		$13.03	cy	681	$8,874.28
				Subtotal for 700-Foot Level Rock Armor	**$8,874.28**
Design Feature	***900-Foot N***				
Rock Mulch		$13.03	cy	737	$9,604.03
				Subtotal for 900-Foot Level North Rock Armor	**$9,604.03**
Design Feature	***900-Foot S***				
Rock Mulch		$13.03	cy	98	$1,277.06
				Subtotal for 900-Foot Level South Rock Armor	**$1,277.06**
				total	
				1,516	

Rock Armor Assumptions
Rock armor assumed to come from on-site material, based on estimates from SE Roadbuilders' quotes
Rock mulch quantities estimated by Geotech engineer
Assuming 800 cy per day is possible to move ; total days is 3 days

Table E - 37 Mobilization Cost Details and Assumptions for Mine Rock Alternative M-3

Mobilization Cost Details				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
Barge from Ketchikan to Site (includes return trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
De- Mobilization				
Barge from Ketchikan to Site (includes return trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
Mobilization Assumptions				
Assume barge would be able to take ALL required rental equipment; there is a 1200-ton, 1500-ton, and 3000-ton Barge available for the same pricing.				
Price of every size barge is $375/hour; trip to Site and back is 16 hours.				
Cost includes loading and unloading for equipment operators.				
Costs are based on discussions with Olsen Marine Inc., out of Ketchikan, AK.				

Table E - 38 Miscellaneous Cost Details and Assumptions for Mine Rock Alternative M-3

Miscellaneous Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Portable Toilet (4)	$400	Day	133	$53,098
Kubota (2 purchased)	$18,000	LS	2	$36,000
Field Pickup (2 purchased)	$10,000	LS	2	$20,000
Miscellaneous Engineering Equipment	$10,000	LS	1	$10,000
Barge for Misc. Equipment	$9,000	RT	1	$9,000
Subtotals of Miscellaneous Costs				**$128,098**
Assumptions				
Assume 2 Kubotas purchased				
Assume 2 used pickups at $10,000 each will be purchased				
Assume additional round trip barge required for additional supplies; $9,000 RT with loading/unloading as a contingency in the event that additional equipment is needed or equipment needs replacement				
Dock Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Miscellaneous Costs				
Field Labor Removal	$100	cy	80	$8,000
Move to OSA	$100	cy	80	$8,000
Subtotals of Miscellaneous Costs				**$16,000**
Assumptions				
Assume dock area will be remediated by field laborer, at 5 cy per hour, @ $100.				
Same cost for moving to OSA.				

Table E - 39 Road and Dock Work Cost Details and Assumptions for Mine Rock Alternative M-3

Road Construction Cost Estimates					
Road Reconstruction Segment	***Days***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Field Engineer	14	$100	hr	140	$14,000
Cat 315 Excavator with Thumb	14	$115	hr	140	$16,100
D-7R Dozer with Winch	14	$175	hr	140	$24,500
A25 Volvo Articulated Dump Truck	14	$100	hr	140	$14,000
Volume of Fill		$2	cy	4,500	$11,025
Subtotal for Road Construction Cost Estimate					**$79,625**
Dock Ramp Construction Estimate					
Road Reconstruction Segment		**Unit Cost**	***Units***	**Quantity**	***Cost***
Construction of Barge Landing		$35,000	LS	1	$35,000
Engineering Design		10%	%	1	$3,500
Permitting		10%	%	1	$3,500
Deconstruction of Dock		10%	%	1	$3,500
Subtotal for Dock Ramp Construction					**$45,500**
Road Assumptions					
Assume material quantities are based on half of the roads requiring construction at 1-foot thickness, and imported onsite.					
Assume 14 days of road construction at 10-hour days, using engineer, excavator, dozer, and truck.					
Assume hourly cost as specified in rental equipment.					
Onsite material based on quantities of each piece of equipment per day removing onsite material.					
Volume of fill is based on prices for one hour and quantities/rates of equipment. $2.45/cy					
Dock Assumptions					
Dock is minimum $35,000 for construction for increased traffic; based on estimate from KRM.					
Assume 10% for permitting and engineering design.					
Assume 10% for dock deconstruction.					

Table E - 40 Solid Waste and Debris s Costs Details and Assumptions for Mine Rock Alternative M-3

Solid Waste and Debris Removal Cost Details									
Solid Waste Removal Oversight/Construction									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Oversight of Solid Waste Removal (engineer)	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
Cat 315 Excavator with Thumb	$115	Per Hour	10	Per Day	14	$16,100	LS	1	$16,100
A25 Volvo Articulated Dump Truck	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
								Sub-total	$44,100
Barge Mobilization/Demobilization									
Barge Mobilization/Demobilization	$9,000	Roundtrip	1	# of Barges	2	$18,000	LS	1	$18,000
								Sub-total	$18,000
Solid and Hazardous Waste Disposal Costs for Acceptable Material									
Landfill Costs / Hazardous Waste	$300	Per Ton	47	n/a	1	$14,216	LS	1	$14,216
Secondary Containment	$10,000	LS	1	n/a	1	$10,000	LS	1	$10,000
Shipping Containers	$10,000	LS	3	n/a	1	$30,000	LS	1	$30,000
								Sub-total	$54,216
Solid Waste Disposal Costs for Scrap Metal at Junkyard									
Scrap Metal Costs	$2,000	Per Vehicle	5	n/a	1	$10,000	LS	1	$10,000
								Sub-total	$10,000
								Total	**$126,316**
Solid Waste Assumptions									
Assume oversight of removal is performed by engineer familiar with clean -p plan, ($100 per hour, 10 hour days).									
Assume haul truck and excavator for removal of all solid waste debris.									
Assume hazardous waste tipping fee is $300/ton based on typical tipping fees in California.									
Assume 14 days for all solid waste to be removed.									
Assume barge is $9000 per trip, roundtrip is assumed from Ketchikan to Kendrick Bay; assume 2 barges required one for equipment and one for wastes.									
Total weight of solid waste is estimated in spreadsheet based on EPA typical densities of various wastes source: *http://www.epa.vic.gov.au/bus/erep/docs/wastematerials-densities-data.pdf*									

Table E - 41 On-Site Cover Materials Cost Details and Assumptions for Mine Rock Alternative M-3

On-Site Cover Material Production						
Quantity of 2–inch Material Required (cy)	***Rate (cy/hr)***	***Days (8 hr)***		***Quantity of 6–inch Material Required***	***Rate (cy/hr)***	***Days (8 hr)***
20977	40	65.6		3768	40	11.8

2-inch Cover Material Production Costs					6-inch Cover Material Production Costs				
	Unit Cost	***Units***	***Quantity***	***Cost***		***Unit Cost***	***Units***	***Quantity***	***Cost***
Screening Plant	$670	Day	65.6	$43,921	Screening Plant	$670	Day	11.8	$7,889
Cat 315 Excavator with Thumb	$1,750	Day	65.6	$114,719	Cat 315 Excavator with Thumb	$1,750	Day	11.8	$20,606
Cat 315 Excavator with Thumb	$1,750	Day	65.6	$114,719	Cat 315 Excavator with Thumb	$1,750	Day	11.8	$20,606
Haul Road Construction	$7,800	LS	1.0	$7,800					
				$ 281,158					**$49,102**
				Total Cost					**Total Cost**

On-Site 2-inch Cover Material Unit Rate					On-Site 6-inch Cover Material Unit Rate			
Estimated Quantity of Material (cy)	***Total Cost***	***Units***	***Unit Rate***		***Estimated Quantity of Material (cy)***	***Total Cost***	***Units***	***Unit Rate***
20977	$281,158	cy	**$13.40**		3768	$49,102	cy	**$13.03**

On-Site Material Assumptions
Screening Plant assumed to be $20,000/month or ~$670/per day SE Roadbuilder estimate.
Assume bulldozer, haul truck, and excavator for 2 days is assumed for cost of access road.
Assume 2 additional excavators will be required to work with Screening Plan all day.
Access road construction assumed to consist of an excavator and a bulldozer for two days.
Assumption for cover material is from SE Road Builders estimate assumes 2" material @ 40 cy/hr.
Assumption from SE Road Builders estimate assumes 6" material @ 40 cy/hr.
Total required volume of 2" cover material is estimated based on required quantities of cover materials for alternative, unit cost of cover material is dependent on quantity.
Total required volume of 6" rip-rap is based on total amount of rock armor and rip rap required per the alternative; unit cost of rip rap/rock armor is dependent on quantity.
Assume access road to stock pile area in intertidal area will cost $7800.

Table E – 42 Total Estimated Days for Mine Rock Alternative M-3

Event	Estimated Time (days)
Cover and Stabilize in Place Time	85
Solid Waste Removal	14
Road Construction	14
Vegetation Removal	18
Rock Armor Placement	2
Total Days	**133**

COST ESTIMATE DETAILS FOR

Mine Rock Alternative M-4: **Excavation, Consolidation and Cover at Mine Affected Areas**

Table E - 43 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-4

Direct Capital Costs- Unique to Alternative M-4					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization of Cover Materials					
1	On-Site Cover Material Costs (includes excavation, screening, and placement)	$188,204	LS	1	$188,204
Mobilization/Labor (Personnel)					
2	Mobilization & Lodging for Earthwork Crew	$177,651	LS	1	$177,651
2	Mobilization & Lodging for Engineering Support (includes labor)	$122,299	LS	1	$122,299
2	Mobilization & Lodging for Radiation Support (includes labor)	$144,457	LS	1	$144,457
Construction Cost: Excavate and Consolidate 700- and 900-Foot Mine Rock to 900-Foot Level Open Pit					
3	Excavate to Open Pit (Equipment and Labor) 700-Foot	$224,209	LS	1	$224,209
3	Excavate to Open Pit and Pile Grading (Equipment and Labor) 900-Foot	$77,777	LS	1	$77,777
6	Rock Mulch	$6,450	LS	1	$6,450
4	Stormwater Controls	$6,486	LS	1	$6,486
4	Reclamation/Re-vegetation of 700-Foot and 900-Foot Levels	$40,000	LS	1	$40,000

Table E - 43 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-4 (cont'd)

Construction Cost: Excavate and Consolidate OSA Mine Rock to 300-Foot Level					
3	Excavate and Cover to 300-Foot Level from Ore Staging Area	$52,646	LS	1	$52,646
4	Reclamation/Re-vegetation of OSA	$20,000	LS	1	$20,000
Construction Cost: Cover and Stabilize in Place - 300-ft Level Mine Rock					
3	Cover and Pile Grading (Equipment and Labor)	$113,568	LS	1	$113,568
Construction Cost: Remove Materials from Haul Roads and Consolidate into Open Pit					
3	Cover and Pile Grading (Equipment and Labor)	$79,533	cy	1	$79,533
I&L Spur Removal to Open Pit					
3	Removal and Placement in Open Pit (Equipment and Labor)	$5,964	LS	1	$5,964
Construction Cost: Cover 900-ft Level Open Pit					
3	Open Pit Cover (2-foot)	$47,896	LS	1	$47,896
3	Synthetic Geomembrane Material and Installation	$2.20	SF	26,700	$58,740
Site Preparation					
4	Fuel Tank Storage, Secondary Containment	$15,000	LS	1	$15,000
5	Vegetation Removal (Equipment and Labor) at OSA and 300-Foot Level	$70,200	LS	1	$70,200
5	Temporary Stormwater Controls	$2,000	Per Area	5	$10,000
5	Chipping	$2,000	Per Area	5	$10,000
Institution Controls					
5	Signage	$5,000	LS	1	$5,000
5	Barriers	$2,000	Per Area	2	$4,000
Total Capital Cost Summary (Unique to All Alternative M-4)					
Summary of Direct Capital Costs (Unique to Alternative M-4) w/On-Site Cover Material					**$1,480,081**

Table E - 44 Summary of Direct Capital Costs Common to all Mine Rock Alternatives

Direct Capital Costs - Common to All Alternatives					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Construction Equipment					
1	Mobilization of Equipment to Site	$9,000	LS	1	$9,000
1	Demobilization of Equipment to Site	$9,000	LS	1	$9,000
Removal of Waste Rock in Dock Areas					
2	Removal of Ore Rock from Intertidal Zone	$16,000	LS	1	$16,000
Temporary Construction of Dock					
3	Dock Engineering, Construction, and Removal	$45,500	LS	1	$45,500
Road Work Construction					
3	Road Improvements (includes turnouts, regrading, widening for all roads)	$79,625	LS	1	$79,625
Miscellaneous Wastes and Debris Removal Offsite					
4	Earthwork and Soil Removal Oversight/Construction	$44,100	LS	1	$44,100
4	Barge Mobilization/Demobilization	$18,000	LS	1	$18,000
4	Solid Waste Disposal Costs (accepted waste)	$54,216	LS	1	$54,216
4	Solid Waste Disposal Costs (vehicles)	$10,000	LS	1	$10,000
Miscellaneous Items					
2	Miscellaneous	$132,406	LS	1	$132,406
Summary of Direct Capital Costs (Common to All Alternatives)					**$417,847**

Table E - 45 Indirect Cost Summary for Mine Rock Alternative M-4

Capital Indirect Cost Summary					
Item #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
	Additional Indirect Capital Costs	**Scenario:**			**On-site Material**
		Scenario Capital Cost:			**$2,111,826**
1	Engineering Design	DC	%	10	$211,183
2	Permitting	$125,000	LS	1	$125,000
3	Regulatory Compliance	DC	%	4	$84,473
4	Construction QA and Management	DC	%	8	$168,946
5	Owners Management	DC	%	15	$316,774
6	Direct Capital Cost Contingency	DC	%	20	$422,365
Total Indirect Capital Costs for Alternative M-4 w/ On-Site Material					**$1,328,741**

Indirect Cost Assumptions
"Engineering Design" is assumed to be 10% of total capital cost. This includes engineering design, civil drawings, and project management. This is a typical value used for mine reclamation projects.
"Permitting" is assumed to be a lump sum of $25,000. This cost includes future permits required for construction at the Site. This is a typical amount estimated for this type of mine reclamation project.
"Regulatory Compliance" is assumed to be 4% of the total capital cost. This is a typical value used for mine reclamation projects.
"Construction QA and Management" is assumed to be 8% of total direct capital cost. This is a typical value used for mine reclamation projects.
"Owners Management" is assumed to be 15% of the total direct capital cost. This is a typical value used for mine reclamation projects.
"Direct Capital Cost Contingency" is assumed to be 20% of total capital cost. This allows for unforeseen or unknown events that may occur during the lifetime of the project.

Table E - 46 Annual Monitoring and Maintenance (M&M) Cost Summary for Mine Rock Alternative M-4

	Item	Unit Cost	Units	Quantity	Cost
Annual M&M Costs					
Annual Inspection and Maintenance (Years 1-3)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$4,500	Trip	1	$4,500
	Maintenance				
	Maintenance Equipment Mobilization	$9,000	Trip	1	$9,000
	Annual Maintenance Allowance (Per Area)	$2,000	Area	2	$4,000
	Subtotal Inspection and Maintenance Costs				**$23,100**
	Contingency		%	25	$5,775
	Subtotal				$28,875
Present Worth M&M (Years 1, 2 and 3)					**$80,283**
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Future M&M Costs					
Annual Inspection and Maintenance (Years 5,10,15,20,25,30)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$4,500	Trip	1	$4,500
	Maintenance				
	Maintenance Equipment Mobilization	$3,500	Trip	1	$3,500
	Annual Maintenance Allowance (Per Area)	$2,000	Area	2	$4,000
	Subtotal Inspection and Maintenance Costs				$17,600
	Contingency		%	25	$4,400
	Subtotal				$22,000
Present Worth M&M (Years 5,10,15,20,25, and 30)					**$71,240**
Present Worth M&M Costs					**$151,523**

Table E - 47 Cost Details for Annual Monitoring and Maintenance (M&M) for Mine Rock Alternative M-4

Required Crews		
Crew Type	**# of Crew**	**Days**
USFS Field Crew	2	2
Areas	2	

M&M Mobilization Cost Details for Alternative M-4									
Mobilization for Inspection Crew									
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	2	$3,000	LS	1	$3,000
Hotel in Ketchikan	$200	Per Person	2	Per Night	2	$800	LS	1	$800
Total for Mobilization Costs Per Annual Inspection									**$3,800**
M&M Labor Cost Details for Alternative M-4									
Annual Inspection Labor and Equipment Costs									
Travel Time	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time On Site (8 hour fixed)	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time at Site (2 hours per Area)	$100	Per Person	2	2 Hours Per Area	4	$800	LS	1	$800
Equipment Costs (field supplies)	$500	Per Trip	1	-	1	$500	LS	1	$500
Total for Mobilization Costs Per Annual Inspection									**$4,500**
M&M Assumptions for Alternative									
Annual inspections by 2 USFS employees (assume $1000 per person, per day) for first three years (year 1, 2, 3) and every five years after until 30 years (year 5, 10, 15, 20, 25, and 30); this assumes a roundtrip flight for each day and lodging in Ketchikan.									
Maintenance Equipment Mobilization on Annual M&M Cost Summary Table is assumed to be $9,000 per trip for year 1 through year 3; and $3,500 per trip for years 5, 10, 15, 20, 25, and 30; this assumes that heavy equipment mobilization may be required during the first three annual allowances ($9,000 RT barge with loading/unloading labor included); the $3,500 during the future visits (years 5, 10, 15, 20, 25, and 30) allows for unexpected costs during the future five-year visits.									
Areas include 300-Foot and Open Pit.									
Minor maintenance (cover, signs, etc.) is $2000 per year, per area.									
Labor for inspection assumes 8 hours for travel, 8 hours onsite, and 2 hours additional per area.									

Table E - 48 Engineering Economic Analysis Details for Mine Rock Alternative M-4

Economic Analysis for Present Worth of M&M (Years 1,2 and 3)								
Discount Rate	i	0.039						
Years	n	3						
Annual Cost	F	$28,875						
								Total Present Worth M&M (3 years)
Present Worth	P	$80,283						$80,283
Economic Analysis for Present Worth of M&M (Years 5-30)								
Discount Rate	i	0.039	0.039	0.039	0.039	0.039	0.039	
Years	n	5	10	15	20	25	30	
Annual Cost	F	$22,000	$22,000	$22,000	$22,000	$22,000	$22,000	
								Total Present Worth M&M (30 years)
Present Worth	P	$18,170	$15,006	$12,393	$10,236	$8,453	$6,982	$71,240

Table E - 49 Summary of Cost Estimate for Mine Rock Alternative M-4

Item	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$299,950	LS	1	$317,947
Radiation Safety, Decon and Monitoring	$144,457	LS	1	$153,125
Site Preparation	$105,200	LS	1	$111,512
Common Elements	$417,847	LS	1	$442,917
Cover Material	$188,204	LS	1	$199,496
Excavate to 300-Foot Level and Open Pit and Cover	$733,270	LS	1	$777,266
Institutional Controls	$9,000	LS	1	$9,000
SUBTOTAL DIRECT CAPITAL COST				**$2,011,263**
Stormwater, Erosion, and Dust Controls		**%**	5%	**$100,563**
TOTAL DIRECT CAPITAL COST				**$2,111,826**
INDIRECT CAPITAL COSTS				
Engineering Design		**%**	10%	$211,183
Permitting	$125,000	LS	1	$125,000
Regulatory Compliance		**%**	4%	$84,473
Construction QA and Management		**%**	8%	$168,946
Owners Management		**%**	15%	$316,774
Direct Capital Cost Contingency		**%**	20%	$422,365
TOTAL INDIRECT CAPITAL COST				**1,328,741**
TOTAL CAPITAL COST (Indirect + Direct)				$3,440,567
Monitoring and Maintenance Present Worth (30 year)				$151,523
Total Project Cost				**$3,592,090**

Note: A discount rate of 3.9% was used in the engineering economic analysis. Unit costs are in 2011 dollars and construction related costs have been adjusted to 2014 using historical cost indices (RSMeans, 2014).

Table E - 50 On-Site Cover Material Cost Details and Assumptions for Mine Rock Alternative M-4

Cover Material Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
On-Site Cover Material Costs	$13.65	C.Y	12531	$188,204
Cover Material Assumptions				
On-site material cost is based on estimate for 2" screening plant rates, and required equipment and quantities.				
Off-site materials assumed to be $70 per cubic yard, based on tech memo's highest rate to be conservative.				

Table E – 51 Mobilization Cost Details for Mine Rock Alternative M-4 - Earthwork Crew

Required Crews Alternative M-4		
Crew Type	**# of Crew**	**Days**
Earthwork Crew	7	95
Engineering Support	1	95
Radiation Support	1	95

Mobilization Cost Details for Alternative M-4									
Lodging / Travel Labor for Earthwork Crew									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	7	Per day, assume 3	**3**	$4,200	LS	1	$4,200
Lodging at island (estimate per person/night)	$250	Per Person	7	Per night	95	$165,401	LS	1	$165,401
Travel Time	$25	Per Person	7	Per hour, assume 16	**16**	$2,800	LS	1	$2,800
Mobilization for Earthwork Crew									
Floatplane to Site (per person, RT)	$750	Per Person	7	Roundtrip	1	$5,250	LS	1	$5,250
								Total for Earthwork	**$177,651**

Table E - 52 Mobilization Cost Details for Mine Rock Alternative M-4 - Engineering Crew

Lodging / Travel Labor for Engineer									
Item	***Unit Cost***	***Adjusted Details 1 Unit***	***Detail 1 Multiplier***	***Adjusted Details 2 Unit***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per day, assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	95	$23,629	LS	1	$23,629
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Labor While At Site for Engineering									
Field Engineer Labor	$100	Per Person	1	Per Hour	10	$1,000	Days	95	$94,515
Mobilization for Engineering									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	1	Roundtrip	1	$456	LS	1	$456
Floatplane to Site (per person, RT)	$750	Per Person	1	One way	2	$1,500	LS	1	$1,500
Contingency	$750	Per Person	1	One way	0	$0	LS	1	$0
Sub-total						**Total for Engineers**			**$122,299**

Table E - 53 Mobilization Cost Details for Mine Rock Alternative M-4 - Radiation Support Crew

Lodging / Travel Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per night assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	95	$23,629	LS	1	$23,629
Travel Time	$150	Per Person	1	Per hour, assume 16	**16**	$2,400	LS	1	$2,400
Equipment Rentals and Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Radiation Technician Labor	$100	Per Person	1	Per day	95	$9,451	hours	10	$94,515
Senior Staff	$185	Per Person	1	Per Hour	40	$7,400	LS	1	$7,400
RAD Equipment for Backpack Systems	$500	Per Week	14	# of Systems	1	$6,751	LS	1	$6,751
Misc. RAD Equipment	$500	Per Week	14	# of Systems	**1**	$6,751	LS	1	$6,751
Mobilization for Radiation Support									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	2	Roundtrip	1	$912	LS	1	$912
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	1	$1,500	LS	1	$1,500
Sub-total						**Total for Radiation**			**$144,457**

Table E - 54 Mobilization and Labor Assumptions for Mine Rock Alternative M-4

Mobilization Assumptions for Alternative M-4
Field crews include Earthwork, Engineering, Radiation
Assume for all field crew need 3 nights in Ketchikan hotel due to adverse weather conditions
Assume for all field crew members will require 16 hours travel time, average travel time for every person
Lodging in Kendrick Bay is based on actual incurred costs from 2009 ad 2010, barge or yacht Bulldog (60k for ~14 days) and Crane (~$2500 per night for 6 people); Includes food, lodging, laundry etc.
Flights for engineering and radiation support are from Denver RT ; Prices from kayak.com for summer months; Earthwork crew is assumed to be local
Float plane for field personnel costs $750 per person per direction
Travel time assumes roundtrip for each individual at 16 hours, delays due to weather, airlines, etc. travel to Site
Labor at Site for field engineer and radiation support included; Earthwork Crew hours included in construction costs
Assume 1 person would be responsible for all radiation protection measurements and guidance, including decontamination of vehicles/equipment prior to demobilization
Responsibilities include providing radiation protection support for field engineers, scientists, laborers, field operators, equipment demobilization/mobilization
Tasks include swipe testing of field equipment, supplies, personnel, anything to be removed off-site
Tasks include GM-Probe testing of field equipment, supplies, personnel, anything to be removed off-site
Tasks include taking notes and writing reports, data collection, equipment calibration checks, source checks, decontamination guidance
Report writing for completion reports summarizing daily tasks and equipment checks
Assume the field engineer labor rate is $100 per hour and radiation technicians are $100 per hour
Assume senior staff's purpose is to develop a RAD Safety training program, ~ 16 hours AND Site Visit 24 hours
Assume field technicians will be working 12 hours a day
Misc. RAD equipment includes alpha and beta counters necessary for vehicle and personnel scans; also includes extra backpack systems
Radiation crew would be responsible for guiding remedial efforts during the day, and scanning people off site every day

Table E - 55 Earthwork Details for Mine Rock Alternative M-4

Area	Material to Excavate and Haul (cy)	Excavation and Hauling Rate (cy/day)	Days	Cover Material Required (cy)	Hauling Rate (cy/day)	Days	Placing Cover Material (cy)	Rate (cy/day)	Days	Total Days
From On-Site Stockpile to Staging Area	12,531	1267	10	n/a						9.9
700-Foot Level to Open Pit	8,091	380	21	n/a						21.3
Mine Road 700-900 Embankments to Open Pit	3,025	380	8	n/a						8.0
900-Foot Level to Open Pit	10,111	845	12	n/a						12.0
OSA to 300-Foot Level	7,500	926	8	n/a						8.1
Open Pit Consolidation/Cover				1,978	404	4.9	1,978	800	2.5	7.4
300-Foot Level Consolidation/Cover				7,499	926	8.1	7,499	800	9.4	17.5
Road OSA-300 to Open Pit	1,600	404	4	1,600	404	4.0	1,600	800	2.0	9.9
Road 300-900 to Open Pit	1,454	404	4	1,454	404	3.6	1,454	800	1.8	9.0
I&L Spur to Open Pit	1,200	845	1	n/a						1.4
Subtotal	32981	**Subtotal**	58		**Subtotal**	20.6		**Subtotal**	16	
									Total	95

Alternative M-4 Earthwork Assumptions
Cover material will be required at 300-Foot Level, Open Pit, and Mine Haul Roads (excluding 700/900)
Stabilize/In-pile Grading and Excavating: Assume 300 HP (D7R-II Dozer) @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day
Placement of Cover Material: Assume 300 HP @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day
Assume work days are 10 hours
Assume cover of Haul Road segments is 1-foot after excavation of material
Assume an earthwork crew consists of 2 excavator (345/315) 2 trucks (A25 Volvo), D-7R Dozer, 980 Front End Loader
ALL Hauling Rates are based on average speeds and distances from each segment of road and assuming 20 cy (Volvo A40D) trucks

Table E - 55 Earthwork Details for Mine Rock Alternative M-4 (cont'd)

Excavated OSA and Consolidate at 300-Foot Level					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	8	$14,174
Cat 315 Excavator with Thumb	$115	$1,150	day	8	$9,314
A25 Volvo Articulated Dump Truck	$100	$1,000	day	8	$8,099
A25 Volvo Articulated Dump Truck	$100	$1,000	day	8	$8,099
D-7R Dozer with Winch	$175	$1,750	day	4	$7,087
980 Front End Loader	$145	$1,450	day	4	$5,872
Excavate and Haul 7500 cy					
Sub-total					$52,646

900-Foot Level- Excavate and Consolidate at Open Pit (N and S)					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	12	$20,940
Cat 315 Excavator with Thumb	$115	$1,150	day	12	$13,761
A25 Volvo Articulated Dump Truck	$100	$1,000	day	12	$11,966
A25 Volvo Articulated Dump Truck	$100	$1,000	day	12	$11,966
D-7R Dozer with Winch	$175	$1,750	day	6	$10,470
980 Front End Loader	$145	$1,450	day	6	$8,675
Excavate and Haul 10,111 cy					
Sub-total					$77,777

Open Pit - Consolidate and Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	7	$12,895
Cat 315 Excavator with Thumb	$115	$1,150	day	7	$8,474
A25 Volvo Articulated Dump Truck	$100	$1,000	day	7	$7,369
A25 Volvo Articulated Dump Truck	$100	$1,000	day	7	$7,369
D-7R Dozer with Winch	$175	$1,750	day	4	$6,447
980 Front End Loader	$145	$1,450	day	4	$5,342
Stabilize 1660 cy					
Haul & Cover 2724 cy					
Sub-total					$47,896

Table E - 55 Earthwork Details for Mine Rock Alternative M-4 (cont'd)

300-Foot Level- Excavate, Consolidate, Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	17	$30,576
Cat 315 Excavator with Thumb	$115	$1,150	day	17	$20,093
A25 Volvo Articulated Dump Truck	$100	$1,000	day	17	$17,472
A25 Volvo Articulated Dump Truck	$100	$1,000	day	17	$17,472
D-7R Dozer with Winch	$175	$1,750	day	9	$15,288
980 Front End Loader	$145	$1,450	day	9	$12,667
Haul & Cover 7499 cy					
Sub-total					$113,568

Haul Roads (OSA to 300-Foot & 300-Foot to 900-Foot segments) Excavate to Open Pit					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	19	$33,139
Cat 315 Excavator with Thumb	$115	$1,150	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	19	$18,936
D-7R Dozer with Winch	$175	$1,750	day		$0
980 Front End Loader	$145	$1,450	day	19	$27,458
Excavate and Haul 3054 cy					
Haul & Cover 3054 cy					
Sub-total					$79,533

700-Foot Level- Excavate and Consolidate at Open Pit (includes WR Embankments)					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	29	$51,192
Cat 315 Excavator with Thumb	$115	$1,150	day	29	$33,641
A25 Volvo Articulated Dump Truck	$100	$1,000	day	29	$29,253
A25 Volvo Articulated Dump Truck	$100	$1,000	day	29	$29,253
D-7R Dozer with Winch	$175	$1,750	day	25	$44,227
980 Front End Loader	$145	$1,450	day	25	$36,645
Excavate & Haul 8091 cy (700-Foot)					
Excavate & Haul 3025 cy (Embankments)					
Sub-total					$224,209

Table E - 55 Earthwork Details for Mine Rock Alternative M-4 (cont'd)

I&L Haul Road- Excavate and Haul to Open Pit					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	1	$2,485
Cat 315 Excavator with Thumb	$115	$1,150	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	1	$1,420
D-7R Dozer with Winch	$175	$1,750	day		$0
980 Front End Loader	$145	$1,450	day	1	$2,059
All Haul Roads					
Excavate & Haul 1200 cy					
Sub-total					$5,964

Table E - 56 Cost Estimate and Assumptions of Stormwater Control Quantities for Mine Rock Alternative M-4

Alternative M-4 Cost Estimate for Stormwater Control Quantities					
Design Feature	***300-Foot Level***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rip Rap Volume (cy)	444	$13.03	cy	444	$5,786
Geotextile (sy)	667	$1.05	sy	667	$700
Subtotal for Alternative M-4 Stormwater Controls					**$6,486**

Stormwater Control Quantities Assumptions
Assumptions: 2' thick throughout channel and 2' vertical up WRD embankment, D_{50} of 12", geotextile along upstream face only unit weight of 1.75 tons/cy, geotextile along bottom of rock, allowing water to flow freely over WRD but protecting open pit
Geotextile unit cost price includes installation and delivery; rip-rap unit cost price includes installation and material costs
Geotextile will be placed beneath the rip-rap to maintain separation between the rip-rap and underlying rock/soil. The geotextile will be used in the stream channel to avoid scour and migration of rock/soils into the rip-rap
Pricing information from usfabricsinc.com comes in (15' x 300') 500 yd^2 rolls @ $1.05/ sy for US 205 Non-woven Geotextile; http://www.usfabricsinc.com/products/us-205nw
Stormwater Control Quantities estimated per area, per alternative by Caleb Stock for stream rip-rap and stabilization
Rip-rap assumed to come from on-site material, based on estimates from SE Roadbuilders' quotes

Table E - 57 Cost Estimate Details and Assumptions for Vegetation Removal and Reclamation for Mine Rock Alternative M-4

Vegetation Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
D-7R Dozer with Winch	$175	hr	180	$31,500
Cat 315 Excavator with Thumb	$115	hr	180	$20,700
A25 Volvo Articulated Dump Truck	$100	hr	180	$18,000
			Subtotals Vegetation Removal	**$70,200**
Vegetation Removal Assumptions				
Assume 18 work days with a dozer, excavator, and dump truck for all vegetation removal				

Reclamation/Revegetation				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
900-Foot Level	$20,000	LS	1	$20,000
700-Foot Level	$20,000	LS	1	$20,000
OSA	$20,000	LS	1	$20,000
			Subtotals Reclamation and Revegetation	**$60,000**
Reclamation and Revegetation Assumptions				
Assume $20,000 per area for vegetation and reclamation of areas which mine rock is removed				
Assume the cost includes reclamation/revegetation of areas disturbed during construction				

Table E - 58 Cost Estimate Details and Assumptions for Rock Armor for Mine Rock Alternative M-4

Alternative M-4 Cost Estimate for Rock Armor Quantities					
Design Feature	***300 & OSA Combined***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rock Mulch		$13.03	cy	1,875	$24,433.59
				Subtotal for 700-Foot Level Rock Armor	**$24,433.59**
Design Feature	***700 and 900-Foot Combined***				
Rock Mulch		$13.03	cy	495	$6,450.47
				Subtotal for 900-Foot Level North Rock Armor	**$6,450.47**
				total	
				2,370	

Rock Armor Assumptions
Rock armor assumed to come from on-site material, based on estimates from SE Roadbuilders quotes
Rock mulch quantities estimated by Geotech engineer
Assuming 800 cy per day is possible to move ; total days is 3 days

Table E - 59 Mobilization Cost Details and Assumptions for Mine Rock Alternative M-4

Equipment Mobilization Cost Details				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
Barge from Ketchikan to Site (includes return trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
De- Mobilization				
Barge from Ketchikan to Site (includes return trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
Mobilization Assumptions				
Assume barge would be able to take ALL required rental equipment, there is a 1200 ton, 1500 ton, and 3000 ton Barge available for the same pricing				
Price of every size barge is $375/hour; trip to Site and back is 16 hours				
Cost includes loading and unloading for equipment operators				
Cost are based on discussions with Olsen Marine Inc., out of Ketchikan, AK				

Table E - 60 Miscellaneous Cost Details and Assumptions for Mine Rock Alternative M-4

Miscellaneous Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Portable Toilet (4)	$400	Day	144	$57,406
Kubota (2 purchased)	$18,000	LS	2	$36,000
Field Pickup (2 purchased)	$10,000	LS	2	$20,000
Miscellaneous Engineering Equipment	$10,000	LS	1	$10,000
Barge for Misc. Equipment	$9,000	RT	1	$9,000
Subtotals of Miscellaneous Costs				**$132,406**
Assumptions				
Assume 2 Kubotas purchased				
Assume 2 used pickups at $10,000 each will be purchased				
Assume additional round trip barge required for additional supplies; $9,000 RT with loading/unloading as a contingency in the event that additional equipment is needed or equipment needs replacement				
Dock Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Field Labor Removal	$100	cy	80	$8,000
Move to OSA	$100	cy	80	$8,000
Subtotals of Miscellaneous Costs				**$16,000**
Assumptions				
Assume dock area will be remediated by field laborer, at 5 cy per hour, @ $100				
Same cost for moving to OSA				

Table E - 61 Road and Dock Work Cost Details and Assumptions for Mine Rock Alternative M-4

Road Construction Cost Estimates					
Road Reconstruction Segment	***Days***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Field Engineer	14	$100	hr	140	$14,000
Cat 315 Excavator with Thumb	14	$115	hr	140	$16,100
D-7R Dozer with Winch	14	$175	hr	140	$24,500
A25 Volvo Articulated Dump Truck	14	$100	hr	140	$14,000
Volume of Fill		$2	cy	4,500	$11,025
Subtotal for Road Construction Cost Estimate					**$79,625**
Dock Ramp Construction Estimate					
Road Reconstruction Segment		**Unit Cost**	***Units***	**Quantity**	***Cost***
Construction of Barge Landing		$35,000	LS	1	$35,000
Engineering Design		10%	%	1	$3,500
Permitting		10%	%	1	$3,500
Deconstruction of Barge		10%	%	1	$3,500
Subtotal for Dock Ramp Construction					**$45,500**
Road Assumptions					
Assume material quantities are based on half of the roads requiring construction at 1-foot thickness, and imported onsite					
Assume 14 days of road construction at 10 hour days, using engineer, excavator, dozer, and truck					
Assume hourly cost as specified in rental equipment					
Onsite material based on quantities of each piece of equipment per day removing onsite material					
Volume of fill is based on prices for one hour and quantities/rates of equipment. $2.45/cy					
Dock Assumptions					
Dock is minimum $35,000 for construction for increased traffic; based on estimate from KRM					
Assume 10% for permitting and engineering design					
Assume 10% for dock deconstruction					

Table E - 62 Solid Waste and Debris s Costs Details and Assumptions for Mine Rock Alternative M-4

Solid Waste and Debris Removal Cost Details									
Solid Waste Removal Oversight/Construction									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Oversight of Solid Waste Removal (engineer)	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
Cat 315 Excavator with Thumb	$115	Per Hour	10	Per Day	14	$16,100	LS	1	$16,100
A25 Volvo Articulated Dump Truck	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
								Sub-total	$44,100
Barge Mobilization/Demobilization									
Barge Mobilization/Demobilization	$9,000	Roundtrip	1	# of Barges	2	$18,000	LS	2	$18,000
								Sub-total	$18,000
Solid and Hazardous Waste Disposal Costs for Acceptable Material									
Landfill Costs / Hazardous Waste	$300	Per Ton	47	n/a	1	$14,216	LS	1	$ 14,216
Secondary Containment	$10,000	LS	1	n/a	1	$10,000	LS	1	$10,000
Shipping Containers	$10,000	LS	3	n/a	1	$30,000	LS	1	$30,000
								Sub-total	$54,216
Solid Waste Disposal Costs for Scrap Metal at Junk Yard									
Scrap Metal Costs	$2,000	Per Vehicle	5	n/a	1	$10,000	LS	1	$10,000
								Sub-total	$10,000
								Total	**$126,316**

Solid Waste Assumptions
Assume oversight of removal is performed by engineer familiar with clean-up plan, ($100 per hour, 10 hour days)
Assume haul truck and excavator for removal of all solid waste debris
Assume hazardous waste tipping fee is $300/ton based on typical tipping fees in California
Assume 14 days for all solid waste to be removed
Assume barge is $9000 per trip, roundtrip is assumed from Ketchikan to Kendrick Bay; assume 2 barges required one for equipment and one for wastes
Total weight of solid waste is estimated in spreadsheet based on EPA typical densities of various wastes source: *http://www.epa.vic.gov.au/bus/erep/docs/wastematerials-densities-data.pdf*

Table E - 63 On-Site Cover Materials Cost Details and Assumptions for Mine Rock Alternative M-4

On-Site Cover Material Production								
Quantity of 2-inch Material Required (cy)		***Rate (cy/hr)***	***Days (8 hr)***		***Quantity of 6-inch Material Required (cy)***		***Rate (cy/hr)***	***Days (8 hr)***
12531		40	39.2		2814		40	8.8
2-inch Cover Material Production Costs					**6-inch Cover Material Production Costs**				
	Unit Cost	Units	Quantity	Cost		Unit Cost	Units	Quantity	Cost
Screening Plant	$670	Day	39.2	$26,237	Screening Plant	$670	Day	8.8	$5,892
Cat 315 Excavator with Thumb	$1,750	Day	39.2	$68,529	Cat 315 Excavator with Thumb	$1,750	Day	8.8	$15,389
Cat 315 Excavator with Thumb	$1,750	Day	39.2	$68,529	Cat 315 Excavator with Thumb	$1,750	Day	8.8	$15,389
Haul Road Construction	$7,800	LS	1.0	$7,800					
			Total Cost	$171,095				**Total Cost**	$36,670
On-Site 2-inch Cover Material Unit Rate					**On-Site 6-inch Cover Material Unit Rate**			
Estimated Quantity of Material	***Total Cost***	***Units***	***Unit Rate***		***Estimated Quantity of Material***	***Total Cost***	***Units***	***Unit Rate***
12531	$171,095	cy	**$13.65**		2814	$36,670	cy	**$13.03**

On-Site Material Assumptions
Screening Plant assumed to be $20,000/month or ~$670/per day SE Roadbuilder Estimate
Assume bull dozer, haul truck, and excavator for 2 days is assumed for cost of access road
Assume 2 additional excavators will be required to work with Screening Plan all day
Access road construction assumed to consist of an excavator and a bull dozer for 2 days
Assumption for cover material is from SE Road Builders estimate assumes 2" material @ 40 cy/hr
Assumption from SE Road Builders estimate assumes 6" material @ 40 cy/hr
Total required volume of 2" cover material is estimated based on required quantities of cover materials for alternative; unit cost of cover material is dependent on quantity
Total required volume of 6" rip rap is based on total amount of rock armor and rip rap required per the alternative; unit cost of rip rap/rock armor is dependent on quantity
Assume access road to stock pile area in intertidal area will cost $7800

Table E - 64 Total Estimated Days for Mine Rock Alternative M-4

Task	Estimated Time (days)
Cover, Excavate and Stabilize in Place Time	95
Solid Waste Removal	14
Road Construction	14
Vegetation Removal	18
Rock Armor Placement	3
Total Days	144

COST ESTIMATE DETAILS FOR
Mine Rock Alternative M-5: **Excavation, Consolidation in Open Pit Repository at 900-Foot Level**

Table E - 65 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-5

Direct Capital Costs- Unique to Alternative M-5					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization of Cover Materials					
1	On-Site Cover Material Costs	$141,775	LS	1	$141,775
Mobilization/Labor (Personnel)					
2	Mobilization & Lodging for Earthwork Crew	$448,688	LS	1	$448,688
2	Mobilization & Lodging for Engineering Support (includes labor)	$297,008	LS	1	$297,008
2	Mobilization & Lodging for Radiation Support (includes labor)	$366,446	LS	1	$366,446
Construction Cost: Excavate I&L Spur Road to Open Pit					
3	I&L Spur Road, Excavate, Consolidate to Open Pit	$9,835	LS	1	$9,835
Construction Cost: Cover Excavate and Consolidate Mine Rock in 900-Foot Level Open Pit					
3	900-Foot Level, Excavate, Consolidate to Open Pit	$77,777	LS	1	$77,777
3	700-Foot Level, Excavate, Consolidate to Open Pit	$161,668	LS	1	$161,668
3	300-Foot Level, Excavate, Consolidate to Open Pit	$637,929	LS	1	$637,929
3	OSA Excavate, Consolidate to Open-Pit	$120,668	LS	1	$120,668
3	Haul Roads Excavate, Consolidate to Open-Pit	$79,533	LS	1	$79,533
4	Reclamation/Re-vegetation of OSA, 700-Foot and 900-Foot Levels	$60,000	LS	1	$60,000

Table E - 65 Summary of Direct Capital Costs Unique to Mine Rock Alternative M-5 (cont'd)

Construction Cost: Cover Open Pit					
3	Open Pit (2-foot Cover)	$207,297	LS	1	$207,297
	Synthetic Liner/Geotextile Material and Installation	$2.20	SF	115600	$254,320
4	Stormwater Controls	$4,924	LS	1	$4,924
6	Rock Mulch for Open Pit	$22,310	LS	1	$22,310
Site Preparation					
	Fuel Tank Storage, Secondary Containment	$15,000	LS	1	$15,000
5	Vegetation Removal (Equipment and Labor) at OSA and 300-Foot Level	$70,200	LS	1	$70,200
5	Temporary Stormwater Controls	$2,000	Per Area	5	$10,000
5	Chipping	$2,000	Per Area	5	$10,000
Institution Controls					
5	Signage	$5,000	LS	1	$5,000
5	Barriers	$2,000	Per Area	1	$2,000
Total Capital Cost Summary (Unique to All Alternative M-5)					
Summary of Direct Capital Costs (Unique to Alternative M-5)					**$3,037,467**

Table E - 66 Summary of Direct Capital Costs Common to all Mine Rock Alternatives

Direct Capital Costs - Common to All Alternatives					
Sheet #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Construction Equipment					
1	Mobilization of Equipment to Site	$9,000	LS	1	$9,000
1	Demobilization of Equipment to Site	$9,000	LS	1	$9,000
Removal of Waste Rock in Dock Areas					
2	Removal of Ore Rock from Intertidal Zone	$16,000	LS	1	$16,000
Temporary Construction of Dock					
3	Dock Engineering, Construction, and Removal	$45,500	LS	1	$45,500
Road Work Construction					
3	Road Improvements (includes turnouts, regrading, widening for all roads)	$79,625	LS	1	$79,625
Miscellaneous Wastes and Debris Removal Offsite					
4	Earthwork and Soil Removal Oversight/Construction	$44,100	LS	1	$44,100
4	Barge Mobilization/Demobilization	$18,000	LS	1	$18,000
4	Solid Waste Disposal Costs (accepted waste)	$54,216	LS	1	$54,216
4	Solid Waste Disposal Costs (vehicles)	$10,000	LS	1	$10,000
Miscellaneous Items					
2	Miscellaneous	$176,917	LS	1	$176,917
Summary of Direct Capital Costs (Common to All Alternatives)					**$462,358**
Additional Direct Capital Costs					
Total Direct Capital Costs for Alternative M-5 w/ On-Site Material					**$3,499,825**

Table E - 67 Indirect Cost Summary for Mine Rock Alternative M-5

Capital Indirect Cost Summary					
Item #	***Item***	***Unit Cost***	***Units***	***Quantity***	***Cost (2014 dollars)***
	Additional Indirect Capital Costs	**Scenario:**			**On-site Material**
		Scenario Capital Cost:			**$3,894,864**
1	Engineering Design	DC	%	10	$389,486
2	Permitting	$125,000	LS	1	$125,000
3	Regulatory Compliance	DC	%	4	$155,795
4	Construction QA and Management	DC	%	8	$311,589
5	Owners Management	DC	%	15	$584,230
6	Direct Capital Cost Contingency	DC	%	20	$778,973
Total Capital Indirect Costs:					**$2,345,072**

Additional Indirect Cost Assumptions
"Engineering Design" is assumed to be 10% of total capital cost. This is includes engineering design, civil drawings, and project management. This is a typical value used for mine reclamation projects.
"Permitting" is assumed to be a lump sum of $25,000. This cost includes future permits required for construction at the Site. This is a typical amount estimated for this type of mine reclamation project."
"Regulatory Compliance" is assumed to be 4% of the total capital cost. This is a typical value used for mine reclamation projects.
"Construction QA and Management" is assumed to be 8% of total direct capital cost. This is a typical value used for mine reclamation projects.
"Owners Management" is assumed to be 15% of the total direct capital cost. This is a typical value used for mine reclamation projects.
"Direct Capital Cost Contingency" is assumed to be 20% of total capital cost. This allows for unforeseen or unknown events that may occur during the lifetime of the project

Table E - 68 Annual Monitoring and Maintenance (M&M) Cost Summary for Mine Rock Alternative M-5

	Item	Unit Cost	Units	Quantity	Cost
Annual M&M Costs					
Annual Inspection and Maintenance (Years 1-3)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$4,100	Trip	1	$4,100
	Maintenance				
	Maintenance Equipment Mobilization	$9,000	Trip	1	$9,000
	Annual Maintenance Allowance (Per Area)	$2,000	Area	1	$2,000
	Subtotal Inspection and Maintenance Costs				**$20,700**
	Contingency		%	25	$5,175
	Subtotal				$25,875
Present Worth M&M (Years 1,2 and 3)					**$71,942**
	Item	**Unit Cost**	**Units**	**Quantity**	**Cost**
Future M&M Costs					
Annual Inspection and Maintenance (Years 5,10,15,20,25,30)					
	Mobilization to Site (Personnel)				
	Mobilization/Demobilization Per Site Visit	$3,800	LS	1	$3,800
	Annual Inspection				
	Project Management/Coordination	$150	HR	12	$1,800
	Field Labor/Field Supplies	$4,100	Trip	1	$4,100
	Maintenance				
	Maintenance Equipment Mobilization	$3,500	Trip	1	$3,500
	Annual Maintenance Allowance (Per Area)	$2,000	Area	1	$2,000
	Subtotal Inspection and Maintenance Costs				$15,200
	Contingency		%	25	$3,800
	Subtotal				$19,000
Present Worth M&M (Years 5,10,15,20,25, and 30)					**$61,525**
Present Worth M&M Costs					**$133,467**

Table E - 69 Cost Details for Annual Monitoring and Maintenance (M&M) for Mine Rock Alternative M-5

Required Crews		
Crew Type	**# of Crew**	**Days**
USFS Field Crew	2	2
Areas	1	

M&M Mobilization Cost Details for Alternative M-5									
Mobilization for Inspection Crew									
Floatplane to Site (per person, RT)	$750	Per Person	2	Roundtrip	2	$3,000	LS	1	$3,000
Hotel in Ketchikan	$200	Per Person	2	Per Night	2	$800	LS	1	$800
Total for Mobilization Costs Per Annual Inspection									**$3,800**
M&M Labor Cost Details for Alternative M-5									
Annual Inspection Labor and Equipment Costs									
Travel Time	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time On Site (8 hour fixed)	$100	Per Person	2	Hours	8	$1,600	LS	1	$1,600
Time at Site (2 hours per Area)	$100	Per Person	2	2 Hours Per Area	2	$400	LS	1	$400
Equipment Costs (field supplies)	$500	Per Trip	1	-	1	$500	LS	1	$500
Total for Mobilization Costs Per Annual Inspection									**$4,100**
M&M Assumptions for Alternative									
Annual inspections by 2 USFS employees (assume $1000 per person, per day) for first three years (year 1, 2, 3) and every five years after until 30 years (years 5, 10, 15, 20, 25, and 30); this assumes a roundtrip flight for each day and lodging in Ketchikan									
Maintenance Equipment Mobilization on Annual M&M Cost Summary Table is assumed to be $9,000 per trip for year 1 through year 3; and $3,500 per trip for years 5, 10, 15, 20, 25, and 30; this assumes that heavy equipment mobilization may be required during the first three annual allowances ($9,000 RT barge with loading/unloading labor included); the $3,500 during the future visits (years 5, 10, 15, 20, 25, and 30) allows for unexpected costs during the future five-year visits									
Area includes Open Pit									
Minor maintenance (cover, signs, etc.) is $2000 per year, per area									
Labor for inspection assumes 8 hours for travel, 8 hours onsite, and 2 hours additional per area									

Table E - 70 Engineering Economic Analysis Details for Mine Rock Alternative M-5

Economic Analysis for Present Worth of M&M (Years 1,2 and 3)								
Discount Rate	i	0.039						
Years	n	3						
Annual Cost	F	$25,875						
								Total Present Worth M&M (3 years)
Present Worth	P	$71,942						$71,942
Economic Analysis for Present Worth of M&M (Years 5-30)								
Discount Rate	i	0.039	0.039	0.039	0.039	0.039	0.039	
Years	n	5	10	15	20	25	30	
Annual Cost	F	$19,000	$19,000	$19,000	$19,000	$19,000	$19,000	
								Total Present Worth M&M (30 years)
Present Worth	P	$15,692	@12,960	$10,703	$8,840	$7,301	$6,030	$61,525

Table E - 71 Summary of Cost Estimate for Mine Rock Alternative M-5

Item	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$780,785	LS	1	$827,633
Radiation Safety, Decon and Monitoring	$366,446	LS	1	$388,433
Site Preparation	$105,200	LS	1	$111,512
Common Elements	$462,358	LS	1	$490,100
Cover Material	$141,775	LS	1	$150,282
Excavate to Open Pit and Cover	$1,636,260	LS	1	$1,734,435
Institutional Controls	$7,000	LS	1	$7,000
SUBTOTAL DIRECT CAPITAL COST				**$3,709,394**
Stormwater, Erosion, and Dust Controls		**%**	**5%**	**$185,470**
TOTAL DIRECT CAPITAL COST				**$3,894,864**
INDIRECT CAPITAL COSTS				
Engineering Design		**%**	10%	$389,486
Permitting	$125,000	LS	1	$125,000
Regulatory Compliance		**%**	4%	$155,795
Construction QA and Management		**%**	8%	$311,589
Owners Management		**%**	15%	$584,230
Direct Capital Cost Contingency		**%**	20%	$778,973
TOTAL INDIRECT CAPITAL COST				**$2,345,072**
TOTAL CAPITAL COST (Indirect + Direct)				$6,239,936
Monitoring and Maintenance Present Worth (30 year)				$133,467
Total Project Cost				**$6,373,403**

Note: A discount rate of 3.9% was used in the engineering economic analysis. Unit costs are in 2011 dollars and construction related costs have been adjusted to 2014 using historical cost indices (RSMeans, 2014).

Table E - 72 On-Site Cover Material Cost Details and Assumptions for Mine Rock Alternative M-5

Cover Material Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
On-Site Cover Material Costs	$11.10	cy	11615	$141,775
Cover Material Assumptions				
On-site material cost is based on estimate for 2" screening plant rates, and required equipment and quantities				
Off-site materials assumed to be $70 per cubic yard, based on tech memo's highest rate to be conservative				

Table E - 73 Mobilization Cost Details for Mine Rock Alternative M-5 - Earthwork Crew

Required Crews Alternative M-5		
Crew Type	**# of Crew**	**Days**
Earthwork Crew	7	255
Engineering Support	1	255
Radiation Support	1	255

Mobilization Cost Details for Alternative M-5									
Lodging / Travel Labor for Earthwork Crew									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	7	Per day, assume 3	**3**	$4,200	LS	1	$4,200
Lodging at island (estimate per person/night)	$250	Per Person	7	Per night	255	$445,888	LS	1	$445,888
Travel Time	$25	Per Person	7	Per hour, assume 16	**16**	$2,800	LS	1	$2,800
Mobilization for Earthwork Crew									
Floatplane to Site (per person, RT)	$750	Per Person	7	Roundtrip	1	$5,250	LS	1	$5,250
								Total for Earthwork	**$458,138**

Table E - 74 Mobilization Cost Details for Mine Rock Alternative M-5 - Engineering Crew

Lodging / Travel Labor for Engineer									
Item	***Unit Cost***	***Adjusted Details 1 Unit***	***Detail 1 Multiplier***	***Adjusted Details 2 Unit***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per day, assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	255	$63,698	LS	1	$63,698
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Labor While At Site for Engineering									
Field Engineer Labor	$100	Per Person	1	Per Hour	10	$1,000	Days	255	$254,793
Mobilization for Engineering									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	1	Roundtrip	1	$456	LS	1	$456
Floatplane to Site (per person, RT)	$750	Per Person	1	One way	2	$1,500	LS	1	$1,500
Contingency	$750	Per Person	1	One way	0	$0	LS	1	$0
Sub-total						**Total for Engineers**			**$322,647**

Table E - 75 Mobilization Cost Details for Mine Rock Alternative M-5 - Radiation Support Crew

Lodging / Travel Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Hotel in Ketchikan (adverse weather)	$200	Per Person	1	Per night assume 3	**3**	$600	LS	1	$600
Lodging at island (estimate per person/night)	$250	Per Person	1	Per night	255	$63,698	LS	1	$63,698
Travel Time	$100	Per Person	1	Per hour, assume 16	**16**	$1,600	LS	1	$1,600
Equipment Rentals and Labor for Radiation Support									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Radiation Technician Labor	$100	Per Person	1	Per day	255	$25,479	hours	10	$254,793
Senior Staff	$185	Per Person	1	Per Hour	40	$7,400	LS	1	$7,400
RAD Equipment for Backpack Systems	$500	Per Week	36	Per night	1	$18,200	LS	1	$18,200
Misc. RAD Equipment	$500	Per Day	36	Per hour, assume 16	**1**	$18,200	LS	1	$18,200
Mobilization for Radiation Support									
RT flight to Ketchikan (engineers from CO)	$456	Per Person	1	n/a	1	$456	LS	1	$456
Floatplane to Site (per person, RT)	$750	Per Person	1	Roundtrip	2	$1,500	LS	1	$1,500
Sub-total						**Total for Radiation**			**$366,446**

Table E - 76 Mobilization and Labor Assumptions for Mine Rock Alternative M-5

Mobilization Assumptions for Alternative M-5
Field crews include Earthwork, Engineering, Radiation
Assume for all field crew need 3 nights in Ketchikan hotel due to adverse weather conditions
Assume for all field crew need 16 hours travel time, average travel time for every person
Lodging on island based on last year cost for Bulldog (60k for ~14 days) and Crane (~$2500 per night for 6 people); Includes Food, Lodging, Laundry etc.
Flights for engineering and radiation support are from Denver RT ; Prices from kayak.com for summer months; Earthwork crew is assumed to be local
Floatplane for field personnel costs $750 per person per direction
Travel time assumes roundtrip for each individual at 16 hours, delays due to weather, airlines, etc. travel to Site
Labor at Site for field engineer and radiation support included; Earthwork Crew hours included in construction costs
Assume 1 person would be responsible for all radiation protection measurements and guidance, including decontamination of vehicles/equipment prior to demobilization
Responsibilities include providing radiation protection support for field engineers, scientists, laborers, field operators, equipment demobilization/mobilization
Tasks include swipe testing of field equipment, supplies, personnel, anything to be removed off-site
Tasks include GM-Probe testing of field equipment, supplies, personnel, anything to be removed off-site
Tasks include taking notes and writing reports, data collection, equipment calibration checks, source checks, decontamination guidance
Report writing for completion reports summarizing daily tasks and equipment checks
Assume the field engineer labor rate is $100 per hour and radiation technicians are $100 per hour
Assume senior staffs purpose is to develop a RAD Safety training program, ~ 16 hours AND Site Visit 24 hours
Assume field technicians will be working 12 hours a day
Misc. RAD equipment includes alpha and beta counters necessary for vehicle and personnel scans; also includes extra backpack systems
Radiation crew would be responsible for guiding remedial efforts during the day, and scanning people off site every day

Table E - 77 Earthwork Details for Mine Rock Alternative M-5

Area	Material to Excavate and Haul (cy)	Excavation and Hauling Rate (cy/day)	Days	Cover Material Required (cy)	Hauling Rate (cy/day)	Days	Placing Cover Material (cy)	Rate (cy/day)	Days	Total Days
From On-Site Stockpile to Staging Area	11,615	1267	9.2	n/a						9.2
300-Foot Level to Open Pit	28,854	294	98	n/a						98.1
700-Foot Level to Open Pit	8,091	380	21	n/a						21.3
Mine Road 700-900 Embankments to Open Pit	3,025	845	4	n/a						3.6
900-Foot Level to Open Pit	10,111	845	12	n/a						12.0
OSA to Open Pit	7,500	404	18.6	n/a						18.6
Open Pit Consolidation/Cover				8,561	404	21.2	8,561	800	10.7	31.9
Road OSA-300 to Open Pit	1,600	404	4.0	1,600	404	4.0	1,600	800	2.0	9.9
Road 300-900 to Open Pit	1,454	404	3.6	1,454	404	3.6	1,454	800	1.8	9.0
I&L Spur to Open Pit	1,200	845	1.4	n/a						1.4
Subtotal	32981	**Subtotal**	64		**Subtotal**	28.8		**Subtotal**	15	
									Total	206

Alternative M-5 Earthwork Assumptions
Cover material will be required at Open Pit, and Mine Haul Roads (excluding 700/900)
Placement of Cover Material: Assume 300 HP @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day
Stabilize/In-pile Grading and Excavating: Assume 300 HP (D7R-II Dozer) @ 150' Haul for Common Earth (2007 Means) @ 800 cy/day
Assume cover of Haul Road segments is 1-foot after excavation of material
Assume work days are 10 hours
Assume an earthwork crew consists of 2 excavator (345/315) 2 trucks (A25 Volvo), D-7R Dozer, 980 Front End Loader
Placing Cover Material: Assume same rate as excavation using front loader and excavator
ALL Hauling Rates are based on average speeds and distances from each segment of road and assuming 20 cy (Volvo A40D) trucks

Table E - 77 Earthwork Details for Mine Rock Alternative M-5 (cont'd)

Excavated OSA and Consolidate into Open Pit					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	19	$32,488
Cat 315 Excavator with Thumb	$115	$1,150	day	19	$21,349
A25 Volvo Articulated Dump Truck	$100	$1,000	day	19	$18,564
A25 Volvo Articulated Dump Truck	$100	$1,000	day	19	$18,564
D-7R Dozer with Winch	$175	$1,750	day	9	$16,244
980 Front End Loader	$145	$1,450	day	9	$13,459
Excavate and Haul 7500 cy					
Sub-total					$120,668
900-Foot Level- Excavate and Consolidate into Open Pit (N and S)					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	12	$20,940
Cat 315 Excavator with Thumb	$115	$1,150	day	12	$13,761
A25 Volvo Articulated Dump Truck	$100	$1,000	day	12	$11,966
A25 Volvo Articulated Dump Truck	$100	$1,000	day	12	$11,966
D-7R Dozer with Winch	$175	$1,750	day	6	$10,470
980 Front End Loader	$145	$1,450	day	6	$8,675
Excavate and Haul 10,111 cy					
Sub-total					$77,777
Open Pit - Consolidate and Cover					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	32	$55,811
Cat 315 Excavator with Thumb	$115	$1,150	day	32	$36,676
A25 Volvo Articulated Dump Truck	$100	$1,000	day	32	$31,892
A25 Volvo Articulated Dump Truck	$100	$1,000	day	32	$31,892
D-7R Dozer with Winch	$175	$1,750	day	16	$27,905
980 Front End Loader	$145	$1,450	day	16	$23,122
Stabilize 1660 cy					
Haul & Cover 2724 cy					
Sub-total					$207,297

Table E - 77 Earthwork Details for Mine Rock Alternative M-5 (cont'd)

300-Foot Level- Excavate and Consolidate into Open Pit					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	98	$171,750
Cat 315 Excavator with Thumb	$115	$1,150	day	98	$112,864
A25 Volvo Articulated Dump Truck	$100	$1,000	day	98	$98,143
A25 Volvo Articulated Dump Truck	$100	$1,000	day	98	$98,143
D-7R Dozer with Winch	$175	$1,750	day	49	$85,875
980 Front End Loader	$145	$1,450	day	49	$71,154
Haul & Cover 7499 cy					
Sub-total					$637,929

Haul Roads (OSA to 300-ft & 300 ft to 900 ft segments) Excavate to Open Pit					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	19	$33,139
Cat 315 Excavator with Thumb	$115	$1,150	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	19	$18,936
D-7R Dozer with Winch	$175	$1,750	day		$0
980 Front End Loader	$145	$1,450	day	19	$27,458
All Haul Roads					
Excavate and Haul 3054 cy					
Haul & Cover 3054 cy					
Sub-total					$79,533

Table E - 77 Earthwork Details for Mine Rock Alternative M-5 (cont'd)

700-Foot Level- Excavate and Consolidate into Open Pit (includes WR Embankments)					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	25	$43,526
Cat 315 Excavator with Thumb	$115	$1,150	day	25	$28,603
A25 Volvo Articulated Dump Truck	$100	$1,000	day	25	$24,872
A25 Volvo Articulated Dump Truck	$100	$1,000	day	25	$24,872
D-7R Dozer with Winch	$175	$1,750	day	12	$21,763
980 Front End Loader	$145	$1,450	day	12	$18,032
Excavate & Haul 8091 cy (700-ft)					
Excavate & Haul 3025 cy (Embankments)					
Sub-total					$161,668

I&L Haul Road- Excavate and Haul to Open Pit					
Item	***Unit Cost***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Cat 345 Excavator with Thumb	$175	$1,750	day	1	$2,485
Cat 315 Excavator with Thumb	$115	$1,150	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day		$0
A25 Volvo Articulated Dump Truck	$100	$1,000	day	3	$3,000
D-7R Dozer with Winch	$175	$1,750	day		$0
980 Front End Loader	$145	$1,450	day	3	$4,350
All Haul Roads					
Excavate & Haul 1200 cy					
Sub-total					$9,835

Table E - 78 Cost Estimate and Assumptions of Stormwater Control Quantities for Mine Rock Alternative M-5

Alternative M-5 Cost Estimate for Stormwater Control Quantities					
Design Feature	***300-Foot Level***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rip Rap Volume (cy)	444	$10.43	cy	444	$4,629
Geotextile (sy)	667	$1.05	sy	281	$295
			Subtotal for Alternative 5 Stormwater Controls		**$4,924**

Stormwater Control Quantities Assumptions
Assumptions: 2' thick throughout channel and 2' vertical up WRD embankment, D_{50} of 12", geotextile along upstream face only unit weight of 1.75 tons/cy, geotextile along bottom of rock, allowing water to flow freely over WRD but protecting open pit.
Geotextile unit cost price includes installation and delivery; rip-rap unit cost price includes installation and material costs.
Geotextile will be placed beneath the rip-rap to maintain separation between the rip-rap and underlying rock/soil. The geotextile will be used in the stream channel to avoid scour and migration of rock/soils into the rip-rap.
Pricing information from usfabricsinc.com comes in (15' x 300') 500 sy rolls @ $1.05/sy for US 205 Non-woven Geotextile; http://www.usfabricsinc.com/products/us-205nw.
Stormwater Control Quantities estimated per area, per alternative by Caleb Stock for stream rip-rap and stabilization.
Rip-rap assumed to come from on-site material, based on estimates from SE Roadbuilders' quotes.

Table E - 79 Cost Estimate Details and Assumptions for Vegetation Removal and Reclamation for Mine Rock Alternative M-5

Vegetation Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
D-7R Dozer with Winch	$175	hr	180	$31,500
Cat 315 Excavator with Thumb	$115	hr	180	$20,700
A25 Volvo Articulated Dump Truck	$100	hr	180	$18,000
			Subtotals Vegetation Removal	**$70,200**
Vegetation Removal Assumptions				
Assume 18 work days with a dozer, excavator, and dump truck for all vegetation removal;				
Reclamation/Revegetation				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
900-Foot Level	$20,000	LS	1	$20,000
700-Foot Level	$20,000	LS	1	$20,000
OSA	$20,000	LS	1	$20,000
			Subtotals Reclamation and Revegetation	**$60,000**
Reclamation and Revegetation Assumptions				
Assume $20,000 per area for vegetation and reclamation of areas which mine rock is removed.				
Assume the cost includes reclamation/revegetation of areas disturbed during construction				

Table E - 80 Cost Estimate Details and Assumptions for Rock Armor for Mine Rock Alternative M-5

Alternative M-5 Cost Estimate for Rock Armor Quantities (Stabilized in Place)					
Design Feature	***Open Pit***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Rock Mulch (cy)		$10.43	cy	2,140	$22,309.50
			Subtotal for Open Pit Rock Armor		**$22,309.50**
Rock Armor Assumptions					
Rock armor assumed to come from on-site material, based on estimates from SE Roadbuilders quotes					
Rock mulch quantities estimated by geotechnical engineer,					
Assuming 800 cy per day is possible to move ; total days is 3 days					

Table E - 81 Mobilization Cost Details and Assumptions for Mine Rock Alternative M-5

Mobilization Cost Details				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization				
Barge from Ketchikan to Site (includes return trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
De- Mobilization				
Barge from Ketchikan to Site (includes return trip)	$375	hr	16	$6,000
Loading/Unloading	$375	hr	8	$3,000
		Subtotals	**Mobilization**	**$9,000**
Mobilization Assumptions				
Assume barge would be able to take ALL required rental equipment, there is a 1200 ton, 1500 ton, and 3000 ton Barge available for the same pricing				
Price of every size barge is $375/hour; trip to Site and back is 16 hours				
Cost includes loading and unloading for equipment operators				
Costs are based on discussions with Olsen Marine Inc., out of Ketchikan, AK				

Table E - 82 Miscellaneous Cost Details and Assumptions for Mine Rock Alternative M-5

Miscellaneous Costs				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Portable Toilet (4)	$400	Day	255	$101,917
Kubota (2 purchased)	$18,000	LS	2	$36,000
Field Pickup (2 purchased)	$10,000	LS	2	$20,000
Miscellaneous Engineering Equipment	$10,000	LS	1	$10,000
Barge for Misc. Equipment	$9,000	RT	1	$9,000
			Subtotals of Miscellaneous Costs	**$176,917**
Assumptions				
Assume 2 Kubotas purchased				
Assume 2 used pickups at $10,000 each will be purchased				
Assume additional round trip barge required for additional supplies; $9,000 RT with loading/unloading as a contingency in the event that additional equipment is needed or equipment needs replacement				
Dock Removal				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Miscellaneous Costs				
Field Labor Removal	$100	cy	80	$8,000
Move to OSA	$100	cy	80	$8,000
			Subtotals of Miscellaneous Costs	**$16,000**
Assumptions				
Assume dock area will be remediated by field laborer, at 5 cy per hour, @ $100				
Same cost for moving to OSA				

Table E - 83 Road and Dock Work Cost Details and Assumptions for Mine Rock Alternative M-5

Road Construction Cost Estimates					
Road Reconstruction Segment	***Days***	**Unit Cost**	***Units***	**Quantity**	***Cost***
Field Engineer	14	100	hr	140	14,000
Cat 315 Excavator with Thumb	14	115	hr	140	16,100
D-7R Dozer with Winch	14	175	hr	140	24,500
A25 Volvo Articulated Dump Truck	14	100	hr	140	14,000
Volume of Fill		2	cy	4,500	11,025
Subtotal for Road Construction Cost Estimate					**79,625**
Dock Ramp Construction Estimate					
Road Reconstruction Segment		**Unit Cost**	***Units***	**Quantity**	***Cost***
Construction of Barge Landing		35,000	LS	1	35,000
Engineering Design		10%	%	1	3,500
Permitting		10%	%	1	3,500
Deconstruction of Barge		10%	%	1	3,500
Subtotal for Dock Ramp Construction					**45,500**
Road Assumptions					
Assume material quantities are based on half of the roads requiring construction at 1-foot thickness, and imported onsite.					
Assume 14 days of road construction at 10 hour days, using engineer, excavator, dozer, and truck.					
Assume hourly cost as specified in rental equipment.					
Onsite material based on quantities of each piece of equipment per day removing onsite material.					
Volume of fill is based on prices for one hour and quantities/rates of equipment. $2.45/cy					
Dock Assumptions					
Dock is minimum $35,000 for construction for increased traffic; based on estimate from KRM					
Assume 10% for permitting and engineering design.					
Assume 10% for dock deconstruction.					

Table E - 84 Solid Waste and Debris s Costs Details and Assumptions for Mine Rock Alternative M-5

Solid Waste and Debris Removal Cost Details									
Solid Waste Removal Oversight/Construction									
Item	***Unit Cost***	***Adjusted Details 1***	***Detail 1 Multiplier***	***Adjusted Details 2***	***Detail 2 Multiplier***	***Adjusted Unit Cost***	***Units***	***Quantity***	***Cost***
Oversight of Solid Waste Removal (engineer)	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
Cat 315 Excavator with Thumb	$115	Per Hour	10	Per Day	14	$16,100	LS	1	$16,100
A25 Volvo Articulated Dump Truck	$100	Per Hour	10	Per Day	14	$14,000	LS	1	$14,000
								Sub-total	$44,100
Barge Mobilization/Demobilization									
Barge Mobilization/Demobilization	$9,000	Roundtrip	1	# of Barges	2	$18,000	LS	1	$18,000
								Sub-total	$18,000
Solid and Hazardous Waste Disposal Costs for Acceptable Material									
Landfill Costs / Hazardous Waste	$300	Per Ton	47	n/a	1	$14,216	LS	1	$14,216
Secondary Containment	$10,000	LS	1	n/a	1	$10,000	LS	1	$10,000
Shipping Containers	$10,000	LS	3	n/a	1	$30,000	LS	1	$30,000
								Sub-total	$54,216
Solid Waste Disposal Costs for Scrap Metal at Junkyard									
Scrap Metal Costs	$2,000	Per Vehicle	5	n/a	1	$10,000	LS	1	$10,000
								Sub-total	$10,000
								Total	**$126,316**

Solid Waste Assumptions
Assume oversight of removal is performed by engineer familiar with clean-up plan, ($100 per hour, 10 hour days)
Assume haul truck and excavator for removal of all solid waste debris
Assume hazardous waste tipping fee is $300/ton based on typical tipping fees in California
Assume 14 days for all solid waste to be removed
Assume barge is $9000 per trip, RT is assumed from Ketchikan to Kendrick Bay; assume 2 barges required one for equipment and one for wastes
Total weight of solid waste is estimated in spreadsheet based on EPA typical densities of various wastes source: *http://www.epa.vic.gov.au/bus/erep/docs/wastematerials-densities-data.pdf*

Table E - 85 On-Site Cover Materials Cost Details for Mine Rock Alternative M-5

On-Site Cover Material Production								
Quantity of 2–inch Material Required (cy)		***Rate (cy/hr)***	***Days (10 hr)***		***Quantity of 6-inch Required***		***Rate (cy/hr)***	***Days (10 hr)***
11615		40	29.0		2584		40	6.5
2-inch Cover Material Production Costs					**6-inch Cover Material Production Costs**				
	Unit Cost	***Units***	***Quantity***	***Cost***		***Unit Cost***	***Units***	***Quantity***	***Cost***
Screening Plant	$670	Day	29.0	$19,455	Screening Plant	$670	Day	6.5	$4,328
Cat 315 Excavator with Thumb	$1,750	Day	29.0	$50,816	Cat 315 Excavator with Thumb	$1,750	Day	6.5	$11,305
Cat 315 Excavator with Thumb	$1,750	Day	29.0	$50,816	Cat 315 Excavator with Thumb	$1,750	Day	6.5	$11,305
Haul Road Construction	$7,800	LS	1.0	$7,800					
			Total Cost	$128,886				**Total Cost**	$26,938
On-site 2-inch Cover Material Unit Rate					**On-site 6-inch Material Unit Rate**			
Estimated Quantity of Material (cy)	***Total Cost***	***Units***	***Unit Rate***		***Estimated Quantity of Material (cy)***	***Total Cost***	***Units***	***Unit Rate***
11615	$128,886	cy	**$11.10**		2584	$26,938	cy	**$10.43**

On-Site Material Assumptions
Screening Plant assumed to be $20,000/month or ~$670/per day SE Roadbuilder Estimate
Assume bull dozer, haul truck, and excavator for 2 days is assumed for cost of access road
Assume 2 additional excavators will be required to work with Screening Plan all day
Access road construction assumed to consist of an excavator and a bull dozer for two days
Assumption for cover material is from SE Road Builders estimate assumes 2" material @ 40 cy/hr
Assumption from SE Road Builders estimate assumes 6" material @ 40 cy/hr
Total required volume of 2" cover material is estimated based on required quantities of cover materials for alternative, unit cost of cover material is dependent on quantity
Total required volume of 6" rip rap is based on total amount of rock armor and rip rap required per the alternative; unit cost of rip rap/rock armor is dependent on quantity
Assume access road to stock pile area in intertidal area will cost $7800

Table E - 86 Total Estimated Days for Mine Rock Alternative M-5

Event	Estimated Time (days)
Excavate, Place in On-site Repository	206
Solid Waste Removal	14
Road Construction	14
Vegetation Removal	18
Rock Armor Placement	3
Total Days	255

COST ESTIMATE DETAILS FOR

Portal Alternative P-2: **Close Upper Mine Openings and Gate at 300-Foot Level Portal**

Table E - 87 Direct Capital Cost Details for Portal Alternative P-2

Direct Capital Costs for Portal Alternative P-2					
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Portal Crew					
	Roundtrip Flight to Ketchikan	$1,075	PP	6	$6,450
	Floatplane to Kendrick Bay from Ketchikan	$1,500	PP	6	$9,000
Lodging, Travel, and Labor for Radiation Crew					
	Hotel in Ketchikan (adverse weather) for Radiation Crew	$100	PN	6	$600
	Lodging at Kendrick Bay for Radiation Crew	$250	PN	30	$7,500
	Travel Time for Radiation Crew	$100	PH	16	$1,600
	Labor Costs for Radiation Work	$100	PH	300	$30,000
Lodging and Travel for Portal Crew					
	Hotel in Ketchikan (adverse weather) for Portal Crew	$600	PN	6	$3,600
	Lodging at Kendrick Bay for Portal Crew	$3,000	PN	30	$90,000
	Travel Time for Portal Crew	$600	PH	16	$9,600
300-Foot Level Portal Closure - Steel Gate					
	Steel	$5,385	LS	1	$5,385
	Equipment Rental	$1,000	LS	1	$1,000
	Labor Costs	$9,200	LS	1	$9,200
	Sediment Controls during gate installation	$10,000	LS	1	$10,000
Closure of Upper Mine Openings					
	700-Foot Level Concrete Bulk Head half height	$18,425	LS	1	$18,425
	900-Foot Level Concrete Bulkhead Plug, full height	$59,725	LS	1	$59,725
	Associated Direct Costs	$130,000	LS	1	$130,000
	Closure of Air Shaft	$20,000	LS	1	$20,000
Institutional Controls					
	Signage Restricting Access to 300-Foot Level Portal	$5,000	LS	1	$5,000
Summary of Direct Capital Costs (Common to All Alternatives)					**$417,085**

Table E - 88 Indirect Capital Cost Details for Portal Alternative P-2

Indirect Capital Costs for Portal Alternative P-2				
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Indirect Capital Cost Items				
Engineering Design		%	10	$41,709
Regulatory Compliance		%	4	$16,683
Construction QA and Monitoring		%	8	$33,367
Owner's Management		%	15	$62,563
Direct Capital Cost Contingency		%	20	$83,417
			Subtotal of In Direct Capital Costs	**$237,738**
Summary of Total Capital Costs for Alternative P-2				**$654,823**

Table E - 89 Annual Monitoring and Maintenance (M&M) Costs for Portal Alternative P-2

Annual M&M Costs for Portal Alternative P-2				
Annual Portal Maintenance and Inspection				**Present Worth Cost**
Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Inspections Included in Mine Rock Alternatives	$1,000	Portal	4	$24,074
Maintenance Allowance (Years 1-3 , 5, 10, 15, 20, 25, 30)				
Subtotal Inspection and Maintenance Costs				**$ $24,074**
Contingency	$$24,074	%	25%	$6,019
TOTAL ANNUAL M&M Cost				**$30,093**
Total Present Worth for Portal Alternative P-2				**$684,916**

Table E - 90 Cost Estimate Summary for Portal Alternative P-2

	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$118,650	LS	1	$125,769
Radiation Safety, Decon and Monitoring	$39,700	LS	1	$42,082
300-Foot Level Closure- Metal Gate	$25,585	LS	1	$27,120
Closure of Upper Mine Openings	$228,150	LS	1	$241,839
Institutional Controls	$5,000	LS	1	$5,000
TOTAL DIRECT CAPITAL COST				**$441,810**
INDIRECT CAPITAL COSTS				
Engineering Design		%	10	$44,181
Regulatory Compliance		%	4	$17,672
Construction QA and Monitoring		%	8	$35,345
Owner's Management		%	15	$66,272
Direct Capital Cost Contingency		%	20	$88,362
TOTAL INDIRECT CAPITAL COST				**$251,832**
TOTAL CAPITAL COST (Indirect + Direct)				**$693,642**
Monitoring and Maintenance Present Worth (30 year)				**$30,093**
Total Project Cost				**$723,735**

Note: A discount rate of 3.9% was used in the engineering economic analysis. Unit costs are in 2011 dollars and construction related costs have been adjusted to 2014 using historical cost indices (RSMeans, 2014).

Table E - 91 Portal Alternative P-2 Assumptions

Portal Crew Mobilization Assumptions
Portal Crew consists of 6 people; based on Frontier Environmental's detailed cost estimate (superintendent, geologist, operator, laborer (2), welder)
Portal crew will require roundtrip from continental US, for roundtrip airfare of $1,075
Floatplane round trip to Kendrick Bay to Ketchikan is $1500 per person
Portal Crew Lodging and Travel Assumptions
Assume portal crew will need 3 nights in Ketchikan hotel due to adverse weather conditions, ($600 per night for crew)
Assume portal crew will require 16 hours of travel time per person at $100 per hour
Lodging and food on island is $3,000 per night for Portal Crew (assuming $500 per person)
Assumes 30 days (Frontier Environmental's estimate) to complete all portal work
Portal Closure Assumptions
300-Foot Level Gate Installation based on cost estimate from MineGates (2/5/11) cost estimate; assumes fluctuation in steel prices
Institutional Controls are required to restrict access to 300-Foot Level Portal (assumed to be lump sum of $5000 maximum)
Sediment controls are required during gate installation; assume lump sum of $10,000
700' Level: Concrete Bulkhead half-height, 3-ft thick tied into native rock with 1" diameter rock bolts embeds to 18" depth minimum at 12"-spacing and tied-in to #6 bulkhead reinforcement bar. Top half with solid 3/16" steel sheet panel on 3"x3" angle iron grid/frame with 3' (w) x 4' (h) vented locking steel panel door with 3"x3" angle iron frame for access. Bottom of bulkhead equipped with 4" SS pipe and valve for drainage control.
900' Level: Full Height Concrete Bulkhead Plug, 5-ft thick tied into native rock with two runs 1" diameter rock bolts embeds to 18" depth minimum at 12"-spacing and tied-in to two runs of bulkhead #6 reinforcement bar, with 3' (w) x4' (h) vented locking steel panel door placed above ½-height.
Associated direct costs for Upper Mine Level closures is based on Frontier Environmental's detailed cost estimate (minus mobilization/lodging costs & costs associated with 700/900' closures labor costs, and contingency costs): total is ~$130,000
Closure of 900-Foot Level Airshaft assumed at lump sum of $20,000
Indirect Cost Assumptions
Assume 10% of capital cost engineering design
Assume 20% of capital cost for contingency and unlisted items
M&M Assumptions
Routine inspections to confirm stability of re-graded mine rock piles and stormwater controls, and any necessary maintenance are required for portals.
Assume mobilization of inspection crew is included in cost estimates for Mine Rock Alternative
Assume 25% of total annual M&M for contingency and unlisted costs
M&M for portal inspection and maintenance includes $1,000 per portal per annual visit (1,2,3,5,10,15,20,25 years)

COST ESTIMATE DETAILS FOR

Portal Alternative P-3: **Close Upper Mine Openings and Rock Backfill at 300-Foot Level Portal**

Table E - 92 Direct Capital Cost Details for Portal Alternative P-3

Direct Capital Costs for Portal Alternative P-3					
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Portal Crew					
	Roundtrip Flight to Ketchikan	$1,075	PP	6	$6,450
	Floatplane to Kendrick Bay from Ketchikan	$1,500	PP	6	$9,000
Lodging, Travel, and Labor for Radiation Crew					
	Hotel in Ketchikan (adverse weather) for Radiation Crew	$100	PN	6	$600
	Lodging at Kendrick Bay for Radiation Crew	$250	PN	30	$7,500
	Travel Time for Radiation Crew	$100	PH	16	$1,600
	Labor Costs for Radiation Work	$100	PH	300	$30,000
Lodging and Travel for Portal Crew					
	Hotel in Ketchikan (adverse weather) for Portal Crew	$600	PN	6	$3,600
	Lodging at Kendrick Bay for Portal Crew	$3,000	PN	30	$90,000
	Travel Time for Portal Crew	$600	PH	16	$9,600
300-Foot Level Portal Closure - Rock Backfill					
	Rock Backfill Labor Costs	$8,250	LS	1	$8,250
	Sediment Controls during gate installation	$10,000	LS	1	$10,000
Water Collection System at 300-Foot Level Portal					
	Pipe Material	$4	LF	200	$800
	Pipe Welding	$4	LF	200	$800
	Pipe Installation	$4	LF	200	$800
	Water Collection System	$20,000	LS	1	$20,000
Closure of Upper Mine Openings					
	700-Foot Level Concrete Bulk Head half height	$18,425	LS	1	$18,425
	900-Foot Level Concrete Bulkhead Plug, full height	$59,725	LS	1	$59,725
	Associated Direct Costs	$130,000	LS	1	$130,000
	Closure of Air Shaft	$20,000	LS	1	$20,000
Institutional Controls					
	Signage Restricting Access to 300-Foot Level Portal	$5,000	LS	1	$5,000
				Summary of Direct Capital Costs	**$432,150**

Table E - 93 Indirect Capital Cost Details for Portal Alternative P-3

Indirect Capital Costs for Portal Alternative P-3					
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Indirect Capital Cost Items					
	Engineering Design		%	10	$43,215
	Regulatory Compliance		%	4	$17,286
	Construction QA and Monitoring		%	8	$34,572
	Owner's Management		%	15	$64,823
	Direct Capital Cost Contingency		%	20	$86,430
				Subtotal of In Direct Capital Costs	**$246,326**
Summary of Total Capital Costs for Alternative P-3					**$678,476**

Table E - 94 Annual Monitoring and Maintenance (M&M) Costs for Portal Alternative P-3

Annual M&M Costs for Portal Alternative P-3					
Annual Portal Maintenance and Inspection					**Present Worth Cost**
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
	Inspections Included in Mine Rock Alternatives				
	Maintenance Allowance (Years 1-3 , 5, 10, 15, 20, 25, 30)	$1,000	Portal	4	$24,074
	Monitoring and Reporting (Years 1-3 , 5, 10, 15, 20, 25, 30)	$8,500	YR	1	$51,158
				Subtotal Inspection and Maintenance Costs	**$75,232**
	Contingency	$75,232	%	25%	$18,808
TOTAL ANNUAL M&M Cost					**$94,040**
Total Present Worth for Portal Alternative P-3					**$772,515**

Table E - 95 Cost Estimate Summary for Portal Alternative P-3

Item	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$118,650	LS	1	$125,769
Radiation Safety, Decon and Monitoring	$39,700	LS	1	$42,082
300-Foot Level Closure - Rock Backfill	$18,250	LS	1	$19,345
Closure of Upper Mine Openings	$228,150	LS	1	$241,839
300-Foot Level Portal Water Collection System	$22,400	LS	1	$23,744
Institutional Controls	$5,000	LS	1	$5,000
TOTAL DIRECT CAPITAL COST				**$457,779**
INDIRECT CAPITAL COSTS				
Engineering Design		%	10	$45,778
Regulatory Compliance		%	4	$18,311
Construction QA and Monitoring		%	8	$36,622
Owner's Management		%	15	$68,667
Direct Capital Cost Contingency		%	20	$91,556
TOTAL INDIRECT CAPITAL COST				**$260,934**
TOTAL CAPITAL COST (Indirect + Direct)				**$718,713**
Monitoring and Maintenance Present Worth (30 year)				**$94,040**
Total Project Cost				**$812,753**

Table E - 96 Portal Alternative P-3 Assumptions

Portal Crew Mobilization Assumptions
Portal Crew consists of 6 people; based on Frontier Environmental's detailed cost estimate (superintendent, geologist, operator, laborer (2), welder)
Portal crew will require roundtrip from continental US, for roundtrip airfare of $1,075
Floatplane round trip to Kendrick Bay to Ketchikan is $1,500 per person
Portal Crew Lodging and Travel Assumptions
Assume portal crew will need 3 nights in Ketchikan hotel due to adverse weather conditions, ($600 per night for crew)
Assume portal crew will require 16 hours of travel time per person at $100 per hour
Lodging and food on island is $3,000 per night for Portal Crew (assuming $500 per person)
Assumes 30 days (Frontier Environmental's estimate) to complete all portal work
Portal Closure Assumptions
300-Foot Level Portal Rock backfill based on cost estimate from Frontier Environmental cost estimate; ($8,250)
Institutional Controls are required to restrict access to 300-Foot Level Portal (assumed to be lump sum of $5000 maximum)
Sediment controls are required during gate installation; assume lump sum of $10,000
700' Level: Concrete Bulkhead half-height, 3-ft thick tied into native rock with 1" diameter rock bolts embeds to 18" depth minimum at 12"-spacing and tied-in to #6 bulkhead reinforcement bar. Top half with solid 3/16" steel sheet panel on 3"x3" angle iron grid/frame with 3' (w) x 4' (h) vented locking steel panel door with 3"x3" angle iron frame for access. Bottom of bulkhead equipped with 4" SS pipe and valve for drainage control.
900' Level: Full Height Concrete Bulkhead Plug, 5-ft thick tied into native rock with two runs 1" diameter rock bolts embeds to 18" depth minimum at 12"-spacing and tied-in to two runs of bulkhead #6 reinforcement bar, with 3' (w) x4' (h) vented locking steel panel door placed above ½-height.
Associated direct costs for Upper Mine Level closures is based on Frontier Environmental's detailed cost estimate (minus mobilization/lodging costs & costs associated with 700/900' closures labor costs, and contingency costs): total is ~$130,000
Closure of 900-Foot Level Airshaft assumed at lump sum of $20,000
Indirect Cost Assumptions
Assume 10% of capital cost engineering design
Assume 20% of capital cost for contingency and unlisted items
M&M Assumptions
Routine inspections to confirm stability of re-graded mine rock piles and stormwater controls, and any necessary maintenance are required for portals.
Assume mobilization of inspection crew is included in cost estimates for Mine Rock Alternative
Assume 25% of total annual M&M for contingency and unlisted costs
M&M for portal inspection and maintenance includes $1,000 per portal per annual visit (1, 2, 3, 5, 10, 15, 20, and 25 years)

COST ESTIMATE DETAILS FOR
Portal Alternative P-4: **Close Upper Mine Openings and Concrete Bulkhead at 300-Foot Level Portal**

Table E - 97 Direct Capital Cost Details for Portal Alternative P-4

Direct Capital Costs for Portal Alternative P-4					
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Mobilization/Demobilization of Portal Crew					
	Roundtrip Flight to Ketchikan	$1,075	PP	6	$6,450
	Floatplane to Kendrick Bay from Ketchikan	$1,500	PP	6	$9,000
Lodging, Travel, and Labor for Radiation Crew					
	Hotel in Ketchikan (adverse weather) for Radiation Crew	$100	PN	6	$600
	Lodging at Kendrick Bay for Radiation Crew	$250	PN	30	$7,500
	Travel Time for Radiation Crew	$100	PH	16	$1,600
	Labor Costs for Radiation Work	$100	PH	300	$30,000
Lodging and Travel for Portal Crew					
	Hotel in Ketchikan (adverse weather) for Portal Crew	$600	PN	6	$3,600
	Lodging at Kendrick Bay for Portal Crew	$3,000	PN	30	$90,000
	Travel Time for Portal Crew	$600	PH	16	$9,600
300-Foot Level Portal Closure - Concrete Bulkhead					
	Concrete Bulkhead Labor Costs	$39,075	LS	1	$39,075
	Sediment Controls during gate installation	$10,000	LS	1	$10,000
Water Collection System at 300-Foot Level Portal					
	Pipe Material	$4	LF	200	$800
	Pipe Welding	$4	LF	200	$800
	Pipe Installation	$4	LF	200	$800
	Water Collection System	$20,000	LS	1	$20,000
Closure of Upper Mine Openings					
	700-Foot Level Concrete Bulk Head half height	$18,425	LS	1	$18,425
	900-Foot Level Concrete Bulkhead Plug, full height	$59,725	LS	1	$59,725
	Associated Direct Costs	$130,000	LS	1	$130,000
	Closure of Air Shaft	$20,000	LS	1	$20,000
Institutional Controls					
	Signage Restricting Access to 300-Foot Level Portal	$5,000	LS	1	$5,000
				Summary of Direct Capital Costs	**$462,975**

Table E - 98 Indirect Capital Cost Details for Portal Alternative P-4

Indirect Capital Costs for Portal Alternative P-4					
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
Indirect Capital Cost Items					
	Engineering Design		%	10	$46,298
	Regulatory Compliance		%	4	$18,519
	Construction QA and Monitoring		%	8	$37,038
	Owner's Management		%	15	$69,446
	Direct Capital Cost Contingency		%	20	$92,595
Subtotal of In Direct Capital Costs					**$263,896**
Summary of Total Capital Costs for Alternative P-4					**$726,871**

Table E - 99 Annual Monitoring and Maintenance (M&M) Costs for Portal Alternative P-4

Annual M&M Costs					
Annual Portal Maintenance and Inspection					**Present Worth Cost**
	Item	***Unit Cost***	***Units***	***Quantity***	***Cost***
	Inspections Included in Mine Rock Alternatives				
	Maintenance Allowance (Years 1-3 , 5, 10, 15, 20, 25, 30)	$1,000	Portal	4	$24,074
	Monitoring and Reporting (Years 1-3 , 5, 10, 15, 20, 25, 30)	$8,500	YR	1	$51,158
Subtotal Inspection and Maintenance Costs					**$75,232**
	Contingency	$75,232	%	25%	$18,808
TOTAL ANNUAL M&M Cost					**$94,040**
Total Estimated Cost					**$820,910**

Table E - 100 Cost Estimate Summary for Portal Alternative P-4

Item	Unit Cost	Unit	Quantity	Cost (2014 dollars)
CAPITAL DIRECT COSTS				
Mobilization	$118,650	LS	1	$125,769
Radiation Safety, Decon and Monitoring	$39,700	LS	1	$42,082
300-Foot Level Closure- Concrete Bulkhead	$49,075	LS	1	$52,020
Closure of Upper Mine Openings	$228,150	LS	1	$241,839
300-Foot Level Portal Water Collection System	$22,400	LS	1	$23,744
Institutional Controls	$5,000	LS	1	$5,000
TOTAL DIRECT CAPITAL COST				**$490,454**
INDIRECT CAPITAL COSTS				
Engineering Design		%	10	$49,045
Regulatory Compliance		%	4	$19,618
Construction QA and Monitoring		%	8	$39,236
Owner's Management		%	15	$73,568
Direct Capital Cost Contingency		%	20	$98,091
TOTAL INDIRECT CAPITAL COST				**$279,558**
TOTAL CAPITAL COST (Indirect + Direct)				**$770,012**
Monitoring and Maintenance Present Worth (30 year)				**$94,040**
Total Project Cost				**$864,052**

Note: A discount rate of 3.9% was used in the engineering economic analysis. Unit costs are in 2011 dollars and construction related costs have been adjusted to 2014 using historical cost indices (RSMeans, 2014).

Table E - 101 Portal Alternative P-4 Assumptions

Portal Crew Mobilization Assumptions
Portal Crew consists of 6 people; based on Frontier Environmental's detailed cost estimate (superintendent, geologist, operator, laborer (2), welder)
Portal crew will require roundtrip from continental US, for roundtrip airfare of $1,075
Floatplane round trip to Kendrick Bay to Ketchikan is $1500 per person
Portal Crew Lodging and Travel Assumptions
Assume portal crew will need 3 nights in Ketchikan hotel due to adverse weather conditions, ($600 per night for crew)
Assume portal crew will require 16 hours of travel time per person at $100 per hour
Lodging and food on island is $3,000 per night for Portal Crew (assuming $500 per person)
Assume 30 days (Frontier Environmental's estimate) to complete all portal work
Portal Closure Assumptions
300-Foot Level Portal Rock backfill based on cost estimate from Frontier Environmental cost estimate; assuming mean price between 700 and 900 labor costs for half and full height bulk head (~$39,075)
Institutional Controls are required to restrict access to 300-Foot Level Portal (assumed to be lump sum of $5000 maximum)
Sediment controls are required during gate installation; assume lump sum of $10,000
700’ Level: Concrete Bulkhead half-height, 3-ft thick tied into native rock with 1” diameter rock bolts embeds to 18” depth minimum at 12”-spacing and tied-in to #6 bulkhead reinforcement bar. Top half with solid 3/16” steel sheet panel on 3”x3” angle iron grid/frame with 3’ (w) x 4’ (h) vented locking steel panel door with 3”x3” angle iron frame for access. Bottom of bulkhead equipped with 4” SS pipe and valve for drainage control.
900’ Level: Full Height Concrete Bulkhead Plug, 5-ft thick tied into native rock with two runs 1” diameter rock bolts embeds to 18” depth minimum at 12”-spacing and tied-in to two runs of bulkhead #6 reinforcement bar, with 3’ (w) x4’ (h) vented locking steel panel door placed above ½-height.
Associated direct costs for Upper Mine Level closures is based on Frontier Environmental’s detailed cost estimate (minus mobilization/lodging costs & costs associated with 700/900' closures labor costs, and contingency costs): total is ~$130,000
Closure of 900-Foot Level Airshaft assumed at lump sum of $20,000

Table E - 101 Portal Alternative 4 Assumptions (cont'd)

Indirect Cost Assumptions
Assume 10% of capital cost engineering design
Assume 20% of capital cost for contingency and unlisted items
M&M Assumptions
Routine inspections to confirm stability of regraded mine rock piles and stormwater controls, and any necessary maintenance are required for portals.
Assume mobilization of inspection crew is included in cost estimates for Mine Rock Alternative
Assume 25% of total annual M&M for contingency and unlisted costs
M&M for portal inspection and maintenance includes $1,000 per portal per annual visit (1, 2, 3, 5, 10, 15, 20, and 25 years)