

TABLES

**Table 2-1
Regulatory and Screening Levels for Selenium**

Media	Site Specific Reference Concentration (95 th percentile)	Area-Wide Risk Management Plan Guidance (IDEQ, 2004)		USFS Reclamation Guidance (2003)	BLM and USFS Interim Guidelines (2002)
		Area-Wide Maximum Background Level	Removal Action Level ¹	Soil Suitable for Use in Reclamation	Goal for Vegetation in Reclaimed Areas
Regulated Surface Water (e.g., Tygee Creek)	---	---	Monitoring action level: 1.6 µg/L (total) Removal action level: Regulatory standard 5.0 µg/L (total)		
Non-regulated Surface Water (e.g., permitted impoundments)	---	---	Extended use by wildlife or livestock: 50 µg/L Transient use by wildlife or livestock: 201 µg/L		
Groundwater (total)	---	---	Monitoring action level: 5 µg/L Removal action level: Regulatory standard 50 µg/L		
Vegetation	---	0.75 mg/Kg dw	5 mg/Kg dw		Reclamation Goal for Unrestricted Grazing 50% of the vegetation measured over the surface of the reclaimed mine area must contain selenium concentrations <5.0 mg/Kg dw
					45% of vegetation measured over the surface of the reclaimed mine area may contain selenium concentrations ranging between 5.0 and 10.0 mg/Kg dw
					≤ 5% of vegetation measured over the surface of the reclaimed mine area may contain selenium concentrations >10 mg/Kg dw and ≤ 0.5 percent of the vegetation measured over the surface of the reclaimed mine area shall be > 20 mg/Kg selenium dry weight
Sediments Supporting Aquatic Life	2.5 mg/Kg dw	2.6 mg/Kg dw	2.6 mg/Kg dw		
Sediments Not Supporting Aquatic Life	---	2.6 mg/Kg dw	7.5 mg/Kg dw		
Riparian/Fluvial Soils	---	3.3 mg/Kg dw	5.2 mg/Kg dw		
Soil ²	3 mg/Kg	---	---	<13 mg/Kg	
Waste shale/Overburden materials ³	---	---	---	<1 mg/Kg and < 0.10 mg/L extractable Se	

¹ Also listed under the Removal Action Levels are IDEQ's Monitoring Action Levels for regulated surface water and groundwater.

² Soil greater than 13 mg/Kg selenium may also be suitable for use in reclamation following additional evaluation to demonstrate that vegetation planted on those soils would not exceed the recommendation for less than 5 mg/Kg selenium in vegetation.

³ The rationale for having separate guidelines for waste shales and soil materials is that the Se in waste shales appears to be more bioavailable than that in soils and it is necessary to maintain total Se below 1 mg/Kg in the shale to maintain Se concentrations in vegetation below 5 mg/Kg.

**Table 2-2
Removal Action Goals for Selenium**

Environmental Medium	Removal Action Goal	Point of Compliance/Decision Unit
Groundwater	50 µg/L	Current boundary of Active Mineral Extraction Area (see Figure 2-1). Goal will apply to entire Site after closure and reclamation of the mine.
Regulated Surface Water	5.0 µg/L (total)	All locations of natural waters of the State or United States.
Non-Regulated Surface Water	50 µg/L - extended use by wildlife or livestock 201 µg/L - transient use by wildlife or livestock	Individual detention basins.
Soil	13 mg/Kg	Soil with selenium concentrations greater than 13 mg/Kg may also be suitable for use in reclamation following additional evaluation to demonstrate that vegetation planted on those soils would not exceed the recommendation for less than 5 mg/Kg selenium in vegetation.
Sediments Supporting Aquatic Life	2.6 mg/Kg dry weight	All locations of natural waters of the State or United States.
Sediments Not Supporting Aquatic Life	7.5 mg/Kg dry weight	Average for each individual detention basins.
Vegetation	5 mg/Kg dry weight	The vegetation goal is supported by the soil guidelines which will be applied to soil covers used for the remedial actions. Additional consideration will be given to the BLM/USFS interim reclamation guidelines for unrestricted grazing use.
	<p>At least 50% of vegetation must contain less than 5.0 mg/Kg selenium dry weight.</p> <p>No more than 45% of vegetation may contain selenium between 5.0 and 10.0 mg/Kg dry weight.</p> <p>No more than 5% of vegetation may contain selenium concentrations greater than 10.0 mg/Kg dry weight.</p> <p>No more than 0.5% of the vegetation measured the reclaimed mine area shall exceed 20 mg/Kg selenium dry weight.</p>	Within each decision unit (defined as disturbed area within each grazing allotment [see Figure 2-2])

Table 3-1

Smoky Canyon Mine Area A Transport Pathways (by Source Area)

Source Area	Pathway for Transport of Selenium (and other COPCs)				
	Transport to Alluvial Flow System	Transport to Wells Formation	Surface Water Transport	Erosion and Sediment Transport	Uptake by Vegetation
A Panel External Disposal Area	No transport	X	Seep flow to basin AP-2	To detention basins	Within source areas
Pole Canyon Overburden Disposal Area	X	X	To Pole Canyon Creek	Local transport to basins and Pole Canyon Creek	Within source areas
D Panel Backfilled Pits	No transport	X	Seep flow to basin DP-10	To detention basins	Within source areas
D Panel External Disposal Area	No transport	X	Seep flow to DP-7	To detention basins	Within source areas
E Panel External Disposal Area	No transport	X	Seep flow to basins EP-4 and EP-5	To detention basins	Not investigated

Note: Shaded cells indicate either no transport pathway or transport/uptake limited in extent to the mining-disturbed areas around each source area.

Table 5-1
Introduced Seed Mixture Based on Drill Seeding Rates

Common Name	Scientific Name	Pounds of Pure Live Seed per Acre	% by Weight
Smooth brome	<i>Bromus inermis</i>	2.0	13
Intermediate wheatgrass	<i>Thinopyrum intermedium</i>	4.0	27
Timothy	<i>Phleum pratense</i>	1.0	7
Orchardgrass	<i>Dactylis glomerata</i>	3.0	20
Russian wildrye	<i>Psathyrostachys juncea</i>	3.0	20
Small burnet	<i>Sanguisorba minor</i>	2.0	13
TOTAL		15.0	100

**Table 5-2
Summary of A Panel Alternatives**

Source Area	Location						
	Backfilled Pits	External Overburden Disposal Area Surface	Storm Water Controls	Storm Water Detention Basins	Seeps	Seep Collection Ponds	Surface Water/Sediments
Alternative 2	N/A	Soil cover and revegetate using a seed mix with low potential for selenium uptake.	Limited regrading along the northern edge of the ODA.	Cover AP-1, AP-3, AP-4, AP-5, AP-6, AP-7, and AP-9A with chert.	Seep AS-2 expected to dry up after cover installation. If not, treat seep flow from AS-2 using a passive treatment system utilizing iron/organic reduction in an underground bioreactor.	Excavation of sediments within collection pond AP-2 and onsite disposal.	N/A
Alternative 3	N/A	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Same as Alternative 2.	Excavate sediments from basins AP-1, AP-3, AP-4, AP-5, AP-6, AP-7, and AP-9A and dispose onsite.	Cover seep area at AP-2 and seep flow path with chert.	Cover sediment with chert.	N/A
Alternative 4	N/A	Low-permeability cap.	Same as Alternative 2.	Same as Alternative 3.	No action. Seep AS-2 is expected to dry up due to placement of the low-permeability cap.	Same as Alternative 2.	N/A

N/A - Not Applicable.

**Table 5-3
Summary of Pole Canyon ODA Alternatives**

Source Area	Location						
	Backfilled Pits	External Overburden Disposal Area Surface	Storm Water Controls	Storm Water Detention Basins	Seeps	Seep Collection Ponds	Surface Water/Sediments
Alternative 2	N/A	Install vegetated chert/soil cover overlying a treatment layer with iron/organic substrate. Revegetate using seed mix with low potential for selenium uptake.	Diversion ditch immediately north of the ODA. Excavate/regrading of an area in the southwest portion of the ODA.	Cover sediments in DP-14 with chert.	N/A	N/A	Treatment of Lower Pole Canyon Creek using an iron/organic reduction infiltration trench in the toe of the ODA. Excavation of creek sediments from lower Pole Canyon Creek and dispose onsite.
Alternative 3	N/A	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Same as Alternative 2.	Excavate sediments from DP-14 and dispose onsite.	If seepage exists after water control actions, cover seep area with chert.	N/A	Divert portion of Pole Canyon Creek flow around ODA. Infiltrate remaining Pole Canyon Creek into Wells Formation upstream of the ODA. Excavate sediments from lower Pole Canyon Creek and dispose onsite.
Alternative 4	N/A	Low-permeability cap.	Same as Alternative 2.	Same as Alternative 3.	N/A	N/A	Same as Alternative 3.

N/A - Not Applicable.

**Table 5-4
Summary of D Panel Alternatives**

Source Area	Location						
	Backfilled Pits	External Overburden Disposal Area Surface	Storm Water Controls	Storm Water Detention Basins	Seeps	Seep Collection Ponds	Surface Water/Sediments
Alternative 2	Soil cover and revegetate using a seed mix with low potential for selenium uptake.	Upgrade existing soil cover and revegetate using a seed mix with low potential for selenium uptake.	Diversion ditch adjacent to the southern portion of the backfilled pit. Limited regrading of southeast portion of backfilled pit.	Cover sediments in DP-1, DP-2, DP-3, DP-4, DP-5, DP-6, DP-8, DP-9, DP-11, DP-13 and DP-15 with chert.	Seeps DS-7 and DS-10 are expected to dry up after soil cover and mine plan reclamation becomes effective. If not, treat seep flows as for A Panel.	Excavate sediments from DP-7 and dispose onsite.	N/A
Alternative 3	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Same as Alternative 2.	Excavate sediments from basins DP-1, DP-2, DP-3, DP-4, DP-5, DP-6, DP-8, DP-9, DP-11, DP-13 and DP-15 and dispose onsite.	Cover seep area at DS-7 and seep flow path with chert.	Cover sediments in DP-7 with chert.	N/A
Alternative 4	Low permeability cap.	Low permeability cap.	Same as Alternative 2.	Same as Alternative 3.	No action. Seeps are expected to dry up due to placement of the low-permeability cap.	Same as Alternative 2.	N/A

N/A - Not Applicable.

**Table 5-5
Summary of E Panel Alternatives**

Source Area	Location						
	Backfilled Pits	External Overburden Disposal Area Surface	Storm Water Controls	Storm Water Detention Basins	Seeps	Seep Collection Ponds	Surface Water/Sediments
Alternative 2	N/A	N/A	None.	Cover sediments in EP-1, EP-2, EP-6, EP-7, and EP-9 with chert.	Seeps ES-4 and ES-5 expected to dry up after mine planned reclamation becomes effective. If not, treat seep flows as above.	Excavate sediments from EP-4 and EP-5 and dispose onsite.	N/A
Alternative 3	N/A	Southern portion of ODA - surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake for portion of external ODA containing seleniferous overburden. No Action for chert portion.	Same as Alternative 2.	Excavate sediments from basins EP-1, EP-2, EP-6, EP-7, and EP-9 and dispose onsite.	Seeps ES-4 and -5 expected to dissipate after mine plan reclamation becomes effective. If not, treat seep flows as above.	Cover sediments in EP-4 and EP-5 with chert.	N/A
Alternative 4	N/A	Low permeability cap for non-chert portion. No action for chert portion.	Same as Alternative 2.	Same as Alternative 3.	No action. Seeps ES-4 and ES-5 are expected to dry up due to placement of the low-permeability cap.	Same as Alternative 2.	N/A

N/A - Not Applicable.

**Table 5-6
Summary of Hoopes Spring Alternatives**

Source Area	Location						
	Backfilled Pits	External Overburden Disposal Area Surface	Storm Water Controls	Storm Water Detention Basins	Seeps	Seep Collection Ponds	Surface Water/Sediments
Alternative 2	N/A	N/A	N/A	N/A	N/A	N/A	Monitor effectiveness of source control actions. Develop site-specific standard. Additional source control actions and/or treatment of Hoopes Spring flow if standard not met within a timeframe that is reasonable for the Site.
Alternative 3	N/A	N/A	N/A	N/A	N/A	N/A	Treatment of Hoopes Spring flow.

N/A - Not Applicable.

**Table 8-1
Identification of Preferred Alternatives**

Source Area/Preferred Alternative	Cost			Action Location						
	Capital	O&M	Total	Backfilled Pits	External Overburden Disposal Area Surface	Storm Water Controls	Storm Water Detention Basins	Seeps	Seep Collection Ponds	Surface Water/Sediments
A Panel External ODA										
Alternative 3	\$0.4 M	\$0.2 M	\$0.6 M	N/A	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Limited regrading along the northern edge of the ODA.	Excavate sediments from basins AP-1, AP-3, AP-4, AP-5, AP-6, AP-7, and AP-9A and dispose onsite once upgradient source controls are effective.	Cover seep area at AP-2 and seep flow path with chert.	Cover sediment with chert.	N/A
Pole Canyon External ODA										
Alternative 3	\$3.4 M	\$1.2 M	\$4.6 M	N/A	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Diversion ditch immediately north of the ODA. Excavate/regrading of an area in the southwest portion of the ODA (just south of Pole Canyon Creek inflow to the ODA).	Excavate sediments from DP-14 and dispose onsite once upgradient source controls are effective.	If seepage exists after water control actions, cover seep area with chert.	N/A	Divert portion of Pole Canyon Creek flow around ODA. Infiltrate remaining Pole Canyon Creek into Wells Formation upstream of the ODA. Excavate sediments from lower Pole Canyon Creek and dispose onsite once upgradient source controls are effective.
D Panel Backfilled Pits and External ODA										
Alternative 3	\$1.1 M	\$0.7 M	\$1.8 M	Surface amendment such as biosolids or composted manure on the northern portion of the backfilled pits. Revegetate using seed mix with low potential for selenium uptake.	Surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake.	Diversion ditch adjacent to the southern portion of the backfilled pit. Limited regrading of southeast portion of backfilled pit.	Excavate sediments from basins DP-1, DP-2, DP-3, DP-4, DP-5, DP-6, DP-8, DP-9, DP-11, DP-13 and DP-15 and dispose onsite once upgradient source controls are effective.	Cover seep area at DS-7 and seep flow path with chert.	Cover sediments in DP-7 with chert.	N/A
E Panel External ODA										
Alternative 3	\$0.2 M	\$0.2 M	\$0.4 M	N/A	Southern portion of ODA - surface amendment such as biosolids or composted manure. Revegetate using seed mix with low potential for selenium uptake for portion of external ODA containing seleniferous overburden. No action for chert portion.	N/A	Excavate sediments from basins EP-1, EP-2, EP-6, EP-7, and EP-9 and dispose onsite once upgradient source controls are effective.	Seeps ES-4 and -5 expected to dissipate after mine plan reclamation becomes effective. If not, cover with chert.	Cover sediments in EP-4 and EP-5 with chert.	N/A
Hoopes Spring										
Alternative 2	\$0.47 M	\$0.03 M	\$0.5 M	N/A	N/A	N/A	N/A	N/A	N/A	Monitor effectiveness of source control actions. Develop site-specific standard. Additional source control actions and/or treatment of Hoopes Spring flow if standard not met within a timeframe that is reasonable for the site.

N/A - Not Applicable.