Attachments

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ATTACHMENT A
Ecological Scoping Checklist

Site Name	Ajax/Magnolia
Date of Site Visit	September 21 & 22, 2004
Site Location	3.5 miles N of Granite, Grant County, Oregon, Umatilla National Forest
Site Visit Conducted by	Johnna Evans

Part ❶

CONTAMINANTS OF INTEREST Types, Classes, Or Specific Hazardous Substances ‡ Known Or Suspected	Onsite	Adjacent to or in locality of the facility †
Mining related activities – primarily metals	Yes	Yes

‡ As defined by OAR 340-122-115(30) † As defined by OAR 340-122-115(34)

Part ❷

OBSERVED IMPACTS ASSOCIATED WITH THE SITE	Finding
Onsite vegetation (**N**one, **L**imited, **E**xtensive)	E
Vegetation in the locality of the site (**N**one, **L**imited, **E**xtensive)	E
Onsite wildlife such as macroinvertebrates, reptiles, amphibians, birds, mammals, other (**N**one, **L**imited, **E**xtensive)	L
Wildlife such as macroinvertebrates, reptiles, amphibians, birds, mammals, other in the locality of the site (**N**one, **L**imited, **E**xtensive)	L
Other readily observable impacts (**N**one, **D**iscuss below)	D
Discussion: There are numerous waste rock piles scattered across the site. Many of the waste rock piles are vegetated with trees and some grasses. There are a couple of settling ponds that receive input from adit drainage.	

ATTACHMENT A
Ecological Scoping Checklist (cont'd)

Part ❸

SPECIFIC EVALUATION OF ECOLOGICAL RECEPTORS / HABITAT	Finding
Terrestrial – Wooded	
Percentage of site that is wooded	95
Dominant vegetation type (**E**vergreen, **D**eciduous, **M**ixed)	E
Prominent tree size at breast height, i.e., 4 feet (<6", 6" to 12", >12")	6" – 12"
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	M, B, M
Terrestrial - Scrub/Shrub/Grasses	
Percentage of site that is scrub/shrub	<5
Dominant vegetation type (**Sc**rub, **Sh**rub, **G**rasses, **O**ther)	G, O
Prominent height of vegetation (<2', 2' to 5', >5')	<2'
Density of vegetation (**D**ense, **P**atchy, **S**parse)	D
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	M, B, M
Terrestrial – Ruderal	
Percentage of site that is ruderal	<5
Dominant vegetation type (**L**andscaped, **A**griculture, **B**are ground)	B
Prominent height of vegetation (0', >0' to <2', 2' to 5', >5')	<2'
Density of vegetation (**D**ense, **P**atchy, **S**parse)	S
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	M, M
Aquatic - Non-flowing (lentic)	
Percentage of site that is covered by lakes or ponds	<1
Type of water bodies (**L**akes, **P**onds, **V**ernal pools, **I**mpoundments, **Lag**oon, **R**eservoir, **C**anal)	P
Size (acres), average depth (feet), trophic status of water bodies	<1, <1, P
Source water (**R**iver, **St**ream, **G**roundwater, **I**ndustrial discharge, **Su**rface water runoff)	Su
Water discharge point (**N**one, **R**iver, **St**ream, **G**roundwater, **W**etlands impoundment)	S, W
Nature of bottom (**M**uddy, **R**ocky, **S**and, **C**oncrete, **O**ther)	M
Vegetation present (**S**ubmerged, **E**mergent, **F**loating)	E
Obvious wetlands present (**Y**es / **N**o)	Y
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	M, M

ATTACHMENT A
Ecological Scoping Checklist (cont'd)

SPECIFIC EVALUATION OF ECOLOGICAL RECEPTORS / HABITAT	Finding
Aquatic - Flowing (lotic)	
Percentage of site that is covered by rivers, streams (brooks, creeks), intermittent streams, dry wash, arroyo, ditches, or channel waterway	1
Type of water bodies (**R**ivers, **S**treams, **I**ntermittent Streams, **D**ry wash, **A**rroyo, **D**itches, **C**hannel waterway)	S
Size (acres), average depth (feet), approximate flow rate (cfs) of water bodies	<1, <6", 5
Bank environment (cover: **V**egetated, **B**are / slope: **S**teep, **G**radual / height (in feet))	V/S-G
Source water (**R**iver, **St**ream, **G**roundwater, **I**ndustrial discharge, **Su**rface water runoff)	Su, G
Tidal influence (**Y**es / **N**o)	N
Water discharge point (**N**one, **R**iver, **St**ream, **G**roundwater, **W**etlands impoundment)	S
Nature of bottom (**M**uddy, **R**ocky, **S**and, **C**oncrete, **O**ther)	R,M
Vegetation present (**S**ubmerged, **E**mergent, **F**loating)	E
Obvious wetlands present (**Y**es / **N**o)	Y
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	M,B,M
Aquatic – Wetlands	
Obvious or designated wetlands present (**Y**es / **N**o)	Y
Wetlands suspected as site is/has (**A**djacent to water body, in **F**loodplain, **S**tanding water, **D**ark wet soils, **M**ud cracks, **D**ebris line, **W**ater marks)	A,F,S
Vegetation present (**S**ubmerged, **E**mergent, **S**crub/shrub, **W**ooded)	E/S
Size (acres) and depth (feet) of suspected wetlands	<1, <1
Source water (**R**iver, **St**ream, **G**roundwater, **I**ndustrial discharge, **Su**rface water runoff)	Su, G
Water discharge point (**N**one, **R**iver, **St**ream, **G**roundwater, **I**mpoundment)	S
Tidal influence (**Y**es / **N**o)	N
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	B,M

*** P**: Photographic documentation of these features is highly recommended.

Part ❹

ECOLOGICALLY IMPORTANT SPECIES / HABITATS OBSERVED
Creek/Wetlands
Redband trout observed by EA Engineering, Science, and Technology, Inc. (2004).

ATTACHMENT B
Evaluation of Receptor-Pathway Interactions

EVALUATION OF RECEPTOR-PATHWAY INTERACTIONS	Y	N	U
Are hazardous substances present or potentially present in surface waters? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via surface water?**	X X X		
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in surface waters. • Ability of hazardous substances to migrate to surface waters. • Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters. Aquatic receptors may be exposed through osmotic exchange, respiration or ventilation of surface waters. • Contaminants may be taken-up by terrestrial plants whose roots are in contact with surface waters. • Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.			
Are hazardous substances present or potentially present in groundwater? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via groundwater?**	X X 	 X	
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in groundwater. • Ability of hazardous substances to migrate to groundwater. • Potential for hazardous substances to migrate via groundwater and discharge into habitats and/or surface waters. • Contaminants may be taken-up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1m depth). • Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.			

"Y" = yes; "N" = No, "U" = Unknown (counts as a "Y")

ATTACHMENT B
Evaluation of Receptor-Pathway Interactions (cont'd)

EVALUATION OF RECEPTOR-PATHWAY INTERACTIONS	Y	N	U
Are hazardous substances present or potentially present in sediments? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via contact with sediments?**	X X X		
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in sediment. • Ability of hazardous substances to leach or erode from surface soils and be carried into sediment via surface runoff. • Potential for contaminated groundwater to upwell through, and deposit contaminants in, sediments. • If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods. Aquatic receptors may be directly exposed to sediments or may be exposed through osmotic exchange, respiration or ventilation of sediment pore waters. • Terrestrial plants may be exposed to sediment in an area that is only periodically inundated with water. • If sediments are present in an area that is only periodically inundated with water, terrestrial species may have direct access to sediments for the purposes of incidental ingestion. Aquatic receptors may regularly or incidentally ingest sediment while foraging.			
Are hazardous substances present or potentially present in prey or food items of ecologically important receptors? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via consumption of food items?**	X X X		
When answering the above questions, consider the following: • Higher trophic level terrestrial and aquatic consumers and predators may be exposed through consumption of contaminated food sources. • In general, organic contaminants with log K_{ow} > 3.5 may accumulate in terrestrial mammals and those with a log K_{ow} > 5 may accumulate in aquatic vertebrates.			

"Y" = yes; "N" = No, "U" = Unknown (counts as a "Y")

ATTACHMENT B
Evaluation of Receptor-Pathway Interactions (cont'd)

EVALUATION OF RECEPTOR-PATHWAY INTERACTIONS	Y	N	U
Are hazardous substances present or potentially present in surficial soils? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via incidental ingestion of or dermal contact with surficial soils?**	X X X		
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in surficial (~1m depth) soils. • Ability of hazardous substances to migrate to surficial soils. • Significant exposure via dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers. • Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash). • Contaminants in bulk soil may partition into soil solution, making them available to roots. • Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil or while grooming themselves clean of soil.			
Are hazardous substances present or potentially present in soils? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via vapors or fugitive dust carried in surface air or confined in burrows?**	X X 	 X	
When answering the above questions, consider the following: • Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant > 10^{-5} atm-m^3/mol and molecular weight < 200 g/mol). • Exposure via inhalation is most important to organisms that burrow in contaminated soils, given the limited amounts of air present to dilute vapors and an absence of air movement to disperse gases. • Exposure via inhalation of fugitive dust is particularly applicable to ground-dwelling species that could be exposed to dust disturbed by their foraging or burrowing activities or by wind movement. • Foliar uptake of organic vapors would be limited to those contaminants with relatively high vapor pressures. • Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces.			

"Y" = yes; "N" = No, "U" = Unknown (counts as a "Y")

Attachment C

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Table C1
Ecological Risk Assessment: Preliminary Screening - Soil/Waste Pile Data
(results are reported in mg/kg)

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	90% UCL [1, 2]	Essential Nutrient?	Retained For Screening?	Detection Frequency	Retained for Screening?	Background Concentration	Include for Risk-Based Screening?
Aluminum	1340	23200	13900	No	**Yes**	100%	**Yes**	24400	No
Antimony	0.44**U**	78.5	45.1	No	**Yes**	87%	**Yes**	0.84	**Yes**
Arsenic	14.2	3730	2520	No	**Yes**	100%	**Yes**	4.5	**Yes**
Barium	25.5	340	196	No	**Yes**	100%	**Yes**	288	**Yes**
Beryllium	0.02	3.4	1.4	No	**Yes**	93%	**Yes**	1.2	**Yes**
Cadmium	0.01**U**	16.9	4.8	No	**Yes**	20%	**Yes**	0.43	**Yes**
Calcium	821	25100		Yes	No	-	**-**	1830	No
$Chromium_6$	0.49**B**	2.85**U**	1.83	No	**Yes**	22%	**Yes**	1.10	**Yes**
$Chromium_t$	5	63.5	26.6	No	**Yes**	100%	**Yes**	31.3	**Yes**
Cobalt	0.8	301	60.5	No	**Yes**	100%	**Yes**	11.3	**Yes**
Copper	13.6	310	129	No	**Yes**	100%	**Yes**	30.7	**Yes**
Iron	9207	139000	58700	Yes	**Yes**	100%	**Yes**	24600	**Yes**
Lead	5	1210	309	No	**Yes**	100%	**Yes**	8.4	**Yes**
Magnesium	155	10500	9730	Yes	No	-	**-**	2630	No
Manganese	8.3	34300	19300	No	**Yes**	100%	**Yes**	837	**Yes**
Mercury	0.11	9.4	7.96	No	**Yes**	100%	**Yes**	0.14	**Yes**
Nickel	6.6	888	268	No	**Yes**	100%	**Yes**	23.4	**Yes**
Potassium	1340	5260		Yes	No	-	**-**	1570	No
Selenium	0.07**U**	11.6	4.6	No	**Yes**	93%	**Yes**	0.76	**Yes**
Silver	0.04**U**	57.7	116	No	**Yes**	87%	**Yes**	0.26	**Yes**
Sodium	10.2**U**	869		Yes	No	-	**-**	806	No
Thallium	0.18	36.3	7.1	No	**Yes**	93%	**Yes**	0.97	**Yes**
Vanadium	8.8	176	69.7	No	**Yes**	100%	**Yes**	47.8	**Yes**
Zinc	5.5	1620	490	No	**Yes**	100%	**Yes**	105	**Yes**
Cyanide	0.21**U**	4.9	2.32	No	**Yes**	11%	**Yes**	0.27	**Yes**

Notes:

U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit.

B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration.

1. Rejected for both normal and lognormal distributions so 90% UCL calculated using Chebyshev Inequality method for nonparametric data (beryllium, cadmium, lead, nickel, and selenium).
2. When there were fewer than 10 samples or the 90% UCL was greater than MDC, the MDC was used as the EPC (chromium6, silver, and cyanide).

Table C2
Ecological Risk Assessment: Preliminary Screening - Surface Water
(concentrations are reported in µg/l)

Analyte [1]	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Retained for Screening?	Background Concentration	Retained for Screening?	Essential Nutrient?	Include for Risk-Based Screening?
Aluminum[2]	27.7**B**	1180	100%	**Yes**	30.2**B**	**Yes**	No	**Yes**
Antimony	1.9**U**	5.6**B**	100%	**Yes**	4.1**B**	**Yes**	No	**Yes**
Arsenic	1.2**U**	63.6	100%	**Yes**	1.2**U**	**Yes**	No	**Yes**
Barium	9.8**B**	71.7**B**	100%	**Yes**	55.2**B**	**Yes**	No	**Yes**
Beryllium	0.1**U**	0.1**U**	0%	No				
Cadmium	0.3**U**	0.3**U**	0%	No				
Calcium	21500	134000	100%	**Yes**	28200	**Yes**	Yes	No
$Chromium_6$	0.0**U**	0.01	17%	**Yes**	0.02	No	-	-
$Chromium_t$	0.3**U**	0.7**U**	100%	**Yes**	0.3**U**	**Yes**	No	**Yes**
Cobalt	0.9**U**	13.3**B**	100%	**Yes**	0.9**U**	**Yes**	No	**Yes**
Copper	0.7**U**	10.3**B**	100%	**Yes**	0.7**U**	**Yes**	No	**Yes**
$Cyanide_t$	5**U**	5**U**	0%	No				
Iron	8.4**U**	10500	100%	**Yes**	38.8**B**	**Yes**	No	**Yes**
Lead	0.65**U**	4.4	100%	**Yes**	0.75**U**	**Yes**	No	**Yes**
Magnesium	10600	69800	100%	**Yes**	12800	**Yes**	Yes	No
Manganese	4.7**B**	1690	100%	**Yes**	3.3**B**	**Yes**	No	**Yes**
Mercury	0.05**U**	0.48	100%	**Yes**	0.1**B**	**Yes**	No	**Yes**
Nickel	1**U**	64.7	100%	**Yes**	1**U**	**Yes**	No	**Yes**
Potassium	1480**B**	4800**B**	100%	**Yes**	2420**B**	**Yes**	Yes	No
Selenium	0.85**U**	1.8**B**	100%	**Yes**	2.4**B**	No	-	-
Silver	1.2**U**	1.2**U**	0%	No	1.2**U**	-	-	-
Sodium	5200	6700	67%	**Yes**	6480	**Yes**	Yes	No
Thallium	1.4**U**	4.3**B**	100%	**Yes**	1.4**U**	**Yes**	No	**Yes**
Vanadium	1**U**	2.5**B**	100%	**Yes**	1.1**U**	**Yes**	No	**Yes**
Zinc	2.85**U**	83	100%	**Yes**	2.85**U**	**Yes**	No	**Yes**

Notes:

U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit

B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration

1. Analyte is reported as the dissolved concentration in the water column, unless otherwise noted.
2. The concentration of Aluminum is reported as the total concentration in the water column.

Table C3
Ecological Risk Assessment: Preliminary Screening - Sediment
(*concentrations are reported in mg/kg*)

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Retained for Screening?	Background Concentration	Retained for Screening?	Essential Nutrient?	Retained for Screening?
Aluminum	1550	46500	100%	**Yes**	14900	**Yes**	No	**Yes**
Antimony	1.5**B**	12.2**B**	100%	**Yes**	0.23**U**	**Yes**	No	**Yes**
Arsenic	121	2800	100%	**Yes**	1.3	**Yes**	No	**Yes**
Barium	40.2	309	100%	**Yes**	502	No	No	**Yes**
Beryllium	0.42**B**	3.8	100%	**Yes**	0.44**B**	**Yes**	No	**Yes**
Cadmium	0.16**B**	9.3	100%	**Yes**	0.0295**U**	**Yes**	No	**Yes**
Calcium	923	33300	100%	**Yes**	5500	**Yes**	Yes	No
$Chromium_t$	4.4	54.9	100%	**Yes**	14.9	**Yes**	No	**Yes**
Cobalt	3.1**B**	254	100%	**Yes**	9.6	**Yes**	No	**Yes**
Copper	32.8	461	100%	**Yes**	14.3	**Yes**	No	**Yes**
Iron	23200	319000	100%	**Yes**	20700	**Yes**	Yes	**Yes**
Lead	4.6	69.4	100%	**Yes**	3.8	**Yes**	No	**Yes**
Magnesium	1010	8630	100%	**Yes**	3910	**Yes**	Yes	No
Manganese	319	40600	100%	**Yes**	424	**Yes**	No	**Yes**
Mercury	0.42	1.4	100%	**Yes**	0.02**B**	**Yes**	No	**Yes**
Nickel	6.6	860	100%	**Yes**	24.3	**Yes**	No	**Yes**
Potassium	848	5430	100%	**Yes**	394**B**	**Yes**	Yes	No
Selenium	0.45**B**	11.6	100%	**Yes**	0.48**B**	**Yes**	No	**Yes**
Silver	0.3	3.6	67%	**Yes**	0.105**U**	**Yes**	No	**Yes**
Sodium	64.5**U**	599**B**	67%	**Yes**	764	No	Yes	No
Thallium	0.31**U**	7.8**U**	33%	**Yes**	0.28**U**	**Yes**	No	**Yes**
Vanadium	17.8	90.2	100%	**Yes**	34.2	**Yes**	No	**Yes**
Zinc	50.3	1660	100%	**Yes**	21.8	**Yes**	No	**Yes**
Cyanide	0.24**U**	2.9	33%	**Yes**	0.32	**Yes**	No	**Yes**

Notes:

U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit

B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration

Table C4
Ecological Risk Assessment Preliminary Screening - Pore Water
(*concentrations are reported in µg/l*)

Analyte [1]	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Retained for Screening?	Background Concentration	Retained for Screening?	Essential Nutrient?	Retain for Screening?
Aluminum	11.8**U**	28**B**	33%	**Yes**	60.7**B**	No	-	-
Antimony	2.35**U**	2.35**U**	0%	No	-	-	-	-
Arsenic	11.5	27.3	100%	**Yes**	1.2**U**	**Yes**	No	**Yes**
Arsenic(III)[2]	0.05**U**	26.9	67%	**Yes**	0.05**U**	**Yes**	No	**Yes**
Arsenic(V)[2]	54.4	258	100%	**Yes**	0.05**U**	**Yes**	No	**Yes**
Barium	74.2**B**	84.1**B**	100%	**Yes**	74.4**B**	**Yes**	No	**Yes**
Beryllium	0.1**U**	0.1**U**	0%	No	-	-	-	
Cadmium	0.3**U**	0.3**U**	0%	No	-	-	-	
Calcium	41700	44200	100%	**Yes**	29200	**Yes**	Yes	No
$Chromium_6$	0	0.01	33%	**Yes**	0.01	No	-	**-**
$Chromium_t$	0.7**U**	0.7**U**	0%	No	2.1**B**	-	-	**-**
Cobalt	1**U**	1**U**	0%	No	-	-	-	-
Copper	1.2**U**	1.2**U**	0%	No	-	-	-	-
$Cyanide_t$	5**U**	5**U**	0%	No	-	-	-	-
Iron	34.9**B**	86.9**B**	100%	**Yes**	40.4**B**	**Yes**	No	**Yes**
Lead	0.65**U**	0.65**U**	0%	No	-	-	-	-
Magnesium	19200	20000	100%	**Yes**	12500	**Yes**	Yes	No
Manganese	3.7**B**	15.2	100%	**Yes**	4**B**	**Yes**	No	**Yes**
Mercury	0.05**U**	0.19**B**	67%	**Yes**	0.11**B**	**Yes**	No	**Yes**
Nickel	1.05**U**	1.05**U**	0%	No	-	-	-	-
Potassium	2380**B**	2480**B**	100%	**Yes**	2150**B**	**Yes**	Yes	No
Selenium	1.7**U**	1.7**U**	0%	No	-	-	-	-
Silver	1.1**U**	1.1**U**	0%	No	-	-	-	-
Sodium	6320	7420	100%	**Yes**	6550	**Yes**	Yes	No
Thallium	1.4**U**	2.85**U**	0%	No	1.4**U**	**-**	-	**-**
Vanadium	1**U**	1**U**	0%	No	-	-	-	-
Zinc	5**B**	9.7**B**	100%	**Yes**	2.85**U**	**Yes**	No	**Yes**

Notes:

U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit

B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration

1. Analyte is reported as the dissolved concentration in the water column, unless otherwise noted.
2. Analyte is reported as the total concentration in the water column.

Table C5
Ecological Risk Assessment: Chemistry-Toxicity Screening - Soil/Waste Rock
(concentrations are reported as mg/kg)

			SCREENING LEVEL VALUES (ODEQ, 2001)				RISK RATIOS (T_{ij})				RISK POSED TO NON-PROTECTED RECEPTORS? (T_{ij} > 5)				CPEC?	MULTIPLE COI RISK (T_{ij}/T_j)				MULTIPLE COI RISK POSED TO NON-PROTECTED RECEPTORS? (T_{ij}/T_j > 5/Nij)				CPEC?	Bioaccumulator CPEC?
Analyte[1]	EPC (Max)[2]	EPC (90%)[3,4,5]	Plant	Invertebrate	Bird	Mammal	Plant	Invertebrate	Bird	Mammal	Plant	Invertebrate	Bird	Mammal		Plant	Invertebrate	Bird	Mammal	Plant	Invertebrate	Bird	Mammal		
Antimony	78.5	45.1	5	NA	NA	15	15.7000	-	-	3.0067	**YES**	**-**	**-**	NO	**YES**	0.0011	-	-	0.0290	NO	**-**	**-**	NO	NO	NO
Arsenic [6]	3730	2520	10	60	10	29	373.0000	62.1667	252	86.8966	**YES**	**YES**	**YES**	**YES**	**YES**	0.0253	0.0451	0.8272	0.8393	NO	NO	**YES**	**YES**	**YES**	NO
Barium	340	196	500	3000	85	638	0.6800	0.1133	2.3059	0.3072	NO	NO	NO	NO	NO	0.0000	0.0001	0.0076	0.0030	NO	NO	NO	NO	NO	NO
Beryllium [7]	3.4	1.4	10	10	10	83	0.3400	0.3400	0.1400	0.0169	NO	NO	NO	NO	NO	0.0000	-	-	0.0002	NO	**-**	-	NO	NO	NO
Cadmium	16.9	4.8	4	20	6	125	4.2250	0.8450	0.8000	0.0384	NO	NO	NO	NO	NO	0.0003	0.0006	0.0026	0.0004	NO	NO	NO	NO	NO	**YES**
$Chromium_6$	2.85**U**	1.83	NA	NA	NA	410	-	-	-	0.0070	-	-	-	NO	NO	-	-	-	0.0001	-	-	-	NO	NO	NO
$Chromium_t$ [8]	63.5	26.6	1	0.4	4	410	63.5000	158.7500	6.6500	0.0649	**YES**	**YES**	**YES**	NO	**YES**	0.0043	0.1153	0.0218	0.0006	NO	NO	NO	NO	NO	NO
Cobalt	301	60.5	20	1000	NA	150	15.0500	0.3010	-	0.4033	**YES**	NO	**-**	NO	**YES**	0.0010	0.0002	-	0.0039	NO	NO	-	NO	NO	NO
Copper	310	129	100	50	190	390	3.1000	6.2000	0.6789	0.3308	NO	**YES**	NO	NO	**YES**	0.0002	0.0045	0.0022	0.0032	NO	NO	NO	NO	NO	NO
Iron	139000	58700	10	200	NA	NA	13900	695	-	-	**YES**	**YES**	**-**	**-**	**YES**	0.9439	0.5047	-	-	**YES**	**YES**	-	-	**YES**	NO
Lead	1210	309	50	500	16	4000	24.2000	2.4200	19.3125	0.0773	**YES**	NO	**YES**	NO	**YES**	0.0016	0.0018	0.0634	0.0007	NO	NO	NO	NO	NO	NO
Manganese	34300	19300	500	100	4125	11000	68.6000	343.0000	4.6788	1.7545	**YES**	**YES**	NO	NO	**YES**	0.0047	0.2491	0.0154	0.0169	NO	NO	NO	NO	NO	NO
Mercury	9.4	7.96	0.3	0.1	1.5	73	31.3333	94.0000	5.3067	0.1090	**YES**	**YES**	**YES**	NO	**YES**	0.0021	0.0683	0.0174	0.0011	NO	NO	NO	NO	NO	**YES**
Nickel	888	268	30	200	320	625	29.6000	4.4400	0.8375	0.4288	**YES**	NO	NO	NO	**YES**	0.0020	0.0032	0.0027	0.0041	NO	NO	NO	NO	NO	NO
Selenium	11.6	4.6	1	70	2	25	11.6000	0.1657	2.3000	0.1840	**YES**	NO	NO	NO	**YES**	0.0008	0.0001	0.0075	0.0018	NO	NO	NO	NO	NO	**YES**
Silver	57.7	116	2	50	NA	NA	28.8500	1.1540	-	-	**YES**	NO	**-**	**-**	**YES**	0.0020	0.0008	-	-	NO	NO	-	-	NO	**YES**
Thallium	36.3	7.1	1	NA	NA	1	36.3000	-	-	7.1000	**YES**	**-**	**-**	**YES**	**YES**	0.0025	-	-	0.0686	NO	-	-	NO	NO	NO
Vanadium	176	69.7	2	NA	47	25	88.0000	-	1.4830	2.7880	**YES**	**-**	NO	NO	**YES**	0.0060	-	0.0049	0.0269	NO	-	NO	NO	NO	NO
Zinc	1620	490	50	200	60	20000	32.4000	8.1000	8.1667	0.0245	**YES**	**YES**	**YES**	NO	**YES**	0.0022	0.0059	0.0268	0.0002	NO	NO	NO	NO	NO	**YES**
Cyanide	4.9	2.32	NA	NA	NA	NA	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**	**YES**	-	-	-	-	**-**	**-**	**-**	-	-	NO
					Sum of T_{ij} (T_j) =		14726.478	1376.995714	304.6599297	103.53776															
					# of COIs (N_{ij}) =		18	15	13	17															
					5/N_{ij} =		0.2777778	0.333333333	0.384615385	0.2941176															

Abbreviations:
EPC - exposure point concentration
NP - non protected
NA - not available
CPEC - constituent of potential ecological concern
U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit

Notes:
1. Chemicals retained after preliminary screening (essential nutrient, detection frequency, and background concentration comparison).
2. The EPC is equal to the maximum detected concentration. This EPC is used for plant and invertebrate receptors.
3. The EPC is equal to the 90% upper confidence limit. This EPC is used for bird and wildlife receptors.
4. Rejected for both normal and lognormal distributions so 90% UCL calculated using Chebyshev Inequality method for nonparametric data (beryllium, cadmium, lead, nickel, and selenium).
5. When there were fewer than 10 samples or the 90% UCL was greater than MDC, we used the MDC as the EPC ($chromium_6$, silver, and cyanide).
6. SLVs for Arsenic(III) are listed.
7. Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Hetertrophic Process: 1997 Revision. ES/ER/TM-162/R2. Prepared for the US Department of En
8. SLVs for plant, invertebrate, and bird receptors is based on Chromium(III) and SLV for mammal receptors is based on Chromium(VI).

Table C6
Ecological Risk Assessment: Chemistry-Toxicity Screening - Surface Water
(concentrations are reported in µg/l)

		SCREENING LEVEL VALUES (ODEQ, 2001)			SINGLE COI RISK RATIO [7]			RISK TO RECEPTORS?				CPEC?	MULTIPLE COI RISK RATIO [10]	RISK TO RECEPTORS?		CPEC?
								Non-Protected [8]			*Protected* [9]			*Non-Protected* [11]	*Protected* [12]	
Analyte [1,2]	**EPC**	Aquatic Life	Bird	Mammal	Aquatic Life	Bird	Mammal	Aquatic Life	Birds	Mammals	Aquatic Life		Aquatic Life	Aquatic Life	Aquatic Life	
Aluminum [3]	1180	87	797000	8000	13.5632	0.0015	0.1475	**YES**	NO	NO	**YES**	**YES**	0.2298	NO	**YES**	**YES**
Antimony	5.6**B**	1600	NA	1000	0.0035	-	0.0056	NO	-	NO	NO	NO	0.0001	NO	NO	NO
Arsenic [4]	63.6	150	18000	6000	0.4240	0.0035	0.0106	NO	NO	NO	NO	NO	0.0072	NO	NO	NO
Barium	71.7**B**	4	150000	39000	17.9250	0.0005	0.0018	**YES**	NO	NO	**YES**	**YES**	0.3037	**YES**	**YES**	**YES**
$Chromium_t$ [5]	0.7**U**	11	7200	25000	0.0636	0.0001	0.0000	NO	NO	NO	NO	NO	0.0011	NO	NO	NO
Cobalt	13.3**B**	23	NA	9000	0.5783	-	0.0015	NO	-	NO	NO	NO	0.0098	NO	NO	NO
Copper	10.3**B**	36.2**H**	341000	53000	0.2845	0.00003	0.0002	NO	NO	NO	NO	NO	0.0048	NO	NO	NO
Iron	10500	1000	NA	NA	10.5000	-	-	**YES**	-	-	**YES**	**YES**	0.1779	NO	**YES**	**YES**
Lead	4.4	14.07**H**	28000	323000	0.3127	0.0002	0.0000	NO	NO	NO	NO	NO	0.0053	NO	NO	NO
Manganese	1690	120	7242000	676000	14.0833	0.0002	0.0025	**YES**	NO	NO	**YES**	**YES**	0.2386	NO	**YES**	**YES**
Mercury [6]	0.48	0.77	3300	10000	0.6234	0.0001	0.0000	NO	NO	NO	NO	NO	0.0106	NO	NO	NO
Nickel	64.7	263.2**H**	562000	38000	0.2458	0.0001	0.0017	NO	NO	NO	NO	NO	0.0042	NO	NO	NO
Thallium	4.3**B**	40	NA	60	0.1075	-	0.0717	NO	-	NO	NO	NO	0.0018	NO	NO	NO
Vanadium	2.5**B**	20	82000	1600	0.1250	0.0000	0.0016	NO	NO	NO	NO	NO	0.0021	NO	NO	NO
Zinc	83	471.4**H**	105000	1230000	0.1761	0.0008	0.0001	NO	NO	NO	NO	NO	0.0030	NO	NO	NO
				Sum of T_{ij} (T_j) =	59.0160	0.0071	0.2448									
				# COIs (N_{ij}) =	19	11	14									
				$1/N_{ij}$ =	0.0526	0.0909	0.0714									
				$5/N_{ij}$ =	0.2632	0.4545	0.3571									

Abbreviations:
EPC - exposure point concentration
NA - not available
CPEC - contaminant of potential ecological concern
U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit
B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration
H - The screening level value was adjusted based on the hardness of the water at the location of the maximum observed concentration.

Notes:
1. Chemicals retained after preliminary screening (essential nutrient, detection frequency, and background concentration comparison).
2. According to the SI: beryllium, cadmium, cyanide, and silver were not detected in any samples.
3. The SLV is based on total concentrations; therefore, the EPC is expressed as the total concentration.
4. Arsenic screening level values were obtained from ODEQ, 2001 - Arsenic III.
5. Screening level values for Chromiumt were based on the most conservative value of Chromium III or Chromium VI in the Level II guidance document (ODEQ, 2001).
6. Although the SLV for mercury is based on the total concentration, we used the dissolved concentration because it was reported as being greater than the total.
7. Single COI risk ratio (Tij) = EPC/SLV
8. Risk posed to a non-protected receptor from a single COI is evaluated by: Tij > 5
9. Risk posed to a protected receptor from a single COI is evaluated by: Tij > 1
10. Multiple COI risk ratio = Tij/Tj; provided Tj > Q. Tj for birds and mammals was less than 5; therefore, risk from exposure to multiple COIs was not evaluated for these receptors.
11. Risk posed to a non-protected receptor from multiple COIs is evaluated by: Tij/Tj > 5/Nij
12. Risk posed to a protected receptor from multiple COIs is evaluated by: Tij/Tj > 1/Nij

Table C7
Ecological Risk Assessment: Chemistry-Toxicity Screening - Sediment
(concentrations are reported as mg/kg)

		SLVs (ODEQ, 2001)		RISK RATIOS (T_{ij})		CPEC? [2]
Analyte [1,2]	**EPC**	**Freshwater Sediment**	**Bioaccumulation**	**Freshwater Sediment**	**Bioaccumulation**	
Aluminum	46500	NA	NA	-	-	**Yes** [3]
Antimony	12.2**B**	3	10	4.066666667	1.22	**Yes**
Arsenic	2800	6	4	466.6666667	700	**Yes**
Beryllium	3.8	NA	122	-	0.031147541	**Yes**
Cadmium	9.3	0.6	0.003	15.5	3100	**Yes**
$Chromium_t$	54.9	37	4200	1.483783784	0.013071429	**Yes**
Cobalt	254	NA	NA	-	-	**Yes** [3]
Copper	461	36	10	12.80555556	46.1	**Yes**
Iron	319000	NA	NA	-	-	**Yes** [3]
Lead	69.4	35	128	1.982857143	0.5421875	**Yes**
Manganese	40600	1100	NA	36.90909091	-	**Yes**
Mercury	1.4	0.2	NA	7	-	**Yes**
Nickel	860	18	316	47.77777778	2.721518987	**Yes**
Selenium	11.6	NA	0.1	-	116	**Yes**
Silver	3.6	4.5	NA	0.8	-	**Yes**
Thallium	7.8**U**	NA	0.7	-	11.14285714	**Yes**
Vanadium	90.2	NA	NA	-	-	**Yes** [3]
Zinc	1660	123	3	13.49593496	553.3333333	**Yes**
Cyanide	2.9	NA	NA	-	-	**Yes** [3]

Notes:

U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit

B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration

1. Chemicals retained after preliminary screening (essential nutrient, detection frequency, and background concentration comparison).
2. CPECs were identified by $T_{ij} \geq 1$
3. These chemicals were retained as CPECs due to the lack of SLVs.

Table C8
Ecological Risk Assessment: Chemistry-Toxicity Screening - Pore Water
(concentrations are reported as µg/l)

Analyte [1, 2]	**EPC**	**Aquatic Life SLV**	**Risk Ratio for Aquatic Life** (T_{ij})	**Aquatic Life (NP) CPEC?** [4]
Arsenic	27.3	150	0.1820	No
Arsenic(III) [3]	26.9	150	0.1793	No
Arsenic(V) [3]	258	150	1.7200	No
Barium	84.1**B**	4	21.0250	**Yes**
Iron	86.9**B**	1000	0.0869	No
Manganese	15.2	120	0.1267	No
Mercury	0.19**B**	0.77	0.2468	No
Thallium	2.85**U**	40	0.0713	No
Zinc	9.7**B**	120	0.0808	No

Notes:

U - Analyzed for but not detected at detection limit; value = 1/2 of detection limit.

B - Detected at concentration between method detection limit and practical quantitation limit; value = reported concentration.

EPC - exposure point concentration

CPEC - Constituent of potential environmental concern

NP - non protected

P - protected

1. Chemicals retained after preliminary screening (essential nutrient, detection frequency, and background concentration comparison).
2. Concentration is reported as the dissolved concentration in the water column, unless otherwise noted.
3. Analyte is reported as the total concentration in the water column.
4. A chemical is an identified CPEC if it poses a risk to non-protected aquatic life. Assessed by: $T_{ij} > 5$

APPENDIX C

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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Table C–1. Chemical-Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL			
Safe Drinking Water Act	40 USC §300		
National Primary Drinking Water Regulations	40 CFR Part 141	Establishes health-based standards, maximum contaminant levels (MCLs), for public water systems.	Not an ARAR, groundwater has been eliminated from the removal action.
National Secondary DrinkingWater Regulations	40 CFR Part 143	Establishes aesthetic standards (secondary MCLs) for public water systems	Not an ARAR, these are not enforceable standards and are outside scope of removal action.
Clean Water Act	33 USC §§1251-1387		
National Ambient Water Quality Criteria	40 CFR Part 131	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	Not an ARAR since the State of Oregon has been delegated this program.
Clean Air Act	40 USC §7409		
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes air quality levels that protect public health.	Not an ARAR—only "major" sources are subject to requirements related to NAAQS, defer to state regulation of fugitive dust emissions.
Resource Conservation and Recovery Act	40 USC §7601		
Lists of Hazardous Wastes	40 CFR Part 261, Subpart D and C	Defines those solids wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Not an ARAR – mine waste is not a listed hazardous waste, Bevill exempt. Even if TCLP testing confirmed a characteristic waste (Subpart C), it is still exempt. Parts of the RCRA regulations may be relevant and appropriate, however, and are discussed under action-specific requirements.

Table C–1. Chemical-Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon (continued)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
STATE OF OREGON			
Hazardous Substance Remedial Action Rules	OAR 340-122-84 and 1-115	Establishes DEQ Guidelines for assessing human health and ecological risk assessments on potential adverse affects from contamination according to DEQ risk guidelines and levels.	Relevant and Appropriate Requirement
Preliminary Remediation Goals (PRGs) for soil and water	US Environmental Protection Agency (EPA) Region 9	Preliminary Remediation Goals (PRGs) are tools for evaluating and cleaning up contaminated sites. They are risk-based concentrations that are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements. The PRGs contained in the Region 9 PRG Table are generic; they are calculated without site specific information. However, they may be re-calculated using site specific data. PRGs should be viewed as Agency guidelines, not legally enforceable standards. They are used for site "screening" and as initial cleanup goals if applicable.	Relevant and Appropriate Requirement
Hazardous Substance Occupational Exposure	OAR 437	Establishes OR-OSHA Permissible Exposure Limits (PELs). OR-OSHA exposure limits mirror the federal chemical specific limits (refer to NIOSH Pocket Guide to Chemical Hazards for details on individual chemicals)	Relevant and Appropriate Requirement
Numeric Soil Cleanup Levels for Motor Fuel and Heating Oil	OAR 340-122-305 through 360	Establish cleanup standards for contamination of soil by motor fuel and heating oil.	To Be Considered at Former Oil Tank Station
Oregon Soil Cleanup Rules for Simple Sites	OAR 340-122-045 and 046	Establishes DEQ rules for streamlined cleanup processes and numerical cleanup standards at simple sites.	To Be Considered
State of Oregon is authorized by the USEPA to implement the Clean Water Act in Oregon	Clean Water Act – FWQC 40 CFR	Establishes acceptable contaminant levels for ingestion of aquatic organisms and for intake by aquatic organisms in surface water.	Applicable Requirement
Asbestos Removal	OAR 340-32-5620 through 5650	Establish DEQ requirements for licensing and certification for asbestos workers. All workers who handle asbestos-containing materials must meet certain training, licensing and certification requirements.	Relevant and Appropriate Requirement

Table C–2. Location–Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL			
Resource Conservation and Recovery Act	40 USC § 7601		
Hazardous and Solid Waste Regulations	40 CFR Part 264.18	Location standards and restrictions for hazardous waste treatment, storage, and disposal (TSD) facilities.	Relevant and Appropriate Requirement
	40 CFR §§ 257.3-1 through 257.3-4	Location standards and restrictions for municipal solid waste (MSW) facilities.	Relevant and Appropriate Requirement
National Historic Preservation Act	16 USC § 470; 36 CFR Part 800 40 CFR 6.301(b)	Requires Federal Agencies to take into account the effect of any Federally assisted undertaking or licensing on any property with historic, architectural, archeological, or cultural value that is included in or eligible for inclusion in the National Register of Historic Places.	Applicable Requirement
Archeological and Historic Preservation Act	16 USC § 469 40 CFR 6.301(c)	Establishes procedures to provide for preservation of significant scientific, prehistoric, historic, and archeological data that might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally licensed activity or program.	Applicable Requirement
Protection of Wetlands Executive Order No. 11990	40 CFR Part 6; Appendix A, 40 CFR 6.302(a)	Avoid adverse impacts associated with the destruction or loss of wetlands and avoid support of new construction in wetlands if a practicable alternative exists.	Applicable Requirement
Dredge and Fill Regulations	33 USC § 1344, 33 CFR 323.1 et. seq.	Prohibits discharge of dredged or fill material into waters of the United States without a permit	Relevant and Appropriate Requirement
Fish and Wildlife Coordination Act	16 USC Chapter 49, §§ 2901-2912; 40 CFR 6.302(g)	Requires consultation when Federal department or agency proposes or authorizes any modification of any stream or other water body to assure adequate protection of fish and wildlife resources.	Not an ARAR – no stream modification is contemplated for this removal action.

Table C–2. Location–Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon (continued)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL (continued)			
Floodplain Management Executive	Order No. 11988 40 CFR Part 6, Appendix A 40 CFR 6.302(b)	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain to the extent possible.	Applicable Requirement
Endangered Species Act	16 USC §§ 1531-1543; 40 CFR 6.302 (h); 50 CFR Part 402	Activities may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.	Applicable Requirement
Bald Eagle Protection Act	16 USC §§ 668 et seq.	Requires continued consultation with the USFWS during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald or golden eagle.	Applicable Requirement
Migratory Bird Treaty Act	16 USC §§ 703 et seq.	Establishes federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the USFWS during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds.	Applicable Requirement

Table C–3. Action–Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL			
Clean Water Act	33 USC § 1342		
National Pollutant Discharge Elimination System	40 CFR Part 122.26	In general, Part 122 provides permit requirements for the discharge of pollutants from any point source into waters of the United States. Part 122.26 requires permits for storm-water discharges.	Applicable Requirement
Surface Mining Control and Reclamation Act	30 USC §§ 1201-1328	Performance standards for surface mining activities.	Relevant and Appropriate Requirement
Hazardous Materials Transportation Act	49 USC §§ 1801-1813 49 CFR Parts 10, 171-177	Regulates transportation of hazardous materials.	Applicable Requirement
Resource Conservation and Recovery Act	46 USC § 7601		
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities	40 CFR Part 264.13.14	Requirements for proper handling, treatment, storage, and disposal of hazardous wastes.	Applicable Requirement
Land Disposal Restrictions (LDRs)	40 CFR Part 268	LDRs place specific restrictions (conc. or trmt) on RCRA hazardous wastes prior to their placement in a land disposal unit. Relevant and appropriate LDR requirements will be met if any material accumulations are treated ex situ.	Applicable Requirement
Disposal of Solid Waste	RCRA 42 U.S.C. § 6901 et seq; 40 CFR 257	Facility or practices in floodplains will not restrict flow of basic flood, reduce the temporary water storage capacity of the floodplain or otherwise result in a wash-out of solid waste.	Applicable Requirement

Table C–3. Action–Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon (continued)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL (continued)			
Closure Requirements	RCRA/HWMA 40 CFR & 264, Subpart G	Closure of hazardous waste repositories must meet protective standards. Regulations to minimize contaminant migration, provide leachate collection and prevent contaminant exposure will be met.	Applicable Requirement
Landfill Design and Construction	RCRA/HWMA 40 CFR & 264, Subpart N	Hazardous waste landfills must meet minimum design standards. Protectiveness will be achieved through capping and institutional controls.	Applicable Requirement
Groundwater Monitoring	RCRA/HWMA 40 CFR & 264, Subpart F 40 CFR & 264, Subpart X	Establishes standards for detection and compliance monitoring. Site wide monitoring will accommodate specific groundwater monitoring requirements.	Relevant and Appropriate Requirement
Occupational Exposure to Asbestos	29 CFR Parts 1910 and 1926.	Establishes OSHA requirements for asbestos-related work in the construction and demolition industry. Requirements on exposure limits, work practices and engineering controls to provide worker safety in handling, removal, disposal, or other workplace exposure to asbestos.	Relevant and Appropriate Requirement

Table C–3. Action–Specific Applicable or Relevant and Appropriate Requirements. Ajax/Magnolia Mines, Oregon (continued)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
STATE OF OREGON			
Fugitive Dust Emissions	40 CFR Section 50.6	Establishes standards for PM-10	Applicable Requirement
Asbestos Removal	OAR 340-32-5620 through 5650	Establish ODEQ requirements for licensing and certification for asbestos workers. All workers who handle asbestos-containing materials must meet certain training, licensing and certification requirements.	Relevant and Appropriate Requirement
	OAR 340-33-010 through 100	Establish ODEQ requirements for handling asbestos-containing materials. Handling, removing, transporting and disposing of asbestos material in a manner that prevents it from becoming friable and releasing asbestos fibers.	Relevant and Appropriate Requirement

APPENDIX D

COST ESTIMATE

Cost Estimate for Ajax/Magnolia Mines
Alternative 2 - Excavation and Off–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
AJAX MINE - ALTERNATIVE 2: EXCAVATION AND OFF-SITE DISPOSAL					
		Bat Gates Installation			
1	ea	Bat gate, installed at Ajax adit	$1,500.00	$1,500.00	USFS experience
8	hr	Demolish existing adit structure	$182.25	$1,458.00	estimate at hourly backhoe crew rate
		Bat Gates Installation Subtotal =		**$2,958.00**	
		Backfill Collapsed Vertical Shaft near WP-13			
370	cy	Excavate material from WP-13 shaft, 1cy backhoe	$2.43	$897.81	place in stockpile
8	hr	Cut and bury timbers and metal from WP-13 shaft	$182.25	$1,458.00	estimate at hourly backhoe crew rate
80	cy	Excavate/push waste rock from WP-13 into shaft, 300hp dozer	$2.15	$172.00	
370	cy	Backfill WP-13 shaft, 1cy backhoe	$2.43	$897.81	transfer from stockpile
2	hr	Grade/contour to drain	$182.25	$364.50	
2	hr	Compact backfill by tamping, 1cy backhoe	$182.25	$364.50	
20	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$83.60	obtain from meadow/repository site
20	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$56.00	
24	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$78.48	volume rounded up to whole number of trucks
20	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$56.00	estimate at excavate/load rate
1	msf	Fertilizer, 800/lb/ac	$16.88	$16.88	1,000 sf
1	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$82.50	Means+50% for USFS seed mix
1	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$67.50	Means+50% for USFS seed mix
1	cy	Mulch	$20.00	$20.00	$14-25/cy typical bulk retail cost
1	cy	Place mulch, backhoe	$182.25	$182.25	
4	hr	Spread mulch, by hand	$25.00	$100.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Backfill Vertical Shaft Subtotal =		**$4,897.82**	
		Mine Waste Excavation			
545	ea	Clear trees from WP-11, 335hp dozer, <12" dia.	$11.40	$6,215.28	assume 1 tree/10 sf
1200	cy	Excavate/load waste rock from WP-11; 1cy backhoe	$2.80	$3,360.00	
50	cy	Excavate/load red soil from near WP-11; 1cy backhoe	$2.80	$140.00	
1260	cy	Haul waste rock and red soil to stockpile, 1 mi r.t.	$3.91	$4,926.60	volume rounded up to whole number of trucks
2	wk	XRF rental	$2,530.00	$5,060.00	Ashtead Technology Rentals +10%
2	ea	Confirmation samples (total As, Mn, Pb)	$82.50	$165.00	SVL+10%
		Mine Waste Excavation Subtotal =		**$19,866.88**	
		Transportation and Disposal			
1260	cy	Load waste onto 20cy trucks, 1cy backhoe	$2.80	$3,528.00	
15120	mi	Haul waste to TSDF in 20cy truck, 240mi	$3.00	$45,360.00	
15120	mi	Fuel surcharge (estimate)	$0.20	$3,024.00	varies with fuel price
4	dy	Driver per diem	$130.00	$520.00	
4	ea	Mob/demob, per driver/truck combo, each way	$1,000.00	$4,000.00	TW Co from SLC, assume 4 trucks
1	ea	Mobilize/demobilize portable bridge	$20,000.00	$20,000.00	rough estimate
1	ea	Place/remove portable bridge on Granite Creek	$3,000.00	$3,000.00	rough estimate
1260	cy	TSDF tipping fee	$75.00	$94,500.00	US Ecology Grand View
		Transportation and Disposal Subtotal =		**$173,932.00**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 2 - Excavation and Off–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Stream Rehabilitation			
250	lf	Reconstruct stream channel, 1cy backhoe	$3.64	$909.94	assume equiv to excavating 0.5cy/lf @ 33% productivity
250	lf	Excavate new stream channel, 1cy backhoe	$3.64	$909.94	assume equiv to excavating 0.5cy/lf @ 33% productivity
250	lf	Coir fabric for stream banks, with stakes, etc.	$10.00	$2,500.00	based on Rolanka price list +14%
250	lf	Place soil back in banks, 1cy backhoe	$3.64	$909.94	assume equiv to excavating 0.5cy/lf @ 33% productivity
250	lf	Sew fabric, place stakes, etc	$5.00	$1,250.00	assume 4 man-hours per 20-lf roll
3	msf	Fertilizer, 800/lb/ac	$16.88	$50.64	new banks: 12x250ft
3	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$247.50	Means+50% for USFS seed mix
3	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$202.50	Means+50% for USFS seed mix
25	ea	Place root wads in banks	$1.50	$37.50	assume 1/10lf
250	ea	Plant willows	$1.50	$375.00	assume 1/lf
185	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$773.30	obtain from meadow/repository site
185	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$518.00	
192	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$627.84	volume rounded up to whole number of trucks
185	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$518.00	10,000sf; estimate at excavate/load rate
10	msf	Fertilizer, 800/lb/ac	$16.88	$168.80	10,000 sf
10	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$825.00	Means+50% for USFS seed mix
10	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$675.00	Means+50% for USFS seed mix
36	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$100.80	
36	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$507.60	source ~2mi S of confluence
36	cy	Place riprap in ditch	$2.27	$81.72	
		Stream Rehabilitation Subtotal =		**$12,189.01**	
		Miscellaneous			
1	L.S.	Staging area prep	$5,000.00	$5,000.00	
1	L.S.	Mobilization	$10,000.00	$10,000.00	est. $50/mi from Pendleton, plus $2500 rentals
1	L.S.	Temporary erosion control	$5,000.00	$5,000.00	
1	L.S.	Aditwater management during construction	$1,000.00	$1,000.00	
		Miscellaneous Subtotal =		**$21,000.00**	
		Monitoring and Maintenance (3 year total)			
1.5	ea	site visit, inspection	$1,000.00	$1,500.00	assume annual site visits after three years for both Ajax and Magnolia
		Monitoring and Maintenance Subtotal =		**$1,500.00**	
		SUMMARY			
		Bat Gates Installation Subtotal =		$2,958	
		Backfill Vertical Shaft Subtotal =		$4,898	
		Mine Waste Excavation Subtotal =		$19,867	
		Transportation and Disposal Subtotal =		$173,932	
		Stream Rehabilitation Subtotal =		$12,189	
		Miscellaneous Subtotal =		$21,000	
		Ajax Construction Total =		**$234,844**	
		Design 20% of construction		$46,969	
		Construction Management 10% of construction		$23,484	
		Monitoring and Maintenance Subtotal =		$1,500	
		Subtotal =		**$306,797**	
		Contingency 20%		$61,359	

4Q2004 Data for Pendleton, Oregon, from R.S. Means CostWorks, unless otherwise noted

Cost Estimate for Ajax/Magnolia Mines
Alternative 2 - Excavation and Off–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		ALTERNATIVE 2 TOTAL FOR AJAX MINE =		**$368,156**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 2 - Excavation and Off–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
MAGNOLIA MINE - ALTERNATIVE 2: EXCAVATION AND OFF-SITE DISPOSAL					
		Bat Gates Installation			
1	ea	Bat gate, installed at Magnolia adit	$1,500.00	$1,500.00	USFS experience
1	ea	Bat gate, installed at west adit across Lucas Gulch	$1,500.00	$1,500.00	USFS experience + 500% for access
16	hr	Demolish existing adit structures	$182.25	$2,916.00	estimate at hourly backhoe crew rate
		Bat Gates Installation Subtotal =		**$5,916.00**	
		Cabin and Debris Removal			
1800	cf	Demolish standing cabin	$0.27	$486.00	15'Lx10'Wx12'H
1800	cf	Demolish collapsed cabin	$0.27	$486.00	estimate at hourly backhoe crew rate
96	cy	Load wood and mill debris, 1cy backhoe	$2.80	$268.80	assume equivalent to 8 truckloads
96	cy	Haul wood and mill debris to stockpile at cabins, 12cy dump, 1/4mi r	$2.84	$272.64	assume equivalent to 8 truckloads
340	cy	Excavate local disposal pit, 1cy backhoe	$2.43	$825.01	assume 2x waste volume
170	cy	Place wood debris in disposal pit	$2.27	$385.90	
340	cy	Cover disposal pit, FE loader	$2.27	$771.80	
1	msf	Fertilizer, 800/lb/ac	$16.88	$16.88	1,000 sf
1	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$82.50	Means+50% for USFS seed mix
1	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$67.50	Means+50% for USFS seed mix
1	cy	Mulch	$20.00	$20.00	$14-25/cy typical bulk retail cost
1	cy	Place mulch, backhoe	$182.25	$182.25	
4	hr	Spread mulch, by hand	$25.00	$100.00	2MSF/day at 2" deep per 029-516-1900 (1996
		Cabin and Debris Removal Subtotal =		**$3,965.28**	
		Backfill Collapsed Vertical Shaft near WP-1			
1340	ea	Clear trees from roadway to WP-1, 335hp dozer, <12" dia.	$11.40	$15,276.00	assume 2 trees/lf
133	ea	Clear trees from adit/trench above WP-1, 335hp dozer, <12" dia.	$11.40	$1,516.20	estimate 30'x40'; 1 tree/sy
670	lf	Grade temporary road to WP-1, 300hp dozer	$0.77	$518.63	estimate similar to 10'Wx6"D excavation + 300ft haul
370	cy	Excavate material from WP-1 shaft, 1cy backhoe	$2.43	$897.81	place in stockpile
80	cy	Excavate/push waste rock from WP-1 into shaft, 300hp dozer	$2.15	$172.00	
370	cy	Backfill WP-1 shaft, 1cy backhoe	$2.43	$897.81	transfer from stockpile
2	hr	Grade/contour to drain	$182.25	$364.50	
2	hr	Compact backfill by tamping, 1cy backhoe	$182.25	$364.50	
20	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$83.60	obtain from meadow/repository site
20	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$56.00	
24	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$78.48	volume rounded up to whole number of trucks
20	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$56.00	estimate at excavate/load rate
670	lf	Rip temporary road to WP-1, 300hp dozer	$0.77	$518.63	estimate similar to 10'Wx6"D excavation + 300ft haul
8	msf	Fertilizer, 800/lb/ac	$16.88	$135.04	1,243sf shaft area + 10ft wide road
8	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$660.00	Means+50% for USFS seed mix
8	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$540.00	Means+50% for USFS seed mix
8	cy	Mulch	$20.00	$160.00	$14-25/cy typical bulk retail cost
8	cy	Place mulch, backhoe	$182.25	$1,458.00	
32	hr	Spread mulch, by hand	$25.00	$800.00	2MSF/day at 2" deep per 029-516-1900 (1996
		Backfill Vertical Shaft Subtotal =		**$24,553.19**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 2 - Excavation and Off–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Backfill Collapsed Adit Near WP-7			
1210	ea	Clear trees/brush for temporary road to WP-7, 335hp dozer	$11.40	$13,794.00	assume 2 trees/lf
333	ea	Clear trees from adit/trench above WP-7, 335hp dozer, <12" dia.	$11.40	$3,796.20	estimate 20'x150'; 1 tree/sy
605	lf	Grade temporary road to WP-7, 335hp dozer	$4.18	$2,528.90	estimate similar to 6" excavation + 300ft haul
400	cy	Excavate material along collapsed adit near WP-7, 1cy backhoe	$2.43	$970.60	12x6x150ft; place in stockpile
170	cy	Excavate/push waste rock from WP-7 into adit, 300hp dozer	$2.15	$365.50	5x6x150ft
400	cy	Backfill WP-7 adit, 1cy backhoe	$2.43	$970.60	transfer from stockpile
2	hr	Grade/contour to drain	$182.25	$364.50	
2	hr	Compact backfill by tamping, 1cy backhoe	$182.25	$364.50	
60	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$250.80	obtain from meadow/repository site
60	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$168.00	
60	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$196.20	volume rounded up to whole number of trucks
60	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$168.00	20x150ft; estimate at excavate/load rate
605	lf	Rip temporary road to WP-7, 300hp dozer	$0.77	$468.31	estimate similar to 10'Wx6"D excavation + 300ft haul
10	msf	Fertilizer, 800/lb/ac	$16.88	$168.80	3578sf shaft area + 10ft wide road
10	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$825.00	Means+50% for USFS seed mix
10	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$675.00	Means+50% for USFS seed mix
10	cy	Mulch	$20.00	$200.00	$14-25/cy typical bulk retail cost
10	cy	Place mulch, backhoe	$182.25	$1,822.50	
40	hr	Spread mulch, by hand	$25.00	$1,000.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Backfill Collapsed Adits Subtotal =		**$29,097.41**	
		Mine Waste Excavation			
1264	ea	Clear trees/brush from WP-1,2,3,4,5,6,8, 335hp dozer	$11.40	$14,405.27	assume 1 tree/10 sf
1940	cy	Excavate/load waste rock from WP-1,2,3,4,5,6,8; 1cy backhoe	$2.80	$5,432.00	volume rounded up
100	cy	Excavate/load soil from near crusher, 1cy backhoe	$2.80	$280.00	1ft over 2446sf
150	cy	Excavate/load settling pond sludge; 1cy backhoe	$2.80	$420.00	1.5ft over area
2196	cy	Haul waste to stockpile, 12cy dump, 1/4 mi round trip	$2.84	$6,236.64	
526	ea	Clear trees/brush from WP-7, 335hp dozer	$11.40	$5,991.27	assume 1 tree/10 sf
860	cy	Excavate/load WP-7 waste rock; 1cy backhoe	$2.80	$2,408.00	170 cy were used in adit backfill
864	cy	Haul WP-7 waste rock to stockpile, 12cy dump, 1/2 mi r.t.	$3.27	$2,825.28	volume rounded up to whole number of trucks
4	wk	XRF rental	$2,530.00	$10,120.00	Ashtead Technology Rentals +10%
10	ea	Confirmation samples (total As, Mn, Pb)	$82.50	$825.00	SVL+10%
380	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$1,588.40	obtain from meadow/repository site
380	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$1,064.00	
84	cy	Haul stockpiled soil to WP-7, 12cy dump, 1/2mi r.t.	$3.27	$274.68	volume rounded up to whole number of trucks
300	cy	Haul stockpiled soil to other excavated areas, 12cy dump, 1/2mi r.t.	$3.27	$981.00	volume rounded up to whole number of trucks
380	cy	Place 6" soil cover, 1cy backhoe	$2.80	$1,064.00	estimate at excavate/load rate
25	msf	Fertilizer, 800/lb/ac	$16.88	$422.00	waste piles, mill, WP-7 and -1 shaft and WP-1 repository, +15%
25	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$2,062.50	Means+50% for USFS seed mix, 15% buffer zone area
25	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$1,687.50	Means+50% for USFS seed mix
25	cy	Mulch	$20.00	$500.00	$14-25/cy typical bulk retail cost
25	cy	Place mulch, backhoe	$182.25	$4,556.25	
100	hr	Spread mulch, by hand	$25.00	$2,500.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Mine Waste Excavation Subtotal =		**$51,238.52**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 2 - Excavation and Off–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Transportation and Disposal			
3060	cy	Load waste onto 20cy trucks, 1cy backhoe	$2.80	$8,568.00	volume rounded up to whole number of trucks
36720	mi	Haul waste to TSDF in 20cy truck, 240mi	$3.00	$110,160.00	
36720	mi	Fuel surcharge (estimate)	$0.20	$7,344.00	varies with fuel price
4	dy	Driver per diem	$130.00	$520.00	
4	ea	Mob/demob, per driver/truck combo, each way	$1,000.00	$4,000.00	TW Co from SLC, assume 4 trucks
1	ea	Mobilize/demobilize portable bridge	$20,000.00	$20,000.00	rough estimate
1	ea	Place/remove portable bridge on Granite Creek	$3,000.00	$3,000.00	rough estimate
3060	cy	TSDF tipping fee	$75.00	$229,500.00	US Ecology Grand View
		Transportation and Disposal Subtotal =		**$383,092.00**	
		Miscellaneous			
1	L.S.	Staging area prep	$5,000.00	$5,000.00	
1	L.S.	Mobilization	$10,000.00	$10,000.00	est. $50/mi from Pendleton, plus $2500 rentals
1	L.S.	Temporary erosion control	$5,000.00	$5,000.00	
1	L.S.	Aditwater management during construction	$3,000.00	$3,000.00	
		Miscellaneous Subtotal =		**$23,000.00**	
		Monitoring and Maintenance (3 year total)			
1.5	ea	site visit, inspection	$1,000.00	$1,500.00	assume annual site visits for three years for both Ajax and Magnolia
		Monitoring and Maintenance Subtotal =		**$1,500.00**	
		SUMMARY			
		Bat Gates Installation Subtotal =		$5,916	
		Cabin and Debris Removal Subtotal =		$3,965	
		Backfill Vertical Shaft Subtotal =		$24,553	
		Backfill Collapsed Adits Subtotal =		$29,097	
		Mine Waste Excavation Subtotal =		$51,239	
		Transportation and Disposal Subtotal =		$383,092	
		Miscellaneous Subtotal =		$23,000	
		Magnolia Construction Total =		**$520,862**	
		Design 20% of construction		$104,172	
		Construction Management 10% of construction		$52,086	
		Monitoring and Maintenance Subtotal =		$1,500	
		Subtotal =		**$678,621**	
		Contingency 20% of subtotal		$135,724	
		ALTERNATIVE 2 TOTAL FOR MAGNOLIA MINE =		**$814,345**	

4Q2004 Data for Pendleton, Oregon, from R.S. Means CostWorks, unless otherwise noted

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
AJAX MINE - ALTERNATIVE 3: EXCAVATION AND ON-SITE DISPOSAL					
		Construction			
		Bat Gates Installation			
1	ea	Bat gate, installed at Ajax adit	$1,500.00	$1,500.00	USFS experience
8	hr	Demolish existing adit structure	$182.25	$1,458.00	estimate at hourly backhoe crew rate
		Bat Gates Installation Subtotal =		**$2,958.00**	
		Backfill Collapsed Vertical Shaft Near WP-13			
370	cy	Excavate material from WP-13 shaft, 1cy backhoe	$2.43	$897.81	place in stockpile
8	hr	Cut and bury timbers and metal from WP-13 shaft	$182.25	$1,458.00	estimate at hourly backhoe crew rate
80	cy	Excavate/push waste rock from WP-13 into shaft, 300hp dozer	$2.15	$172.00	
370	cy	Backfill WP-13 shaft, 1cy backhoe	$2.43	$897.81	transfer from stockpile
2	hr	Grade/contour to drain	$182.25	$364.50	
2	hr	Compact backfill by tamping, 1cy backhoe	$182.25	$364.50	
20	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$83.60	obtain from meadow/repository site
20	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$56.00	
24	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$78.48	volume rounded up to whole number of trucks
20	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$56.00	estimate at excavate/load rate
1	msf	Fertilizer, 800/lb/ac	$16.88	$16.88	1,000 sf
1	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$82.50	Means+50% for USFS seed mix
1	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$67.50	Means+50% for USFS seed mix
1	cy	Mulch	$20.00	$20.00	$14-25/cy typical bulk retail cost
1	cy	Place mulch, backhoe	$182.25	$182.25	
4	hr	Spread mulch, by hand	$25.00	$100.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Backfill Vertical Shaft Subtotal =		**$4,897.82**	
		Mine Waste Excavation and Placement			
595	ea	Clear trees/brush from WP-11, 335hp dozer, <12" dia.	$11.40	$6,785.28	assume 1 tree/10 sf
1200	cy	Excavate/load waste rock from WP-11; 1cy backhoe	$2.80	$3,360.00	
50	cy	Excavate/load red soil from near WP-11; 1cy backhoe	$2.80	$140.00	
1260	cy	Haul waste rock and red soil to stockpile, 1 mi r.t.	$3.91	$4,926.60	volume rounded up to whole number of trucks
1250	cy	Place waste in repository, FE loader	$2.27	$2,837.50	
1250	cy	Compact waste, 6" lifts, sheepsfoot	$0.57	$712.50	
2	wk	XRF rental	$2,530.00	$5,060.00	Ashtead Technology Rentals +10%
2	ea	Confirmation samples (total As, Mn, Pb)	$82.50	$165.00	SVL+10%
		Mine Waste Excavation and Placement Subtotal =		**$23,986.88**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Stream Rehabilitation			
250	lf	Reconstruct stream channel, 1cy backhoe	$3.64	$909.94	assume equiv to excavating 0.5cy/lf @ 33% productivity
250	lf	Excavate new stream channel, 1cy backhoe	$3.64	$909.94	assume equiv to excavating 0.5cy/lf @ 33% productivity
250	lf	Coir fabric for stream banks, with stakes, etc.	$10.00	$2,500.00	based on Rolanka price list +14%
250	lf	Place soil back in banks, 1cy backhoe	$3.64	$909.94	assume equiv to excavating 0.5cy/lf @ 33% productivity
250	lf	Sew fabric, place stakes, etc	$5.00	$1,250.00	assume 4 man-hours per 20-lf roll
3	msf	Fertilizer, 800/lb/ac	$16.88	$50.64	new banks: 12x250ft
3	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$247.50	Means+50% for USFS seed mix
3	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$202.50	Means+50% for USFS seed mix
25	ea	Place root wads in banks	$1.50	$37.50	assume 1/10lf
250	ea	Plant willows	$1.50	$375.00	assume 1/lf
185	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$773.30	obtain from meadow/repository site
185	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$518.00	
192	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$627.84	volume rounded up to whole number of trucks
185	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$518.00	10,000sf; estimate at excavate/load rate
10	msf	Fertilizer, 800/lb/ac	$16.88	$168.80	10,000 sf
10	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$825.00	Means+50% for USFS seed mix
10	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$675.00	Means+50% for USFS seed mix
36	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$100.80	
36	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$507.60	source ~2mi S of confluence
36	cy	Place riprap in ditch	$2.27	$81.72	
		Stream Rehabilitation Subtotal =		**$12,189.01**	
		Miscellaneous			
1	L.S.	Staging area prep	$5,000.00	$5,000.00	
1	L.S.	Mobilization	$10,000.00	$10,000.00	est. $50/mi from Pendleton, plus $2500 rentals
1	ea	Mobilize/demobilize portable bridge	$20,000.00	$20,000.00	rough estimate
1	ea	Place/remove portable bridge on Granite Creek	$3,000.00	$3,000.00	rough estimate
1	L.S.	Temporary erosion control	$5,000.00	$5,000.00	
1	L.S.	Aditwater management during construction	$1,000.00	$1,000.00	
		Miscellaneous Subtotal =		**$44,000.00**	
		Monitoring and Maintenance (3 year total)			
1.5	ea	site visit, inspection	$1,600.00	$2,400.00	assume annual visits for three years for both Ajax and Magnolia
24	ea	Stream water analysis: TALM (incl. MS/MSD alternate events)	$286.00	$6,864.00	totals only, SVL+10%
		Monitoring and Maintenance Subtotal =		**$9,264.00**	
		SUMMARY			
		Bat Gates Installation Subtotal =		$2,958	
		Backfill Vertical Shaft Subtotal =		$4,898	
		Mine Waste Excavation and Placement Subtotal =		$23,987	
		Share of repository construction cost allocated to Ajax (opt#1)		$50,955	
		Stream Rehabilitation Subtotal =		$12,189	
		Miscellaneous Subtotal =		$44,000	
		Ajax Construction Total		$138,986	
		Design 20% of construction		$27,797	
		Construction Management 10% of construction		$13,899	
		Monitoring and Maintenance Subtotal =		$9,264	
		Subtotal		$189,946	
		Contingency 20%		$37,989	

4Q2004 Data for Pendleton, Oregon, from R.S. Means CostWorks, unless otherwise noted

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		ALTERNATIVE 3 TOTAL FOR AJAX MINE (cover option 1) =		**$227,936**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		SUMMARY			
		Bat Gates Installation Subtotal =		$2,958	
		Backfill Vertical Shaft Subtotal =		$4,898	
		Mine Waste Excavation and Placement Subtotal =		$23,987	
		Share of repository construction cost allocated to Ajax (opt#1)		$29,424	
		Stream Rehabilitation Subtotal =		$12,189	
		Miscellaneous Subtotal =		$44,000	
		Ajax Construction Total		$117,456	
		Design 20% of construction		$23,491	
		Construction Management 10% of construction		$11,746	
		Monitoring and Maintenance Subtotal =		$9,264	
		Subtotal		$161,956	
		Contingency 20%		$32,391	
		ALTERNATIVE 3 TOTAL FOR AJAX MINE (cover option 2) =		**$194,348**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
MAGNOLIA MINE - ALTERNATIVE 3: EXCAVATION AND ON-STE DISPOSAL					
		Construction			
		Bat Gates Installation			
1	ea	Bat gate, installed at Magnolia adit	$1,500.00	$1,500.00	USFS experience
1	ea	Bat gate, installed at west adit across Lucas Gulch	$1,500.00	$1,500.00	USFS experience + 500% for access
16	hr	Demolish existing adit structures	$182.25	$2,916.00	estimate at hourly backhoe crew rate
		Bat Gates Installation Subtotal =		**$5,916.00**	
		Cabin and Debris Removal			
1800	cf	Demolish standing cabin	$0.27	$486.00	15'Lx10'Wx12'H
1800	cf	Demolish collapsed cabin	$0.27	$486.00	estimate at hourly backhoe crew rate
96	cy	Load mill and wood debris, 1cy backhoe	$2.80	$268.80	assume equivalent to 8 truckloads
96	cy	Haul mill and wood debris to stockpile at cabins, 12cy dump, 1/4mi r.t.	$2.84	$272.64	assume equivalent to 8 truckloads
340	cy	Excavate local disposal pit, 1cy backhoe	$2.43	$825.01	assume 2x waste volume
170	cy	Place wood debris in disposal pit	$2.27	$385.90	
340	cy	Cover disposal pit, FE loader	$2.27	$771.80	
1	msf	Fertilizer, 800/lb/ac	$16.88	$16.88	1,000 sf
1	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$82.50	Means+50% for USFS seed mix
1	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$67.50	Means+50% for USFS seed mix
1	cy	Mulch	$20.00	$20.00	$14-25/cy typical bulk retail cost
1	cy	Place mulch, backhoe	$182.25	$182.25	
4	hr	Spread mulch, by hand	$25.00	$100.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Cabin and Debris Removal Subtotal =		**$3,965.28**	
		Backfill Collapsed Vertical Shaft Near WP-1			
1340	ea	Clear trees from roadway to WP-1, 335hp dozer, <12" dia.	$11.40	$15,276.00	assume 2 trees/lf
133	ea	Clear trees from adit/trench above WP-1, 335hp dozer, <12" dia.	$11.40	$1,516.20	estimate 30'x40'; 1 tree/sy
670	lf	Grade temporary road to WP-1, 300hp dozer	$0.77	$518.63	estimate similar to 10'Wx6"D excavation + 300ft haul
370	cy	Excavate material from WP-1 shaft, 1cy backhoe	$2.43	$897.81	place in stockpile
80	cy	Excavate/push waste rock from WP-1 into shaft, 300hp dozer	$2.15	$172.00	
370	cy	Backfill WP-1 shaft, 1cy backhoe	$2.43	$897.81	transfer from stockpile
2	hr	Grade/contour to drain	$182.25	$364.50	
2	hr	Compact backfill by tamping, 1cy backhoe	$182.25	$364.50	
20	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$83.60	obtain from meadow/repository site
20	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$56.00	
24	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$78.48	volume rounded up to whole number of trucks
20	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$56.00	estimate at excavate/load rate
670	lf	Rip temporary road to WP-1, 300hp dozer	$0.77	$518.63	estimate similar to 10'Wx6"D excavation + 300ft haul
8	msf	Fertilizer, 800/lb/ac	$16.88	$135.04	1,243sf shaft area + 10ft wide road
8	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$660.00	Means+50% for USFS seed mix
8	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$540.00	Means+50% for USFS seed mix
8	cy	Mulch	$20.00	$160.00	$14-25/cy typical bulk retail cost
8	cy	Place mulch, backhoe	$182.25	$1,458.00	
32	hr	Spread mulch, by hand	$25.00	$800.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Backfill Vertical Shaft Subtotal =		**$24,553.19**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Backfill Collapsed Adit Near WP-7			
1210	ea	Clear trees/brush for temporary road to WP-7, 335hp dozer <12" dia.	$11.40	$13,794.00	assume 2 trees/lf
333	ea	Clear trees from adit/trench above WP-7, 335hp dozer, <12" dia.	$11.40	$3,796.20	estimate 20'x150'; 1 tree/sy
605	lf	Grade temporary road to WP-7, 335hp dozer	$4.18	$2,528.90	estimate similar to 6" excavation + 300ft haul
400	cy	Excavate material along collapsed adit near WP-7, 1cy backhoe	$2.43	$970.60	12x6x150ft; place in stockpile
170	cy	Excavate/push waste rock from WP-7 into adit, 300hp dozer	$2.15	$365.50	5x6x150ft
400	cy	Backfill WP-7 adit, 1cy backhoe	$2.43	$970.60	transfer from stockpile
2	hr	Grade/contour to drain	$182.25	$364.50	
2	hr	Compact backfill by tamping, 1cy backhoe	$182.25	$364.50	
60	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$250.80	obtain from meadow/repository site
60	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$168.00	
60	cy	Haul stockpiled soil, 12cy dump, 1/2mi r.t.	$3.27	$196.20	volume rounded up to whole number of trucks
60	cy	Place 6" soil cover on excavated waste area, 1cy backhoe	$2.80	$168.00	20x150ft; estimate at excavate/load rate
605	lf	Rip temporary road to WP-7, 300hp dozer	$0.77	$468.31	estimate similar to 10'Wx6"D excavation + 300ft haul
10	msf	Fertilizer, 800/lb/ac	$16.88	$168.80	3578sf shaft area + 10ft wide road
10	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$825.00	Means+50% for USFS seed mix
10	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$675.00	Means+50% for USFS seed mix
10	cy	Mulch	$20.00	$200.00	$14-25/cy typical bulk retail cost
10	cy	Place mulch, backhoe	$182.25	$1,822.50	
40	hr	Spread mulch, by hand	$25.00	$1,000.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Backfill Collapsed Adits Subtotal =		**$29,097.41**	
		Mine Waste Excavation and Placement			
1264	ea	Clear trees/brush from WP-1,2,3,4,5,6,8; 335hp dozer <12" dia.	$11.40	$14,405.27	assume 1 tree/10 sf
1940	cy	Excavate/load waste rock from WP-1,2,3,4,5,6,8; 1cy backhoe	$2.80	$5,432.00	volume rounded up
100	cy	Excavate/load soil from near crusher, 1cy backhoe	$2.80	$280.00	1ft over 2446sf
150	cy	Excavate/load settling pond sludge; 1cy backhoe	$2.80	$420.00	1.5ft over area
2196	cy	Haul waste to repository, 12cy dump, 1/4 mi round trip	$2.84	$6,236.64	volume rounded up to whole number of trucks
2190	cy	Place waste in repository, FE loader	$2.27	$4,971.30	
2190	cy	Compact waste, 6" lifts, sheepsfoot	$0.57	$1,248.30	
526	ea	Clear trees/brush from WP-1,2,3,4,5,6,8; 335hp dozer <12" dia.	$11.40	$5,991.27	assume 1 tree/10 sf
860	cy	Excavate/load WP-7 waste rock; 1cy backhoe	$2.80	$2,408.00	170cy were used in adit backfill
864	cy	Haul WP-7 waste rock to repository, 12cy dump, 1/2 mi r.t.	$3.27	$2,825.28	volume rounded up to whole number of trucks
860	cy	Place waste in repository, FE loader	$2.27	$1,952.20	
860	cy	Compact waste, 6" lifts, sheepsfoot	$0.57	$490.20	
4	wk	XRF rental	$2,530.00	$10,120.00	Ashtead Technology Rentals +10%
10	ea	Confirmation samples (total As, Mn, Pb)	$82.50	$825.00	SVL+10%
380	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$1,588.40	obtain from meadow/repository site
380	cy	Load stockpiled soil into truck, 1cy backhoe	$2.80	$1,064.00	
84	cy	Haul stockpiled soil to WP-7, 12cy dump, 1/2mi r.t.	$3.27	$274.68	volume rounded up to whole number of trucks
300	cy	Haul stockpiled soil to other excavated areas, 12cy dump, 1/2mi r.t.	$3.27	$981.00	volume rounded up to whole number of trucks
380	cy	Place 1ft soil cover, 1cy backhoe	$2.80	$1,064.00	estimate at excavate/load rate
25	msf	Fertilizer, 800/lb/ac	$16.88	$422.00	waste piles, mill, WP-7 and -1 shaft and WP-1 repository, +15%
25	msf	Seeding, slope mix, 6lb/MSF, push spreader	$82.50	$2,062.50	Means+50% for USFS seed mix
25	msf	Seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$1,687.50	Means+50% for USFS seed mix
25	cy	Mulch	$20.00	$500.00	$14-25/cy typical bulk retail cost
25	cy	Place mulch, backhoe	$182.25	$4,556.25	
100	hr	Spread mulch, by hand	$25.00	$2,500.00	2MSF/day at 2" deep per 029-516-1900 (1996)
		Mine Waste Excavation and Placement Subtotal =		**$59,900.52**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Construct Repository at Magnolia Meadow			
		Common items			
410	lf	Cut drainage ditch, 30"Wx1'D	$1.00	$410.00	assume 1200 lf/ day for Means crew instead of 6000lf/day
4	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$11.20	assume 10'x10'x1'
12	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$169.20	source ~2mi S of confluence; round up to nearest truckload
4	cy	Place riprap in ditch outlet	$2.27	$9.08	
1665	ea	Clear trees from repository and stockpile areas, 335hp dozer, <12" dia.	$11.40	$18,981.00	assume 1tree/4sf over 1/4 of footprint
		Cover option 1: polypropylene liner			
2570	cy	Excavate/stockpile topsoil, 300hp dozer, 300'haul	$4.18	$10,742.60	assume 2'Dx(26,645sf+800' perimeter 10'W)
500	cy	Compact bottom of repository, 6" lift, sheepsfoot	$0.57	$285.00	one lift on 26645sf
1000	cy	Screen <3/4" dia. from topsoil for drainage layer on geomembrane	$5.00	$5,000.00	70% passed #4 screen, but assume 50% yield
500	cy	Place coarse <3/4" dia. in 6" drainage layer	$2.27	$1,135.00	6"Dx26,645sf
2000	cy	Screen fines from topsoil for drainage layer on geomembrane	$5.00	$10,000.00	70% passed #4 screen, but assume 50% yield
1000	cy	Place fines in 1' bedding layer under geomembrane	$2.27	$2,270.00	1'Dx26,645sf
41570	sf	45mil liner, installed (assume 20% waste/selvage)	$1.00	$41,556.70	Serrot Oct2001 + 42%
4620	sy	Filter fabric, 8oz non-woven (assume 20% waste/selvage)	$1.28	$5,904.36	Specialty Construction Supply 2001 +42%
8	hr	Install filter fabric over drainage layer	$182.25	$1,458.00	hourly for backhoe crew
2570	cy	Excavate/load topsoil from stockpile, 1cy backhoe	$2.80	$7,196.00	assume 2'Dx(26,645sf+800' perimeter 10'W) +18% bulking
2570	cy	Compact topsoil, 6" lifts, sheepsfoot	$0.57	$1,464.90	
35	msf	Fertilizer, 800/lb/ac	$16.88	$590.80	26,645sf+800' perimeter 10'W
35	msf	Repository seeding, slope mix, 6lb/MSF, push spreader	$82.50	$2,887.50	Means+50% for USFS seed mix
35	msf	Repository seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$2,362.50	Means+50% for USFS seed mix
35	cy	Mulch	$20.00	$700.00	$14-25/cy typical bulk retail cost
35	cy	Place mulch, backhoe	$182.25	$6,378.75	
140	hr	Spread mulch, by hand	$25.00	$3,500.00	2MSF/day at 2" deep per 029-516-1900 (1996)
24	hr	Place cut trees on soil	$182.25	$4,374.00	hourly for backhoe
		Construct Repository with Cover Option 1 Subtotal =		$127,386.59	
		Cover option 2: soil cover			
2570	cy	Excavate/stockpile topsoil, 300hp dozer, 300'haul	$4.18	$10,742.60	assume 2'Dx(26,645sf+800' perimeter 10'W)
500	cy	Compact bottom of repository, 6" lift, sheepsfoot	$0.57	$285.00	one lift on 26645sf
1000	cy	Screen <3/4" dia. from topsoil for capillary break	$5.00	$5,000.00	70% passed #4 screen, but assume 50% yield
500	cy	Place coarse <3/4" dia. in 6" capillary break	$2.27	$1,135.00	6"Dx26,645sf
4620	sy	Filter fabric, 8oz non-woven (assume 20% waste/selvage)	$1.28	$5,904.36	Specialty Construction Supply 2001 +42%
8	hr	Install filter fabric over capillary break	$182.25	$1,458.00	hourly for backhoe crew
2570	cy	Excavate/load topsoil from stockpile, 1cy backhoe	$2.80	$7,196.00	assume 2'Dx(26,645sf+800' perimeter 10'W) +18% bulking
2570	cy	Compact topsoil, 6" lifts, sheepsfoot	$0.57	$1,464.90	
35	msf	Fertilizer, 800/lb/ac	$16.88	$590.80	26,645sf+800' perimeter 10'W
35	msf	Repository seeding, slope mix, 6lb/MSF, push spreader	$82.50	$2,887.50	Means+50% for USFS seed mix
35	msf	Repository seeding, wildflowers, 0.6lb/MSF, push spreader	$67.50	$2,362.50	Means+50% for USFS seed mix
35	cy	Mulch	$20.00	$700.00	$14-25/cy typical bulk retail cost
35	cy	Place mulch, backhoe	$182.25	$6,378.75	
140	hr	Spread mulch, by hand	$25.00	$3,500.00	2MSF/day at 2" deep per 029-516-1900 (1996)
24	hr	Place cut trees on soil	$182.25	$4,374.00	hourly for backhoe crew
		Construct Repository with Cover Option 2 Subtotal =		$73,559.89	
3050	cy	Waste rock and sludge from Magnolia to repository			
1250	cy	Waste rock and sludge from Ajax to repository			
81%		Share of repository construction cost allocated to Magnolia (opt#1)		**$103,183.14**	added 10%, in case Ajax not done
81%		Share of repository construction cost allocated to Magnolia (opt#2)		**$59,583.51**	added 10%, in case Ajax not done
40%		Share of repository construction cost allocated to Ajax (opt#1)		**$50,954.64**	added 10%, in case Magnolia not done
40%		Share of repository construction cost allocated to Ajax (opt#2)		**$29,423.96**	added 10%, in case Magnolia not done

4Q2004 Data for Pendleton, Oregon, from R.S. Means CostWorks, unless otherwise noted

Cost Estimate for Ajax/Magnolia Mines
Alternative 3- Excavation and On–Site Disposal

Qty	Unit	Description	Unit Cost	Cost	Comment
		Miscellaneous			
1	L.S.	Staging area prep	$5,000.00	$5,000.00	
1	L.S.	Mobilization	$10,000.00	$10,000.00	est. $50/mi from Pendleton, plus $2500 rentals
1	ea	Mobilize/demobilize portable bridge	$20,000.00	$20,000.00	rough estimate
1	ea	Place/remove portable bridge on Granite Creek	$3,000.00	$3,000.00	rough estimate
1	L.S.	Temporary erosion control	$5,000.00	$5,000.00	
1	L.S.	Aditwater management during construction	$3,000.00	$3,000.00	
		Miscellaneous Subtotal =		**$46,000.00**	
		Monitoring and Maintenance (3 year total)			
1.5	ea	site visit, inspection	$1,600.00	$2,400.00	assume annual visits for three years for both Ajax and Magnolia
24	ea	Stream water analysis: TALM (incl. MS/MSD alternate events)	$286.00	$6,864.00	totals only, SVL+10%
		Monitoring and Maintenance Subtotal =		**$9,264.00**	

SUMMARY	
Bat Gates Installation Subtotal =	$5,916
Cabin and Debris Removal Subtotal =	$3,965
Backfill Vertical Shaft Subtotal =	$24,553
Backfill Collapsed Adits Subtotal =	$29,097
Mine Waste Excavation and Placement Subtotal =	$59,901
Share of repository construction cost allocated to Magnolia (opt#1)	$103,183
Miscellaneous Subtotal =	$46,000
Magnolia Construction Total	$272,616
Design 20% of construction	$54,523
Construction Management 10% of construction	$27,262
Monitoring and Maintenance Subtotal =	$9,264
Subtotal	$363,664
Contingency 20% of subtotal	$72,733

ALTERNATIVE 3 TOTAL FOR MAGNOLIA MINE (cover option 1)= $436,397

SUMMARY	
Bat Gates Installation Subtotal =	$5,916
Cabin and Debris Removal Subtotal =	$3,965
Backfill Vertical Shaft Subtotal =	$24,553
Backfill Collapsed Adits Subtotal =	$29,097
Mine Waste Excavation and Placement Subtotal =	$59,901
Share of repository construction cost allocated to Magnolia (opt#1)	$59,584
Miscellaneous Subtotal =	$46,000
Magnolia Construction Total	$229,016
Design 20% of construction	$45,803
Construction Management 10% of construction	$22,902
Monitoring and Maintenance Subtotal =	$9,264
Subtotal	$306,985
Contingency 20% of subtotal	$61,397

ALTERNATIVE 3 TOTAL FOR MAGNOLIA MINE (cover option 2) = $368,382

Cost Estimate for Ajax/Magnolia Mines
Alternative 4 - Adit Discharge Treatment

Qty	Unit	Description	Unit Cost	Cost	Comment
AJAX MINE - ALTERNATIVE 4: ADIT DISCHARGE TREATMENT					
		Sediment Pond Construction			
30	lf	Excavate inlet culvert trench, 1cy backhoe	$1.00	$30.00	30"Wx3'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
30	lf	Place drain pipe, 8", corrugated double-walled HDPE	$7.62	$228.69	027-168-2040 (1996) +50%
9	cy	Backfill inlet culvert trench 1cy backhoe	$2.80	$25.20	
1	hr	Compact trench by tamping, 1cy backhoe	$182.25	$182.25	
25	cy	Excavate pond, 1cy backhoe	$2.43	$60.66	assume balanced cut/fill, so ½ of pond volume
1	hr	Compact pond bottom by tamping, 1cy backhoe	$182.25	$182.25	
32	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$133.76	obtain from meadow/repository site; 50% yield so 2X volume
32	cy	Screen fines from topsoil for liner bedding	$5.00	$160.00	70% passed #4 screen, but assume 50% yield
16	cy	Load fines into truck, 1cy backhoe	$2.80	$44.80	
24	cy	Haul fines, 12cy dump, 1/2mi r.t.	$3.27	$78.48	volume rounded up to whole number of trucks
16	cy	Place fines in 6" bedding layer under liner	$2.27	$36.32	
1152	sf	45mil liner, installed (assume 20% waste/selvage)	$1.00	$1,152.00	Serrot Oct2001 + 42%; 24'x40' to include anchor + 20%
140	lf	Excavate diversion channel	$1.00	$140.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
30	lf	Excavate outlet channel	$1.00	$30.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
23	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$64.40	
24	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$338.40	source ~2mi S of confluence; vol. rounded to whole number of trucks
8	cy	Place riprap in diversion & outlet channels, 1cy backhoe	$2.27	$18.16	
15	cy	Place riprap along pond berm	$2.27	$34.05	assume 400sf x 1'
1	L.S.	Staging area prep	$1,000.00	$1,000.00	assume temporary bridge already in place
1	L.S.	Mobilization	$5,000.00	$5,000.00	est. $50/mi from Pendleton, plus $2500 rentals
		Sediment Pond Construction Subtotal =		**$8,939.42**	
		Sediment Pond Monitoring and Maintenance (3 year total)			
3	ea	Site visit, twice/year; flow measurements; inspection	$1,200.00	$3,600.00	Twice a year for 3 years for both Ajax and Magnolia
24	ea	Water analysis: TALM (incl. MS/MSD alternate events)	$286.00	$6,864.00	totals only, SVL+10%
3/10	ea	Excavate pond sludge and dispose of in repository	$5,000.00	$1,500.00	estimate 8cy/10yr
		Sediment Pond Monitoring/Maintenance Subtotal =		**$11,964.00**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 4 - Adit Discharge Treatment

Qty	Unit	Description	Unit Cost	Cost	Comment
		Aerobic Wetland Construction			
34	lf	Excavate inlet culvert trench, 1cy backhoe	$1.00	$34.00	30"Wx3'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
34	lf	Place drain pipe, 12", corrugated double-walled HDPE	$7.62	$259.18	027-168-2040 (1996) +50%
10	cy	Backfill inlet culvert trench 1cy backhoe	$2.80	$28.00	
1	hr	Compact trench by tamping, 1cy backhoe	$182.25	$182.25	
37	cy	Excavate wetland, 1cy backhoe	$2.43	$89.78	assume balanced cut/fill, so ½ of wetland volume
2	hr	Compact wetland bottom by tires, 1cy backhoe	$182.25	$364.50	
34	cy	Load sand into truck, 1cy backhoe	$2.80	$95.20	
36	cy	Purchase and haul sand, 12cy dump, 120mi r.t.	$22.72	$817.92	3hr/load; rounded to whole number of trucks
34	cy	Place 6" sand bedding layer under liner, FE loader	$2.27	$77.18	
1555	sf	45mil liner, installed (assume 20% waste/selvage)	$1.00	$1,555.20	Serrot Oct2001 + 42%; 54'x24' to include anchor+ 20%
67	cy	Load compost into truck, 1cy backhoe	$2.80	$186.48	
72	cy	Purchase and haul compost, 12cy dump, 120mi r.t.	$25.72	$1,852.11	3hr/load; rounded to whole number of trucks
67	cy	Place compost in wetland, FE loader	$2.27	$151.18	
7	cy	Load gravel into truck, 1cy backhoe	$2.80	$20.72	
12	cy	Purchase and haul gravel, 12cy dump, 120mi r.t.	$25.72	$308.68	3hr/load; rounded to whole number of trucks
7	cy	Place gravel in wetland, FE loader	$2.27	$16.80	assume 10% gravel and 90% compost mixture by volume
74	cy	Mix gravel and compost in wetland, 1cy backhoe	$2.43	$179.56	use rate for excavation
44	lf	Extend diversion channel	$1.00	$44.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
30	lf	Excavate outlet channel	$1.00	$30.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
23	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$64.40	
24	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$338.40	source ~2mi S of confluence; vol. rounded to whole number of trucks
8	cy	Place riprap in diversion & outlet channels, 1cy backhoe	$2.27	$18.16	
15	cy	Place riprap along wetland berm	$2.27	$34.05	assume 400sf x 1'
1	ea	Mobilize/demobilize portable bridge	$20,000.00	$20,000.00	rough estimate
1	ea	Place/remove portable bridge on Granite Creek	$3,000.00	$3,000.00	rough estimate
1	L.S.	Staging area prep	$2,000.00	$2,000.00	
1	L.S.	Mobilization	$5,000.00	$5,000.00	est. $50/mi from Pendleton, plus $2500 rentals
		Aerobic Wetland Construction Subtotal =		**$36,747.75**	
		Wetland Monitoring and Maintenance (3 year portion)			
24	ea	Water analysis: TALM (incl. MS/MSD alternate events)	$286.00	$6,864.00	totals only, SVL+10%
3/20	ea	Replace wetlands substrate with fresh organic material (20yr)	$18,400.00	$2,760.00	assume 50% of construction cost
3/20	ea	On-site disposal of used substrate (20yr)	$5,000.00	$750.00	
		Wetland Monitoring/Maintenance Subtotal =		**$10,374.00**	
		SEDIMENT POND SUMMARY			
		Sediment Pond Construction Subtotal =		$8,939	
		Design 20% of construction		$1,788	
		Construction Management 10% of construction		$894	
		Sediment Pond Monitoring/Maintenance Subtotal =		$11,964	
		ALTERNATIVE 4 SEDIMENT POND TOTAL FOR AJAX MINE =		**$23,585**	
		WETLAND SUMMARY			
		Aerobic Wetland Construction Subtotal =		$36,748	
		Design 20% of construction		$7,350	
		Construction Management 10% of construction		$3,675	
		Wetland Monitoring/Maintenance Subtotal =		$10,374	
		ALTERNATIVE 4 AEROBIC WETLAND TOTAL FOR AJAX MINE =		**$58,146**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 4 - Adit Discharge Treatment

Qty	Unit	Description	Unit Cost	Cost	Comment
MAGNOLIA MINE - ALTERNATIVE 4: ADIT DISCHARGE TREATMENT					
		Sediment Pond Construction			
14	cy	Excavate inlet culvert trench, 1cy backhoe	$1.00	$14.00	30"Wx2'D
14	lf	Place drain pipe, 8", corrugated double-walled HDPE	$7.62	$106.72	027-168-2040 (1996) +50%
14	cy	Backfill inlet culvert trench 1cy backhoe	$2.80	$39.20	
1	hr	Compact trench by tamping, 1cy backhoe	$182.25	$182.25	
100	cy	Excavate pond, 1cy backhoe	$2.43	$242.65	assume balanced cut/fill, so ½ of pond volume
2	hr	Compact pond bottom by tires, 1cy backhoe	$182.25	$364.50	
102	cy	Excavate/stockpile topsoil from meadow, 300hp dozer, 300'haul	$4.18	$426.36	obtain from meadow/repository site; 50% yield so 2X volume
102	cy	Screen fines from topsoil for liner bedding	$5.00	$510.00	70% passed #4 screen, but assume 50% yield
51	cy	Load fines into truck, 1cy backhoe	$2.80	$142.80	
60	cy	Haul fines, 12cy dump, 1/2mi r.t.	$3.27	$196.20	volume rounded up to whole number of trucks
51	cy	Place fines in 6" bedding layer under liner	$2.27	$115.77	
3360	sf	45mil polypropylene liner, installed (assume 20% waste/selvage)	$1.00	$3,360.00	Serrot Oct2001 + 42%; 2800 sf includes anchor + 20%
450	lf	Excavate diversion channels	$1.00	$450.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
27	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$75.60	
36	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$507.60	source ~2mi S of confluence; vol. rounded to whole number of trucks
12	cy	Place riprap at channel outlets	$2.27	$27.24	10'x10'x1', 3 outlets
1	L.S.	Staging area prep	$1,000.00	$1,000.00	assume temporary bridge already in place
1	L.S.	Mobilization	$5,000.00	$5,000.00	est. $50/mi from Pendleton, plus $2500 rentals
		Sediment Pond Construction Subtotal =		**$12,760.89**	
		Aerobic Wetland Construction			
34	lf	Excavate inlet culvert trench, 1cy backhoe	$1.00	$34.00	30"Wx3'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
34	lf	Place drain pipe, 12", corrugated double-walled HDPE	$7.62	$259.18	027-168-2040 (1996) +50%
10	cy	Backfill inlet culvert trench 1cy backhoe	$2.80	$28.00	
1	hr	Compact trench by tamping, 1cy backhoe	$182.25	$182.25	
150	cy	Excavate wetland, 1cy backhoe	$2.43	$363.98	assume balanced cut/fill, so ½ of wetland volume
3	hr	Compact wetland bottom by tires, 1cy backhoe	$182.25	$546.75	
74	cy	Load sand into truck, 1cy backhoe	$2.80	$207.20	
84	cy	Purchase and haul sand, 12cy dump, 120mi r.t.	$22.72	$1,908.48	3hr/load; rounded to whole number of trucks
74	cy	Place 6" sand bedding layer under liner, FE loader	$2.27	$167.98	
6989	sf	45mil liner, installed (assume 20% waste/selvage)	$1.00	$6,988.80	Serrot Oct2001 + 42%; 28'x208' + 20%
266	cy	Load compost into truck, 1cy backhoe	$2.80	$745.92	
276	cy	Haul compost, 12cy dump, 120mi r.t.	$25.72	$7,099.74	3hr/load; rounded to whole number of trucks
266	cy	Place compost in wetland, FE loader	$2.27	$604.73	
30	cy	Load gravel into truck, 1cy backhoe	$2.80	$82.88	
36	cy	Haul gravel, 12cy dump, 120mi r.t.	$25.72	$926.05	3hr/load; rounded to whole number of trucks
30	cy	Place gravel in wetland, FE loader	$2.27	$67.19	assume 10% of substrate by volume
296	cy	Mix gravel and compost in wetland, 1cy backhoe	$2.43	$718.24	use rate for excavation
40	lf	Extend diversion channel	$1.00	$40.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
100	lf	Excavate outlet channel	$1.00	$100.00	30"Wx2'D; assume 1200 lf/ day for Means crew instead of 6000lf/day
23	cy	Excavate/load riprap from Granite Ck, 1cy backhoe	$2.80	$64.40	
24	cy	Haul riprap from Granite Ck, 12cy dump, 10mi r.t.	$14.10	$338.40	source ~2mi S of confluence; vol. rounded to whole number of trucks
8	cy	Place riprap in diversion & outlet channels, 1cy backhoe	$2.27	$18.16	
15	cy	Place riprap along wetland berm	$2.27	$34.05	400sfx1'
1	ea	Mobilize/demobilize portable bridge	$20,000.00	$20,000.00	rough estimate
1	ea	Place/remove portable bridge on Granite Creek	$3,000.00	$3,000.00	rough estimate
1	L.S.	Staging area prep	$2,000.00	$2,000.00	
1	L.S.	Mobilization	$5,000.00	$5,000.00	est. $50/mi from Pendleton, plus $2500 rentals

Cost Estimate for Ajax/Magnolia Mines
Alternative 4 - Adit Discharge Treatment

Qty	Unit	Description	Unit Cost	Cost	Comment
		Aerobic Wetland Construction Subtotal =		**$51,526.38**	

Cost Estimate for Ajax/Magnolia Mines
Alternative 4 - Adit Discharge Treatment

Qty	Unit	Description	Unit Cost	Cost	Comment
		Sediment Pond Monitoring and Maintenance (3 year total)			
6	day	Site visit, twice/year; flow measurements	$1,200.00	$7,200.00	
24	ea	Water analysis: TALM (incl. MS/MSD alternate events)	$286.00	$6,864.00	totals only, SVL+10%
3/10	ea	Excavate pond sludge and dispose of in repository	$10,000.00	$3,000.00	estimate 32cy/10yr
		Sediment Pond Monitoring/Maintenance Subtotal =		**$17,064.00**	
		Wetland Monitoring and Maintenance (3 year portion)			
24	ea	Water analysis: TALM (incl. MS/MSD alternate events)	$286.00	$6,864.00	totals only, SVL+10%
3/20	ea	Replace wetlands substrate with fresh organic material (20yr)	$8,600.00	$1,290.00	assume 50% of construction cost
3/20	ea	On-site disposal of used substrate (20yr)	$5,000.00	$750.00	
		Wetland Monitoring/Maintentance Subtotal =		**$8,904.00**	
		SEDIMENT POND SUMMARY			
		Sediment Pond Construction Subtotal =		$12,761	
		Design 20% of construction		$2,552	
		Construction Management 10% of construction		$1,276	
		Sediment Pond Monitoring/Maintenance Subtotal =		$17,064	
		ALTERNATIVE 4 SEDIMENT POND TOTAL FOR MAGNOLIA MINE =		**$33,653**	
		AEROBIC WETLAND SUMMARY			
		Aerobic Wetland Construction Subtotal =		$51,526	
		Design 20% of construction		$10,305	
		Construction Management 10% of construction		$5,153	
		Wetland Monitoring/Maintentance Subtotal =		$8,904	
		ALTERNATIVE 4 AEROBIC WETLAND TOTAL FOR MAGNOLIA MINE =		**$75,888**	

Cost Estimate for Ajax/Magnolia Mines
SUMMARY

Alternative	Cost Ajax	Cost Magnolia	TOTAL
ALTERNATIVES EVALUATED:			
1 No Action	$ -	$ -	$ -
2 Excavation and Off-site Disposal	$ 368,156	$ 814,345	$ 1,182,502
3 Excavation and On-site Disposal			
Repository Cover Option 1 - Engineered Cover	$ 227,936	$ 436,397	$ 664,333
Repository Cover Option 2 - Soil Cover	$ 194,348	$ 368,382	$ 562,729
4 Adit Discharge Treatment			
Sediment Pond	$ 23,585	$ 33,653	$ 57,238
Aerobic Wetland	$ 58,146	$ 75,888	$ 134,034
PREFERRED ALTERNATIVE:			
3 Excavation and On-site Disposal			
Repository Cover Option 2 - Soil Cover	$ 194,348	$ 368,382	$ 562,729
4 Adit Discharge Treatment			
Sediment Pond	$ 23,585	$ 33,653	$ 57,238
TOTAL ESTIMATED COST FOR PREFERRED ALTERNATIVE =	**$ 217,933**	**$ 402,035**	**$ 619,968**