CHAPTER 5 – CUMULATIVE EFFECTS

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Cumulative effects are the impacts on the environment that result when the incremental impacts of the Proposed Action or alternatives are added to other past, present, and reasonably foreseeable future actions in the Cumulative Effects Area. The reasonably foreseeable future is defined as 15 years (BLM and USFS 2002). Cumulative effects are analyzed for the same resources as were described in **Chapter 4** of this document. Results of these analyses lead to the determination of whether the Proposed Action or alternatives would contribute significantly to impacts associated with other activities in the area.

The geographic Cumulative Effects Area described in this section varies according to the resource discussed, but generally includes the east half of Caribou County and a portion of northern Bear Lake County which encompasses an area of approximately 505,000 acres. Major land uses in the area are timber harvesting, livestock grazing, and mining. The area is also used for dispersed recreation such as hunting, fishing, and other outdoor activities, but the effects of these actions are likely to be of lower magnitude than the three major land uses.

Since the early 1980s, many timber sales have occurred in areas within the Cumulative Effects Area. From 1992 to 2002, the Caribou Unit of the Caribou-Targhee National Forest sold 67.2 million board-feet and harvested approximately 72.5 million board-feet from suitable lands (Padian 2003). Approximately 2,372 acres of timber have been harvested, and 488 acres have been harvested as a result of mining on Rasmussen Ridge. During the period for the analysis of cumulative effects, an additional 1,800 acres may be harvested as a result of mining. After the timber is removed, these areas would be reclaimed with grasses and, where practical, efforts would be made to replace the timber.

The USFS conducts monthly monitoring during the growing season of lands at the Rasmussen Ridge Mine for potential occurrences of weeds. Weeds that are located are reported to the mine, and Agrium retains a contractor to control weeds on Agrium's historic mine properties; the active mine property Agrium treats itself. The USFS has also been treating weeds in other areas and maintains an atlas of weeds and treatments. The increased awareness of and active treatment of weeds are designed to limit the spread of invasive species and, if possible, to eradicate noxious weeds from national forest lands.

The livestock industry has been an integral part of the Cumulative Effects Area since humans settled the area. Allotments have been established and leased on federal lands in the area. After years of overgrazing, recent livestock stocking levels have decreased to bring numbers in line with forage production. Private lands also are grazed within the Cumulative Effects Area. Livestock grazing would continue to be a major land use and may be expected to increase above current rates, after mining areas are reclaimed. Grazing as a general land use can contribute to erosion and sedimentation in waterways in the Cumulative Effects Area.

Mining in the Rasmussen Ridge reserve began in 1991 when an Environmental Assessment was approved for South Rasmussen. Mining continued with approvals of the Central Rasmussen block in 1996, 1997, 1998 and 1999. A total of 488 acres has and will be disturbed by these mines. The Enoch Valley Mine is located west of Rasmussen Ridge and may disturb up to 733

acres of land. The Proposed Action for mining North Rasmussen Ridge includes disturbance of 269 acres between the years 2003 and 2011.

The Caribou Unit of the Caribou-Targhee National Forest comprises a little over 1 million acres in southeast Idaho. The Preferred Alternative for the Draft Revised Forest Plan (USFS 2001) is committed to multiple use on National Forest System lands in the following ways: Access/recreation management emphasizes the recreation opportunity classes of semi-primitive motorized, roaded natural, and rural classes. Ecosystem management indicates a high risk for insect hazard, and a high risk for wildfire in forested areas. The Preferred Future Condition for mature and old-growth forested vegetation is 63 percent conifer and 76 percent aspen, although this preferred future condition is not considered achievable. Livestock grazing management estimates grazing of cattle on 566,800 acres and sheep on 1,000,400 acres. Mining management would follow adaptive directions. Riparian water quality/aquatic habitat management would be based on maintaining a moderate persistence of species. The timber sale program for the first decade estimates a total of 29 million board-feet sold from 7,000 acres and 500 acres in roadless areas, with 9 miles of new road and 9 miles of reconstructed road. Wilderness and roadless area management recommends 47,200 acres for wilderness, available for summer non-motorized and winter-motorized use. Finally, wildlife habitat management is predicted to meet summer habitat effectiveness, hunting season vulnerability, and acres managed for winter range, and the viability analysis indicates a high likelihood of species persistence (USFS 2001).

5.1 MINERALS, TOPOGRAPHY, GEOLOGY AND PALENTOLOGY

A larger Cumulative Effects Area that encompasses the eastern half of Caribou County and the northern half of Bear Lake County was used to evaluate cumulative effects on minerals, topography, geology, geochemistry, and paleontology of the Western Phosphate Field in southeastern Idaho. Implementation of the Proposed Action and other reasonably foreseeable activities would have potential effects related to mineral resource depletion, topographic changes, exposure of potential seleniferous materials and other contaminants of potential concern to weathering processes and subsequent dissolution and mobilization through seepage, geotechnical instability, and discovery, damage, or removal of paleontological resources.

The location and status of known phosphate reserves in the Cumulative Effects Area are shown in **Figure 5.1-1**. If an anticipated annual increase of 1 to 2 percent in annual production of phosphate ore from southeastern Idaho was projected for the next 15 years, the cumulative production of phosphate ore from southeastern Idaho would be 80 to 100 million tons, or an average annual production rate of 6 million tons per year. The impact of the Proposed Action accounts for about 15 percent of the phosphate ore that would be mined over this period. In contrast, economically recoverable phosphate ore reserves in southeastern Idaho have been estimated at one billion tons (BLM and USFS 2002).

The Cumulative Effects Area shown in **Figure 5.1-1** represents an area of 789 square miles, or 504,960 acres. The figure illustrates two classes of phosphate mining: historical and current mining (mined-out) and current reserve leases. Acreages for these classes of phosphate mining are presented in **Table 5.1-1**. The portion of the current leases that represent reasonably foreseeable phosphate mines is not known because ownership of a lease does not guarantee the

Figure 5.1-1 Phosphate Mining in the Cumulative Effects Area

(page two)

TABLE 5.1-1
TOTAL MINED-OUT AND RESERVE AREAS AND ASSOCIATED ACRES OF VEGETATION, TIMBER MANAGEMENT, DEER AND ELK WINTER RANGE, AND LAND OWNERSHIP WITHIN THE CUMULATIVE EFFECTS AREA

Area	Acres	Percent		
TOTAL	**504,960**	**100**		
Current Leases	38,874	7.7		
Mined-out	13,687	2.7		
Reclaimed	11,976	87.5 of Mined-out		
Total not Reclaimed	1,711	0.34 of TOTAL		
Land Type	**Mined-out (Acres)**	**Reserves (Acres)**	**Area Total**	**Area Percent**
Agriculture	1,340	1,235	90,530	18
Alpine Meadow	1	22	630	0.125
Exposed Rock	550	0	850	0.17
Forest Upland/Broadleaf Forests	2,400	9,955	94,560	18.73
Forest Upland/Needleleaf Forests	1,750	10,850	112,040	22.19
Non-forested Lands (including grassland and shrub)	7,680	11,800	183,060	36.25
Riparian	295	990	17,050	3.38
Urban/Developed	1,960	0	6,240	1.16
Timber Management Units				
Prescription b	575	5,410	25,530	5.01
Prescription c	0	1,570	6,960	1.38
Deer and Elk Winter Range				
Winter Range	1,270	1,255	48,460	9.6
Critical Winter Range	30	60	11,100	2.2
Land Ownership				
BLM	1,215	540	23,800	4.71
U.S. Forest Service	6,800	19,130	249,275	49.37
State of Idaho	1,875	10,190	41,045	8.13
Private	6,080	4,985	196,925	40
USFWS	0	0	3,968	0.79

ore will be mined. The active leases represent three times the amount of mineralized area that has already been mined.

The portion of the mined-out areas that has been reclaimed is unclear, as reclamation is highly variable from mine to mine and information for older mines is sparse. As of October 2000, there

were four active phosphate mines in the Southeast Idaho Phosphate Resource Area: Dry Valley Mine, Smoky Canyon Mine, Enoch Valley Mine, and the Rasmussen Ridge Mine (Montgomery Watson 2000). These mines have published plans to reclaim more than 87.5 percent of the disturbance areas. The areas that will not be reclaimed consist of pit walls, pit lakes, or partially backfilled pit bottoms. Nearly 12,000 disturbed acres have been reclaimed, and the amount of disturbance that will remain unreclaimed is less than 1 percent of the Southeast Idaho Phosphate Resource Area. Acreages for these classes of phosphate mining are presented in **Table 5.1-1**. **Table 5.1-1** also depicts total acres of vegetation, timber management units, deer and elk winter range, and land ownership that are located within mined-out and reserve areas within the Cumulative Effects Area.

Effects on topography result from mining-related surface disturbance. Natural and mining-related slope failures or erosion also affect the land surface and its features. The topography of the Cumulative Effects Area has been relatively unaffected by mining. A large phosphate mine usually affects several hundred acres, and most is reclaimed to the approximate original topography. In contrast, the Cumulative Effects Area contains more than one-half million acres. The Proposed Action and reasonably foreseeable activities within the Cumulative Effects Area would not have a noticeable effect on topography except in pit areas that are not backfilled or in external waste rock dump areas.

Mobilization of selenium and other contaminants of potential concern within the Cumulative Effects Area can be affected by a variety of activities. However, mining has the most significant impact because it disturbs and exposes geologic units that contain elevated concentrations of selenium. Recent research has identified sources, pathways, and control measures that would reduce this impact from reasonably foreseeable phosphate mining. Based on the design measures for the Proposed Action described in this document, dissolution and mobilization of selenium from the Proposed Action and reasonably foreseeable future actions would be greatly reduced when compared with past phosphate mining operations, and minor relative to the Cumulative Effects Area.

Within the Cumulative Effects Area, potential geotechnical instability associated with mining results from failures of highwall and overburden fill or failures associated with other major earth moving. Earthquakes or storms could also increase failures of the highwall or overburden fill in mine areas, activate landslides, or cause failures in road cuts or other surface disturbance areas. The potential effects on geotechnical stability that would be associated with the Proposed Action and other reasonably foreseeable future activities likely would be minor relative to the Cumulative Effects Area.

Within the Cumulative Effects Area, impacts associated with the discovery, damage, destruction, or removal of paleontological resources would result primarily from mining. The effects from mining can be positive as well as negative. Mining can uncover paleontological resources and information that otherwise would not be discovered, thereby increasing scientific knowledge. However, mining generally is very destructive to fossil resources.

The cumulative effects associated with Alternative 1 would be similar to the Proposed Action, with the following exception. A mining operation that produces the mineral materials for the

impermeable backfill cap likely would affect at least 25 additional acres. This addition to the cumulative disturbance described above for the Proposed Action would not have a noticeable effect on topography except in the immediate vicinity of the mine disturbances.

The cumulative effects associated with Alternative 2, No Action, would not be similar to the Proposed Action. The impact of Alternative 2 would not account for any of the phosphate ore mined in the Cumulative Effects Area at North Rasmussen Ridge. Thus, this alternative would represent an estimated 15 percent reduction in the phosphate ore mined through 2011, unless this volume could be produced from another mine within the Cumulative Effects Area.

5.2 AIR RESOURCES

Airborne particulate matter is the most common air pollutant emission associated with the major commercial land use activities in the Cumulative Effects Area. Sources of airborne particulate matter include mining, timber harvesting, prescribed fire, wildfire, fire suppression activities, road use, and grazing. Grazing and timber harvesting can produce fugitive dust, but the quantities are minimal and are expected to remain approximately equal to present conditions. Mining is the major activity that produces dust in the area. The trend in phosphate production in southeast Idaho is an increase of 1 to 2 percent annually (BLM and USFS 2002). Since fugitive dust emissions are directly related to the mining process rate, it can reasonably be expected that fugitive emissions in southeast Idaho may increase 1 to 2 percent annually. However, cumulative effects on air quality from phosphate mining are not expected for the following reasons: all existing mines and all foreseeable mines are required by stipulations in their permits to implement BMPs for air quality that include watering roads and active work areas or applying magnesium chloride (a dust suppressant) to roads and work areas. Adherence to these and other permit conditions, enforced by the State of Idaho, ensures that the mines will be in compliance with NAAQS for fugitive dust. Additionally, there is typically from 2 to 5 miles between mines in southeast Idaho (**Figure 5.1-1**). The separation between mines contributes to the amelioration of effects from any single mine rather than contributing to cumulative effects among several mines. The Proposed Action and Alternative 1 would be extensions of the existing Central Rasmussen Ridge Mine at the same mining rate and would not be expected to increase existing levels of air pollutant emissions.

The cumulative effects of noise would also be equivalent to existing conditions. Noise impacts from mining operations would shift in a northern direction for the proposed mining operations. The noise from these operations would not be cumulative but relocated along the phosphate-mining trend.

5.3 WATER RESOURCES

The North Rasmussen Ridge mining activities span three watersheds, including Reese Canyon Creek, No Name Creek, and the West Fork of Sheep Creek. A drainage divide occurs in the northwestern portion of the project area that separates surface water tributary to the Little Blackfoot River from water tributary to the Blackfoot River. Reese Canyon Creek flows northwest and is tributary to the Little Blackfoot River. No Name Creek flows southeast to Angus Creek, and Sheep Creek also flows southeast, to Lanes Creek; both are tributaries to the

Blackfoot River. The Little Blackfoot River and Blackfoot River both discharge into Blackfoot Reservoir that defines the Cumulative Effects Area.

Groundwater used in the Cumulative Effects Area is from water wells for domestic water supplies. Domestic water wells in the Cumulative Effects Area are few in number and are widely distributed. Modeling calculations in the Environmental Consequences chapter indicate the only groundwater contaminant plume may travel three thousand feet over 500 years. In most cases, domestic water wells are miles from the nearest mine. Where a phosphate mine and domestic water well are in closer proximity, intensive monitoring would occur and well water mitigation measures would be taken when necessary. Effects from timber harvesting, grazing, road construction, and recreational uses on groundwater resources are negligible.

Many of the past and current human activities within these watersheds, including mining, livestock grazing, timber harvesting, and road construction, typically increase sediment loads to streams and often result in channel instability. These types of impacts are documented within the watersheds of interest, and Sheep Creek, Angus Creek, Lanes Creek, and the Blackfoot River below the confluence with Lanes Creek are listed as water quality limited water bodies under Section 303(d) of the Clean Water Act. Sediment was the pollutant that exceeded standards in the assessment. Best management practices and other controls implemented in recent years serve to reduce sediment impacts from mining and timber production.

Samples of stream water from 12 stations were collected along the Blackfoot River in the summer of 1999 (Montgomery Watson 2000). **Figure 5.3-1** illustrates nine of the sample locations on the Blackfoot River and three stations on tributary streams. **Table 5.3-1** summarizes the results for selenium and cadmium. Values shown in bold type exceed the corresponding aquatic cold-water criteria, and italicized values are less than the upper tolerance bound (Montgomery Watson 2000).

Figure 5.3-2 displays selenium and cadmium concentrations from May through August 1999 for monitoring stations ST232 and ST113 on the Blackfoot River and Dry Valley Creek, respectively. The figure shows that concentrations of selenium at these two stations exceeded the chronic cold-water standard of 0.005 mg/L in May. In June, only the sample collected from the Dry Valley Creek station (ST113) exceeded the standard, and by July, the selenium concentrations were less than the standard at both stations. Concentrations of cadmium at both locations were less than the hardness-specific standard during all sampling events (Montgomery Watson 2000).

Stream field data also were collected and are presented in **Table 5.3-2.** These data were considered consistent with what was observed in 1998 (Montgomery Watson 2000). Effects from timber harvest, grazing, recreational uses, and road construction on groundwater resources are minimal. Mining has the potential to affect the resource by withdrawal for consumptive use or from infiltration from open pits and seepage through overburden backfill that have the potential to affect groundwater quality. Groundwater modeling indicated that the Proposed Action would have a limited and localized impact on existing groundwater.

Figure 5.3-1 Stream Monitoring Locations on the Blackfoot River

(page two)

TABLE 5.3-1
CONCENTRATIONS OF SELENIUM AND CADMIUM IN STREAMS

Site ID	Date	Selenium (mg/L)	Selenium Chronic Cold-water Concentration[1]	Cadmium (mg/L)	Cadmium Chronic Cold-water Concentration[2]
May					
ST233	5/26/99	*0.00049*	0.005	*0.0015*	0.0019
ST232	5/24/99	**0.0067**	0.005	*-0.00076*	0.0017
ST019	52499	**0.0082**	0.005	*-0.00073*	0.0015
ST020	5/25/99	**0.0072**	0.005	*-0.00073*	0.0015
ST022	5/25/99	**0.0098**	0.005	*0.0*	0.0015
ST023	5/24/99	**0.079**	0.005	*-0.0015*	0.0015
ST113	5/24/99	**0.049**	0.005	*0.0011*	0.0020
ST024	5/24/99	**0.0074**	0.005	*0.00073*	0.0015
ST026	5/25/99	**0.0090**	0.005	*-0.0012*	0.0015
ST229	5/25/99	**0.019**	0.005	*-0.00073*	0.0015
ST145	5/25/99	**0.046**	0.005	*-0.0015*	0.0016
ST029	5/26/99	0.00044	0.005	*0.00048*	0.0014
June[1]					
ST232	6/23/99	0.0021	0.005	0.00010	0.00018
ST113	6/23/99	**0.0068**	0.005	0.00078	0.0021
July[3]					
ST232	7/21/99	0.0024	0.005	0.0016	0.0018
ST113	7/21/99	0.0027	0.005	0.0012	0.0022
August[3]					
ST232	8/10/99	0.0015	0.005	0.00088	0.0018
ST113	8/10/99	0.00099	0.005	0.0018	0.0022

Notes: 1 EPA chronic hardness criterion (EPA 1988)
2 Hardness specific chronic criterion. Hardness values are presented in Ratti and Garten 2000.
3 Upper tolerance bounds (UTB) were not calculated for samples collected in June, July, and August because the sample size was inadequate for statistical tests. The UTB calculations are presented in Ratti and Garten 2000.
Values shown in **bold** exceed the chronic aquatic cold water criterion.
Values shown in *italics* are less than the UTB for the blank samples.
Source: Montgomery Watson 2000.

TABLE 5.3-2
STREAM FIELD DATA

Parameter	Range of Reported Values
pH (units)	7.8 – 8.4
Conductivity (µS/cm)	297 – 506
Temperature (°C)[1]	9.8 – 22.1
Dissolved Oxygen (mg/L)	7.7 – 10.9
Turbidity (NTU)[2]	3.93 – 113
Oxygen-Reduction Potential (mV)[3]	97 - 206

Notes: 1 In general, the coolest temperatures were measured in May and increased every month. The highest value was measured at ST232 in July.
2 Turbidity readings were typically much higher in May than in the other months. Measurements at ST113 were similar every month.
3 Oxygen reduction potential was not measured in June through August.

Source: Montgomery Watson 2000.

Figure 5.3-2 Stream Concentration Temporal Trends

Water quality data for selenium were gathered from a variety of sites at various mines in the southeast Idaho area (BLM and USFS 2002). Data were collected from ponds, overburden seeps, and springs below overburden storage, and from French drains. (The Proposed Action at North Rasmussen Ridge does not include any of these features, and these data sets represent other existing mines in the area). There were 29 revised data points taken from ponds that had a mean value of 0.080 mg/L of selenium. There were 23 revised data points from overburden seep and springs below overburden that had a mean value of 0.252 mg/L. There were four data points from French drains and they had a mean concentration of selenium of 0.508 mg/L. (The data for these three categories of samples are presented in **Tables 5.3-3, 5.3-4,** and **5.3-5**). Although these data are non-homogeneous with regard to field workers, sampling protocols, months and years of sampling, laboratories, analytical methods, and other factors, the data provide ranges of results that meet the objective of generally describing the variability and approximate maximum values that might be expected to occur in water samples obtained from facilities at phosphate mines in southeast Idaho (BLM and USFS 2002).

5.4 WATERSHED AND SOILS

A Cumulative Effects Area that encompasses the eastern half of Caribou County and the northern half of Bear Lake County was used to evaluate cumulative effects on soils and watersheds of the Western Phosphate Field in southeastern Idaho. Activities affecting watersheds include mining, farming, ranching, livestock grazing, wildfires, fire suppression activities, timber sales, and road building. Past and present mining affects approximately 10.4 percent of the area; agricultural activities affect approximately 18 percent of the area; and forested lands occupy approximately 40.9 percent of the Cumulative Effects Area. All of man's activities affect soils and watershed resources within the Cumulative Effects Area. Potential cumulative effects consist of damage or removal of vegetation, topsoil and subsoil, changes in slope, and exposure of soil and earth materials to weathering processes and subsequent erosion. Another result of all the activities in the watershed is that the watershed slowly loses the ability to capture, store, and safely release the water deposited on it.

Effects on soil slope values result from mining-related surface disturbance. Natural and mining-related slope failures or erosion also affect the land surface and its soil and watershed resources. The soil resources of the Cumulative Effects Area have been relatively unaffected by mining. A large phosphate mine usually affects several hundred acres, most of which are reclaimed to the approximate original topography. In contrast, the Cumulative Effects Area contains more than million acres. The Proposed Action and reasonably foreseeable activities within the Cumulative Effects Area would not have a noticeable effect on soil slopes except in pit areas that are not backfilled or external waste rock dump sites.

Mobilization of selenium and other contaminants of potential concern within the Cumulative Effects Area can be affected by a variety of activities. However, mining has the most significant impact because it disturbs and exposes geologic units that contain elevated concentrations of selenium, leading to the formation of soluble selenium in overlying soil. Recent research has identified sources, pathways, and control measures that would reduce this impact from reasonably foreseeable phosphate mining. Based on the design measures for the Proposed Action described in this document, dissolution and mobilization of selenium from the Proposed Action

and reasonably foreseeable future actions would be greatly reduced when compared with past phosphate mining operations, and minor relative to the Cumulative Effects Area.

TABLE 5.3-3
REVISED DATA FROM PONDS

Site	Location	Description	Sample Date	Selenium (mg/L)
13[1]	South Rasmussen Ridge	Haul Road Pond in Ras. Valley	4/10/00	0.008
32	Enoch Valley	Bat Cave Pond	9/97 – 8/00	0.201
27	Henry	Center Henry	9/19/979	0.248
15[1]	South Rasmussen Ridge	Haul Road Pond in Ras. Valley	4/10/00	0.039
34	Enoch Valley	South Pond	9/97 – 8/00	0.401
26	Henry	Smith Pond	9/19/97	0.402
33	Enoch Valley	West Pond	9/97 – 8/00	0.432
55	Gay	JF Pit Lake	9/23/97	0.468
4	South Rasmussen Ridge	Haul Road Pond on East Ridge	4/10/00	0.05
12[1]	South Rasmussen Ridge	Haul Road Pond in Ras. Valley	4/10/00	0.05
16	South Rasmussen Ridge	Haul Road Pond by Cattleguard	4/10/00	0.05
31	Enoch Valley	Stock Pond	5/97 – 8/00	0.507
14[1]	South Rasmussen Ridge	Haul Road Pond in Ras. Valley	4/10/00	0.504
35	Enoch Valley	Tipple Pond	9/97 – 8/00	0.057
3	South Rasmussen Ridge	Haul Road Pond on East Road	4/10/00	0.057
58	Gay	Z Pit Lake	9/29/97	0.0583
36	Enoch Valley	Haul Road Pond	9/97 – 8/00	0.0592
40	Wooley Valley	Unit III Panel E Pond	9/19/97	0.0746
39	Wooley Valley	Large Haul Road Pond	9/19/97	0.075
6	Rasmussen Valley	Enoch Valley Pond	4/10/00	0.075
A-Pit	Smoky Canyon	A-Pit Pond	5, 9/98	0.0805
8	South Rasmussen Ridge	Haul Road Pond near Coyote Corner	4/10/00	0.095
41	Wooley Valley	Unit III Panel F Pond	9/19/97	0.098
56	Gay	A-12 Pit Lake	9/23/97	0.1
71	Conda	NL4 Pond	9/29/97	0.151
37	Enoch Valley	North Pond	9/18/97	0.185
17	South Rasmussen Ridge	Pond East of Shop/Office-North	4/17/00	0.2
7	South Rasmussen Ridge	Haul Road Pond near Shop/Office	4/17/00	0.22
18	South Rasmussen Ridge	Pond East of Shop/Office – South	4/17/00	0.22

Selenium Count = 29
Data Average = 0.080086207
Standard Deviation = 0.058560956
Maximum = 0.22
Minimum = 0.008
Variance = 0.003429386

Notes: Revised data have been modified to combine results for multiple samples at the same location and to delete results for samples that are near or below 0.05 mg/L.
[1] Reclaimed in 2001.
Source: BLM and USFS 2002.

TABLE 5.3-4
REVISED DATA FROM OVERBURDEN SEEPS AND SPRINGS BELOW OVERBURDEN

Site	Location	Description	Sample Date	Selenium (mg/L)
SE Well 99-1	Enoch Valley	SE Well 99-1	6/6/00	0.005
West Seep	Enoch Valley	West Seep	5/31/00	0.008
10	Champ	Champ Dumps	9/17/97	0.0149
7	Mtn. Fuel	New Spring #2	9/18/97	0.0209
DS003	Dry Valley	S. B-Dump	Ave. 5, 9/98	0.02145
2	S. Rasmussen Ridge	Spr. S. of Shop	4/10/00	0.023
1	N. Maybe	East Mill Dump	9/16/97	0.0336
DS011	Wooley Valley	Unit III Dump	Ave. 5, 9/98	0.37
6	Mtn. Fuel	New Spring #1	9/17/97	0.431
42	Wooley Valley	Unit III Dump	9/19/97	0.65
DS010	Wooley Valley	Unit I Dump	Ave. 5, 9/98	0.0785
North B Dump	Dry Valley	North B Dump	Ave. 5, 9/98	0.114
SE Well 99-2	Enoch Valley	SE Well 99-2	6/6/00	0.013
SE Well 99-3	Enoch Valley	SE Well 99-3	6/6/00	0.14
Hidden Lake	Conda	Hidden Lake	9/11/97	0.15
No Name Creek Spring	S. Rasmussen Ridge	No Name Creek Spring	Ave. 4, 5/99, 4/00	0.1567
1, 16	S. Rasmussen Ridge	Wetlands South of Shop	4, 12/00	0.165
Shop Spring	S. Rasmussen Ridge	Shop Spring	Ave. 4, 5/99	0.24
E Dump	Smoky Canyon	E. Dump Seep	Ave. 99, 7, 10, 12/00, 4/00	0.31
East Spring	Conda	East Spring	9/11/97	0.325
D Dump	Smoky Canyon	D Dump Seek	Ave. 5, 6, 9, 10, 12/00, 4/00	0.716
DS012	Wooley Valley	Unit IV Dump	Ave. 5, 9/98	1.4
46 and DS015	Conda	SW3/West Limb Seep	9/97, 9/98	1.617

Selenium Count = 23
Data Average = 0.25278913
Standard Deviation = 0.427315708
Maximum = 0.1.617
Minimum = 0.005
Variance = 0.182598714

Note: Revised data have been modified to combine results for multiple samples at the same location and to delete results for samples that are near or below 0.05 mg/L.
[1] Sites 1,16 and Shop Spring are at the same location.
Source: BLM and USFS 2002.

TABLE 5.3-5
REVISED DATA FROM FRENCH DRAINS

Site	Location	Description	Sample Date	Selenium (mg/L)
44	Conda	SL# Drain	9/29/97	0.065
FD001	Conda	Conda Mine French Drain	Ave. 5, 9/98	0.154
66 & Pole Creek	Smoky Canyon	Pole Creek Below Pole Canyon Dump	Ave. 1991 – 2001	0.673
SW-2	Maybe Canyon	Maybe Creek below Cross Valley Fill	Ave. 5/97 – 10/98	1.14

Selenium Count = 4
Data Average = 0.508
Standard Deviation = 0.49940431
Maximum = 01.14
Minimum = 0.065
Variance = 0.24940467

Note: Revised data have been modified to combine results for multiple samples at the same location and to delete results for samples that are near or below 0.05 mg/L.
Source: BLM and USFS 2002.

5.5 VEGETATION, RIPARIAN AREAS AND WETLANDS

Mining has disturbed vegetation in the Cumulative Effects Area in the past, including 257 acres associated with the South Rasmussen Ridge Mine and 231 acres associated with the Central Rasmussen Ridge Mine. Total acreages reclaimed are 257 acres at the South Rasmussen Ridge Mine and 196 acres at the Central Rasmussen Ridge Mine. The estimated life of the proposed development of the open pit at the North Rasmussen Ridge under the Proposed Action is 8 years and would disturb an additional 269 acres. A description of vegetation types that would be disturbed under the Proposed Action and Alternative 1 are presented in Chapter 4 of this EIS and include aspen, conifer, and sagebrush. Of the 269 acres proposed for disturbance, 72 would be left as exposed pit highwall and would not be reclaimed. If North Rasmussen is mined, the 35 acres of unreclaimed pit at Central Rasmussen would be filled and revegetated. In October 1989, Monsanto's Enoch Valley Mine began operations at the north end of Rasmussen Valley. During the life of the Enoch Valley Mine (about 15 years), 733 acres would be disturbed. Of this total, 676 acres or 92 percent of the disturbed lands would be reclaimed. The 57 acres that would not be reclaimed at the Enoch Valley Mine also include exposed highwalls in the pits that would result in long-term impacts to grazing and visual resources.

Beginning in the early 1980s, the timber resources have been harvested on 2,372 acres within the Greater Rasmussen Valley-Grays Range area. Since the early 1980s, several timber sales have occurred in the Greater Rasmussen Valley-Sheep Creek area and the timber resources have been removed and reforested on 1,644 acres. The timber sales included 344 acres on the east flank of the Wooley Range (west side of Rasmussen Valley) and about 1,300 acres in the Sheep Creek area, including 800 acres on Rhone-Poulenc's Rasmussen Ridge leasehold. The timber sales have increased access into both areas and as a result have affected security of big game.

Timber resources are also managed within portions of the Caribou-Targhee National Forest located in the Cumulative Effects Area. According to the most recent version of the Caribou-Targhee National Forest Plan revision (USFS 2001), Alternative 7 (agency's Preferred

Alternative) 30 to 40 percent of timber resources will be maintained in a mature/old growth structure. Forest types managed include conifer sites (particularly mixed conifer), aspen/conifer, and aspen communities. Silviculture methods focus on harvest of saw timber and wood fiber resources from mixed conifer, aspen/conifer, and aspen sites to restore ecological processes. Specific management actions include prescribed fire, wildfire for resource benefit, timber harvesting, and forest thinning. Some areas that do not represent timber resources may also be managed to restore ecosystem function.

Timber management prescriptions for recreation within the Cumulative Effects Area include prescriptions b and c. Both prescriptions allow for cross-country, road, and trail travel by pedestrians, horse/pack stock, motorized off road vehicles and mountain bikes during the snow-free season. Prescription b does not allow for cross country travel of motorized vehicles but allows for road and trail travel. Prescription b establishes an open motorized route density of 2.0 miles/square mile. Prescription c allows for both cross country, road, and trail travel of motorized vehicles. Prescription c does not establish an open motorized route density. Both prescriptions b and c allow for winter non-motorized and snowmobile travel.

Timber management within the Cumulative Effects Area has the goal of using all techniques available to achieve ecosystem management and multiple use goals, with emphasis on restoration of ecological function, structure, composition (Proposed Future Condition) and providing products and services to the public. Prescription 5.1 (b, c, d) - Timber Management, emphasizes scheduled wood-fiber production and use and other compatible commodity outputs, with consideration for long-term forest resilience. There are specific guidelines for minimum stocking rates, slash treatments, created openings, logging systems, and general practices. Fire/fuels management prescriptions on the Cumulative Effects Area include guidelines for forest vegetation management, semi-primitive recreation, rangeland, visual quality maintenance, elk and deer winter range, concentrated development areas, and phosphate mine areas. All of these prescriptions default to forest-wide guidance except for Semi-Primitive Recreation (minimal fire suppression), Forest Vegetation Management (suppress wildfires; prescribed fire may be used to meet various goals), and Concentrated Development Areas (Wildfire aggressively suppressed; mechanical treatments preferred). Phosphate land are classified as being a Concentrated Development Area.

Cumulative effects of timber management include changes in species composition, habitat loss, habitat fragmentation from road construction, and increased soil erosion. Future timber management will result in similar effects within the Cumulative Effects Area in the future. Mining within the Cumulative Effects Area may also affect timber resources. Areas designated for timber management are or may be affected by phosphate mining activities within the Cumulative Effects Area are shown on **Figure 5.5-1**. Timber resources within the Cumulative Effects Area are limited. However, the Proposed Action would contribute to the cumulative effects on timber resources. Thinning of over-mature stands in the Cumulative Effects Area would likely take place in the future to prevent beetle infestation and reduce fuel loads.

Disturbance to wetlands and waters of the U.S. would not occur as part of the Proposed Action. However, indirect effects from erosion and alteration of the shallow groundwater system may affect some springs/seeps and flow rates in surface drainages. If phosphate mining in the

Cumulative Effects Area increases by 1 to 2 percent over the next 15 years, then additional wetland areas could be affected. However, current regulations that require compensatory mitigation would reduce or eliminate potential effects to wetlands and waters of the U.S.

Noxious weeds have been introduced in the Cumulative Effects Area from ground disturbances associated with mining, grazing, timber harvest and road construction. Species that have been observed include spotted knapweed, diffuse knapweed, musk thistle, Canada thistle, yellow toadflax, and dyer's woad. Mining-related disturbance has the potential for further encroachment by noxious weeds in the area.

A number of plant communities located within the cumulative effects area have been affected or may be affected by mining. **Figure 5.5-2** illustrates those vegetation communities that existed within mined-out areas and vegetation communities located within current reserve leases.

5.6 TERRESTRIAL WILDLIFE

Dominant wildlife habitat types within the Cumulative Effects Area include aspen and conifer forests as well as sagebrush communities. Riparian and wetland communities also represent potentially important wildlife habitat, although they occupy a very small portion of the Cumulative Effects Area. The most common types of impacts to wildlife habitat in the area include disturbances associated with phosphate mining, timber harvest, and livestock grazing. Other impacts include noise, increased human activity, and wildlife mortalities.

Elk and deer winter range are managed within portions of the Caribou-Targhee National Forest located within the Cumulative Effects Area. Areas designated as elk and deer winter range under the most recent Caribou-Targhee National Forest Plan revision (USFS 2001) - Alternative 7 (agency's Preferred Alternative) are shown in **Figure 5.5-1**. Winter range represents areas that contribute to the long-term viability of elk and deer population. Under this management prescription, a number of actions are taken to protect winter habitat while allowing for multiple land uses. Specific management actions include the following:

- Vegetation management to improve habitat to contain a good mixture of grasses, forbs, and shrubs and maintain good vegetative cover.
- Timber harvesting resulting in changes in structure and composition of the plant community.
- Manage or restrict recreational access to elk and deer winter range.
- Manage livestock grazing to ensure that forage conditions are compatible with goals for the big game winter range.
- Minimize human disturbance to wintering big game animals.
- Phosphate mining in the Cumulative Effects Area is located within and adjacent to elk and deer winter range. A number of other actions also have and will likely continue to affect big game winter range. These actions include the following:
- Fire suppression, resulting in changes in structure and composition of the plant community.
- Recreation uses including use of off-road vehicles.
- Invasion of native and non-native species, resulting in changes in livestock forage production.

Figure 5.5-1 Wildlife Habitat and Timber Management Units in Cumulative Effects Area

Figure 5.5-2 Vegetation Types in the Cumulative Effects Area

- Historical and current livestock grazing.
- Subdevelopment of lands adjacent to the forest, resulting in a loss of winter range.

These actions would be expected to continue within the Cumulative Effects Area under the Proposed Action.

Reclaimed areas would represent a long-term change in wildlife habitat from aspen, conifer, mixed aspen/conifer, and sagebrush communities to habitat dominated by perennial grasses. This conversion would increase the forage productivity of perennial grasses within the Cumulative Effects Area. However, the conversion of habitat would represent a loss of habitat for forest-dependent wildlife as well as wildlife that depends on contiguous stands of forest. Forest-dependent wildlife species far outnumber other species within and adjacent to the project area.

The Proposed Action may cause increased risks of exposure to selenium, even for wide-ranging wildlife species. This risk would arise because of potential cumulative effects from selenium contamination of the environment from phosphate mines within the adjacent watersheds of the area.

Other nearby phosphate mines have increased concentrations of selenium and other metals in groundwater and surface water in the area watersheds, including the Blackfoot River (Montgomery Watson 2000). Concentrations of metals in some creeks may be capable of causing detrimental effects to wildlife that use the creeks as a source of drinking water. A concentration of 0.5 milligrams selenium per liter of water was measured in samples from one of the creeks that may be affected by the Smoky Canyon Mine (BLM 2001). This concentration is considered toxic to cattle (Gough et al 1979), and may be equally toxic to similar-sized terrestrial wildlife such as mule deer, elk, and moose. Concentrations of selenium were measured at 0.436 mg/L in overburden seeps (95 percent upper confidence limit of the mean), 0.716 mg/L in springs below the overburden (mean), and 1.303 mg/L in French drains installed at the Smoky Canyon Mine (95 percent upper confidence limit of the mean) (BLM and USFS 2002). All of these concentrations are near or greater than the toxicity threshold (0.5 milligrams of selenium per liter) for drinking water sources for cattle (Gough et al 1979). Increasing concentrations of selenium in surface water and groundwater seeps and springs may lead to reduced reproductive success in the terrestrial wildlife of the region. The toxicity effects could, in turn, cause changes in food web structure and ecosystem functioning and decreased monetary revenues from big game and waterfowl hunting.

Wildlife are negatively affected by livestock grazing because of the competition for forage, changes in the structure or composition of native plant communities, and habitat removal or conversion caused by overgrazing on both upland and riparian habitats. Grazing is also a factor in the decline or loss of aspen stands by accelerating succession to stands of conifers and reducing fuels that support low intensity wildfires. Aspen habitat provides cover, forage, and nesting opportunities to a variety of both game and nongame species. Grazing may reduce understory vegetation in both forest and shrub habitats. Proper rotation and stocking rates can minimize these negative effects.

Major recreational uses in the area include hunting, fishing, off highway vehicles and snowmobile use, and hiking and camping. Accessible (all-season road) areas receive year-round recreational use. Human disturbance during periods of the year when wildlife are otherwise stressed by a lack of forage or harsh weather can further stress wildlife and may increase mortality. Specifically, wintering big game may be subject to increased harassment by recreationists, particularly if available hiding and escape cover is reduced by other activities. Recreation use in the area can be expected to reflect local changes in population and interest in outdoor activities. Losses of forage or changes in habitat structure caused by road construction, encroachment of noxious weeds, or livestock grazing may also affect game and nongame species that inhabit the area. New road construction tends to increase recreational and other use of formerly remote areas, placing further pressure on wildlife.

In 1996, timber sales of 3,585,000 board-feet occurred in Caribou County (USFS 2003). Over the past 30 years, the Soda Springs Ranger District has sold over 74 million board-feet at a rate of about 2 million board-feet per year (Van deWeg 2003). These timbered lands are used to some extent by many species of game and nongame wildlife. After timber is removed, these areas are either reseeded and reforested or allowed to revegetate naturally. Effects of this habitat conversion are described above.

5.7 FISHERIES AND AQUATIC RESOURCES

The Proposed Action may contribute to increases in sedimentation which can cause loss of habitat or additional stress on reproduction by fish species. Sedimentation can change the composition of streambeds from gravel to fine sediments that are not suitable for the insect prey of fish or the incubation of fish eggs. Sedimentation can also contribute to turbidity that can lessen the suitability of the waterway to fish by increasing the difficulty of finding food.

The Proposed Action may cause increased exposure risks to aquatic life, even for wide-ranging fish species, because of the cumulative effects from selenium contamination of the environment from past mining that have affected the project and adjacent watersheds in the area. Other nearby phosphate mines have caused increases in selenium and other metal concentrations in groundwater and surface water in the area watersheds, including the Blackfoot River, as described above. Reproductive effects may be observed if contributions of selenium to the Blackfoot Reservoir from multiple phosphate mines in the area lead to concentrations in fish eggs that exceed the recommended toxicity threshold in egg tissue of 10 milligrams selenium per kilogram fish egg tissue.

In a study on cutthroat trout fed varying selenium-enhanced diets ranging from 1.4 to 10 ppm seleno-methionine, no clinical signs of selenium toxicity were observed nor were differences in reproductive performance (such as fecundity and egg hatchability) although in all dietary groups, egg fertility and hatchability were lower than that observed in eggs from wild cutthroat trout (Hardy and Moller 2002).

Increasing concentrations of selenium in surface water and groundwater seeps and springs may lead to reduced reproductive success in the fisheries populations of the region that are known to be of high quality from a recreational perspective. The state water quality standard for selenium

has been exceeded in the region's watersheds as a result of surface water runoff from phosphate mining, and hazards to aquatic biota and wildlife have been predicted (Lemly 1999). The toxicity effects of selenium and other mining-related metals could reduce fisheries populations via direct effects on fish or indirectly through effects on prey populations and cause changes in the structure of the food web and ecosystem functioning that result in decreased monetary revenues from fishing licenses and associated spending (equipment, lodging, and meals). Proposed BMPs and other permit requirements for North Rasmussen Ridge would limit cumulative effects of the mining operations.

5.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

The most common type of impacts to TES species within the Cumulative Effects Area is loss of habitat associated with phosphate mining, timber harvest, and livestock grazing. Other trends within the Cumulative Effects Area include additional rural residential development, commercial development, road building by state and local governments, and recreational use of state and federal lands. These activities are expected to continue and increase in the future for the Cumulative Effects Area and the southeast Idaho region. The impact of these activities and the future trend would be the increasing displacement and disappearance of species from the region that require large tracts of relatively undisturbed forest. Other impacts to wildlife that might cause mortalities or large-scale avoidance of the region's high-activity areas include increased noise and dust, increased human activity, and degradation of water quality.

Reclaimed areas would represent a long-term change in wildlife habitat from aspen, conifer, mixed aspen/conifer, and sagebrush communities to habitat dominated by perennial grasses. Habitat conversion would represent a long-tem loss of foraging habitat for forest-dependent wildlife such as flammulated owl, northern goshawk, and three-toed woodpecker. The conversion would also represent a long-term loss of habitat for wildlife dependent upon contiguous stands of forest such as gray wolf and wolverine. Canada lynx linkage habitat also exists within the Cumulative Effects Area. As additional areas are developed, this habitat may be fragmented. This fragmentation may prohibit or deter the natural repopulation and movement of Canada lynx into and through the area.

The Proposed Action may cause increased risks of exposure, even for wide-ranging TES wildlife species, because of the cumulative effects regarding selenium contamination of the environment from the Proposed Action and other mines within the same and adjacent watersheds in the area.

5.9 GRAZING MANAGEMENT

Approximately 1,221 acres would be affected by mining operations in the Rasmussen Ridge lease area that are potentially usable for grazing. The available forage would also be reduced by the 269 acres of proposed disturbance under the Proposed Action. Unit 1A of the Rasmussen Valley Cattle Allotment cannot be used for grazing due to the mining activity. This unit supported 23 percent of the grazing use on this allotment. Over time, reclamation of disturbed areas would replace lost grazing resources. The private lands within the Greater Rasmussen Valley-Sheep Creek Area (primarily the Rasmussen Valley) have been grazed since the late

1800s and would continue into the foreseeable future. All state and federal lands that are not affected by active mine operations with grazing leases would continue to be used to graze livestock.

Vegetation growing in soils or growth media that contains elevated levels of selenium can lead to bioaccumulation of selenium in plant tissues. Subsequent consumption of vegetation that contains elevated levels of selenium by livestock can result in selenium poisoning. The maximum tolerance level for selenium is estimated to be 2 milligrams selenium per kilogram of food for large mammals such as cattle, sheep, horses, and pigs (NRC 1980). Levels greater than the maximum tolerance level can cause chronic selenium toxicity. BMPs have been established in recent years that make significant reductions in selenium accumulation in surface soils and waters. These BMPs include selective placement of seleniferous waste rock, backfilling with non-seleniferous materials, covering waste rock with 2 to 3 feet of growth media, enhancing runoff to minimize infiltration, and avoiding the formation of ponds or lakes. Previous analyses of vegetation samples collected from reclaimed waste rock dumps indicate that total selenium levels ranged from less than 0.5 to 3.00 mg/kg. All samples of vegetation contained less than 5.0 milligrams selenium per kilogram of dry weight vegetation (TRC 1999; Greystone 2002). The initial results of these studies indicate that, to date, vegetation has not accumulated selenium to concentrations that exceed standards established by the BLM and USFS.

5.10 RECREATION

The cumulative impact of phosphate mining in the Cumulative Effects Area would be significant if the supply of recreational opportunities is exceeded by the demand. Supply could exceed demand if the supply were reduced from existing levels by the removal of land associated with mining operations, or if demand were increased from any influx of population from employment opportunities at the mine. Forest land near Rasmussen Ridge provides mostly dispersed recreation. It is a small area relative to lands available for dispersed recreation in the Cumulative Effects Area, which contains the Soda Springs Ranger District. Overall demand for recreational use is not expected to exceed supply in the Soda Springs Ranger District and in the Caribou National Forest during project operations. Additional population growth in Caribou County independent of the Proposed Action is possible as a result of various in-migration factors and could result in additional demand for recreational opportunities.

5.11 VISUAL RESOURCES

The Cumulative Effects Area is within a region of generally north- to northwest-trending mountain ranges and valleys. The most common land forms are foothills, which are cut at intervals by small creeks and drainages. Although scenic variety exists in the densities, arrangements, and colors of vegetation, no visually distinct landscapes are found in the Cumulative Effects Area. The area is generally undeveloped other than for mining; visual modifications to the area have been in the form of timber cuts, roads, mining operations, range improvements, power lines, and pipelines. Cumulative effects to visual resources from other planned or foreseeable development activities near the project area would result from historical, existing, and future mining in the Rasmussen Ridge area. Often, phosphate mining impacts are not considered substantial if the disturbance areas are not readily visible to the general public.

5.12 LAND USE, ACCESS AND TRANSPORTATION

Previous, current, and future reasonable foreseeable mining-related operations in the Cumulative Effects Area include the South, Central, and North Rasmussen Ridge Mines, Enoch Valley Mine, the Dry Valley Mine, South Rasmussen, Simplot Manning and Deer Creek, and the Smoky Canyon Mine. Past mining operations have removed more than 1221 acres from rangeland use at the Rasmussen Ridge Mines, 450 acres at the Enoch Valley Mine, more than 1,000 acres at Smoky Canyon, and 350 acres at the Dry Valley Mine. Of these disturbances, more than 125 acres at the Central and South Rasmussen Ridge Mines and more than 310 acres at the Enoch Valley Mine, and at least 120 acres at the Dry Valley Mine have been reclaimed to date (USFS 1998). Under the Proposed Action, an estimated 269 additional acres would be disturbed in the short term, and 197 acres would be reclaimed.

Over the long term, most of the disturbances associated with mining in the area would be reclaimed and returned to rangeland uses. As described above, grazing in the area may be affected by the introduction of noxious weeds or selenium-enriched soil resulting from mining-related ground disturbances.

Land ownership in the area is described in **Table 5.1-1** and illustrated in **Figure 5.12-1**. The private lands within the area would continue to be used primarily as rangeland into the future. All state and federal lands with grazing leases that are not affected by active mine operations would continue to be used for livestock grazing. State and federal land ownership is depicted in **Figure 5.12-1**. After reclamation is completed, cumulative effects to land use, access, or transportation resources would be insignificant relative to the overall availability of rangeland and recreational resources accessible to the public.

5.13 CULTURAL RESOURCES

The existing Rasmussen Ridge Mine and other mines in similar settings have not resulted in adverse effects to cultural resources. These mines have been developed in comparatively high and rugged terrain with few reliable sources of water. These locations have been unattractive for sustained historic or prehistoric occupation, are marginal for ranching, and do not hold precious metal deposits that could have attracted early mining. Historic and prehistoric sites in the region, including emigrant trails, occur along the river valleys and in lower, more open terrain with access to reliable sources of water. Continued development of the Rasmussen Ridge Mine would not result in significant cumulative effects to cultural resources.

5.14 SOCIAL AND ECONOMIC CONDITIONS

Implementation of the Proposed Action or Alternative 1 would not contribute adverse cumulative effects on public utilities and services beyond existing levels. Since no major effects to population, housing, or employment are predicted, there would be no incremental increases in service requirements as a direct result of the project. If the No Action Alternative is selected and mine closure occurs, a loss of county revenues would result, and the county's ability to fund selected public services and utilities may be jeopardized.

Continued development of phosphate mining within southeastern Idaho would result in increased revenue as a result of tax collections. Continuation of area mining would extend the anticipated life span of existing operations, prolong revenue collections to Caribou and Bear Lake counties. Payment of taxes on purchases of goods and services also would be prolonged.

Figure 5.12-1 Land Ownership in Cumulative Effects Area