SOUTHEAST IDAHO PHOSPHATE MINE ASSESSMENT AREA

NATURAL RESOURCE DAMAGE INJURY ASSESSMENT PLAN

PREPARED BY THE SOUTHEAST IDAHO PHOSPHATE MINE SITE NATURAL RESOURCES TRUSTEES:

United States Department of the Interior,
United States Department of Agriculture,
State of Idaho, and
Shoshone-Bannock Tribes

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LIST OF ACRONYMS

APC	Agriculture Products Corporation
ASAOC	Administrative Settlement Agreements/Orders on Consent
AOC	Administrative Orders on Consent
BIA	United States Bureau of Indian Affairs
BLM	United States Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFFC	Central Farmers Fertilizer Company
CFR	Code of Federal Regulations
CPO	Conda Phosphate Operations
CWA	Clean Water Act
DOI	United States Department of the Interior
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental protection Agency
FMC	Food Machinery Corporation
FWS	United States Fish and Wildlife Service
HOA	Horseshoe Overburden Area
IAP	Injury Assessment Plan
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
IDL	Idaho Department of Lands
ND	Non-detect Value
NOI	Notice of Intent
NRDAR	Natural Resource Damage Assessment and Restoration
ODA	Overburden Disposal Area
PAS	Preassessment Screen
PRPs	Potentially Responsible Parties

QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QMP	Quality Management Plan
RCDP	Restoration and Compensation and Determination Plan
RI/FS	Remedial Investigation/Feasibility Studies
SOPs	Standard Operating Procedures
TLC	Terteling Land Company
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
YCT	Yellowstone cutthroat trout

CHAPTER 1

INTRODUCTION

Pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, 42 United States Code (USC) § 9601, *et seq*. as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), the Clean Water Act (CWA), 33 USC § 1251, *et seq*., the National Contingency Plan, 40 Code of Federal Regulations (CFR) Subpart G, the CERCLA Natural Resource Damage Assessment and Restoration Regulations, 43 CFR Part 11, and all other relevant and applicable legal authorities, the State of Idaho, the United States Department of the Interior (DOI), the United States Department of Agriculture (USDA), and the Shoshone-Bannock Tribes are conducting a natural resource damage assessment and restoration (NRDAR) for the Southeast Idaho Phosphate Mine Assessment Area (Assessment Area). The Assessment Area, located in the Bannock, Bear Lake, Bingham, and Caribou Counties of Idaho, is the site of a number of historic and current mining operations that have released and continue to release hazardous substances into the environment. The Assessment Area spans three subbasins and provides important habitat for a variety of wildlife, including Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*), elk (*Cervus canadensis*), and bald eagle (*Haliaeetus leucocephalus*). Natural resources in the Assessment Area have been exposed to contaminants from these mining operations, and existing data indicate that hazardous substances released as a result of mining operations and ore processing may be adversely affecting natural resources in aquatic and terrestrial habitats.

In their capacities as natural resource trustees, the State of Idaho, DOI, USDA, and the Shoshone-Bannock Tribes (collectively, the Trustees) have formed the Southeast Idaho Phosphate Mine Site Natural Resource Trustee Council to coordinate NRDAR activities. The objective of the Trustees is to restore, replace or acquire the equivalent of those natural resources that have been injured as a result of releases of hazardous substances from mining operations and ore processing facilities. An important step in the NRDAR process involves the development of an Injury Assessment Plan (IAP). Section 11.30 (b) of 43 CFR states that the purpose of an IAP is to "ensure that the assessment is performed in a planned and systematic manner" and that the identified methods "can be conducted at a reasonable cost." This IAP describes the activities that the Trustees currently intend to pursue to perform the injury determination phase of the assessment.[1] The IAP also briefly describes the Trustees' plans for injury quantification and damage[2] determination, which will be performed following completion of the injury determination. More detailed descriptions of the activities and studies to conduct the injury

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[1] The CERCLA NRDAR regulations define "injury" as "a measureable adverse change, either long- or short-term, in the chemical or physical quality or the viability of a natural resource resulting either directly or indirectly from exposure to a discharge of oil or release of a hazardous substance." 43 CFR § 11.14(v). The use of the term injury in the CERCLA NRDAR regulations includes injury, destruction, and loss.

[2] Damages are defined as "the amount of money sought by the natural resource trustee as compensation for injury, destruction, or the loss of natural resources as set forth in section 107(a) or 111(b) of CERCLA." 43 CFR § 11.14(l).

quantification and damage determination phases of the NRDAR will be presented in future addenda to this IAP.

The remainder of this chapter addresses the following elements of the NRDAR:

- Assessment Area;
- Hazardous substance releases;
- Temporal scope of the assessment;
- Trustee authorities;
- Potentially Responsible Parties;
- Natural resource damage assessment and restoration process;
- Public involvement; and
- Structure of the IAP.

ASSESSMENT AREA

The Assessment Area is defined in the CERCLA NRDAR regulations as, "the area or areas within which natural resources have been affected directly or indirectly by the discharge of oil or release of a hazardous substance and that serves as the geographic basis for the injury assessment" (43 CFR §11.14(c)). The Trustees have identified an approximately 13,000-acre area corresponding with the locations of individual mine sites and facilities as the Assessment Area (Exhibit 1). As described in more detail in Chapter 2, contaminants of concern, particularly selenium, are present in mine wastes that were typically deposited on the ground. These contaminants have been mobilized from the wastes, leading to contamination of soils, surface water and sediments, ground water, and biota throughout the Assessment Area (IDEQ, 2002).

The Assessment Area encompasses three subbasins that receive surface and ground water flow from areas surrounding 18 individual mine sites and three ore processing facilities.[3] The three major subbasins in the Assessment Area are the Blackfoot River, Salt River, and Bear River Subbasins. The majority of the mines (15) occur within the Blackfoot River Subbasin, and one mine drains to the Salt River Subbasin; both subbasins ultimately drain to the Snake River. Two mines drain to the Bear River Subbasin, which is a tributary to the Great Salt Lake. Additionally, one mine has the potential to drain to both the Blackfoot and Bear River subbasins. Exhibit 2 describes the surface water drainage from some of the major tributary streams influenced by the individual mines and the rivers into which they drain. Existing data indicate that natural resources across the Assessment Area have been exposed to hazardous substances released as a result of mining operations and ore processing.

[3] The Gay Mine and Portneuf Subbasin are not included in the Assessment Area and are not part of this IAP, and therefore, are not shown in the figure.

HAZARDOUS SUBSTANCE RELEASES

Selenium is a major focus of the Trustees' assessment process because it is "the most significant contaminant (in concentration, extent, and potential toxicity)" in the Assessment Area (SIPMSTC, 2015). Selenium is a naturally occurring element in the environment, and an essential micronutrient for humans, plants, and wildlife. However, at high concentrations, selenium can be toxic. Mining processes produce selenium-bearing mine waste typically deposited on the surface. This makes the mine waste susceptible to processes that can facilitate selenium becoming highly water soluble, mobile, and biologically available. Historical mining and reclamation practices have resulted in the interaction of water with selenium-bearing material, leading to selenium contamination of surface and ground water. Elevated levels of selenium have been detected in water, sediment, soil, and biota collected throughout the Assessment Area (IDEQ, 2002).

Phosphate mining activities are also a potential source of aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, silver, thallium, uranium, vanadium, and zinc (SIPMSTC, 2015). The Trustees may include specific evaluations of these hazardous substances as determined by ongoing assessment activities.

TEMPORAL SCOPE

The Trustees plan to evaluate past, present, and expected future injuries to natural resources within the Assessment Area. Injuries will be quantified, and damages calculated from the onset of injuries or December 12, 1980, , through the expected date of resource recovery. The rate of recovery will be determined based on information related to exposure, remedial and restoration activities, natural attenuation, and resource recoverability. Some injuries may occur in perpetuity if resources are unable to recover to baseline conditions.

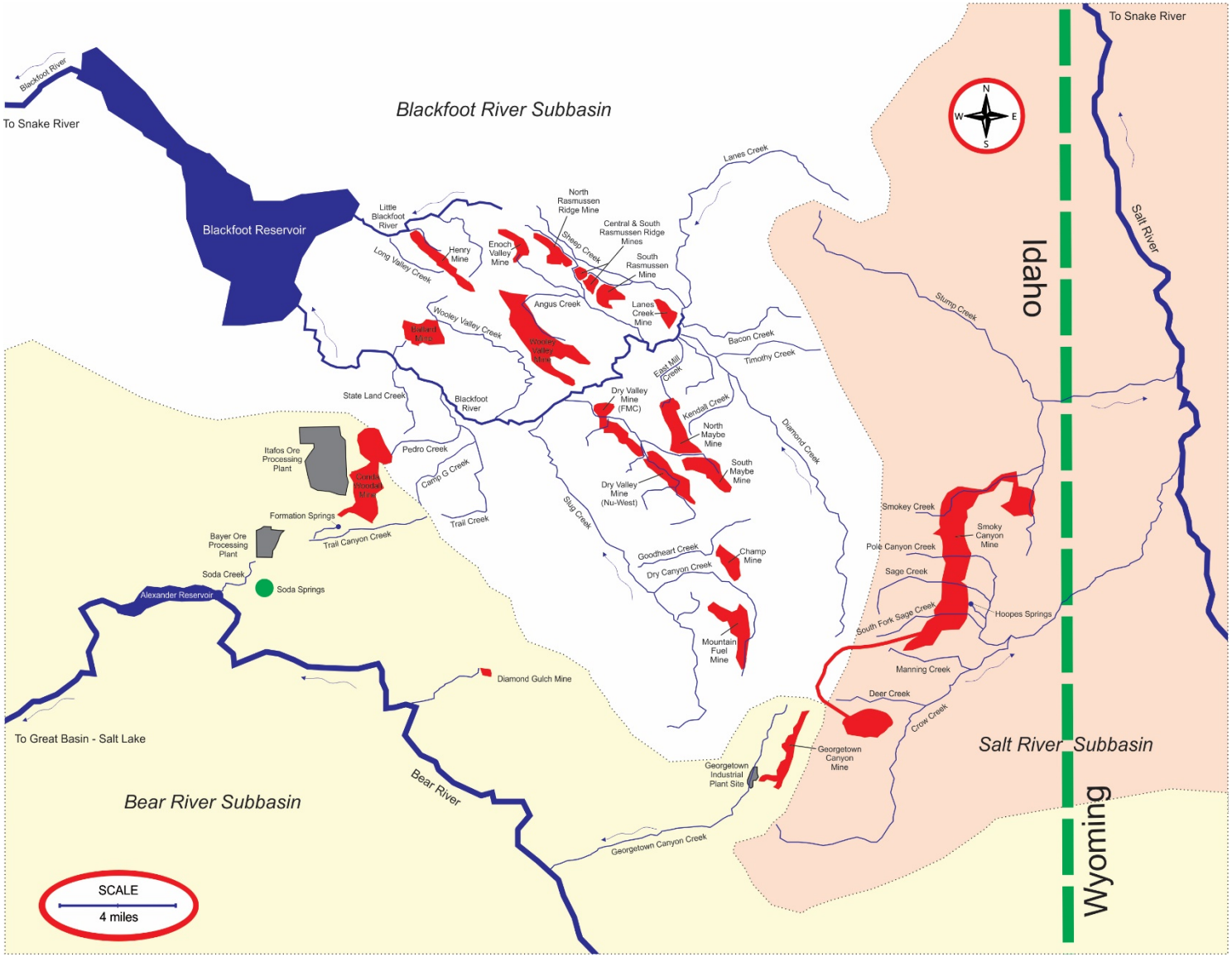


Exhibit 1. Individual phosphate mines, major subbasins, and streams within the Southeast Idaho Phosphate Mine Assessment Area.

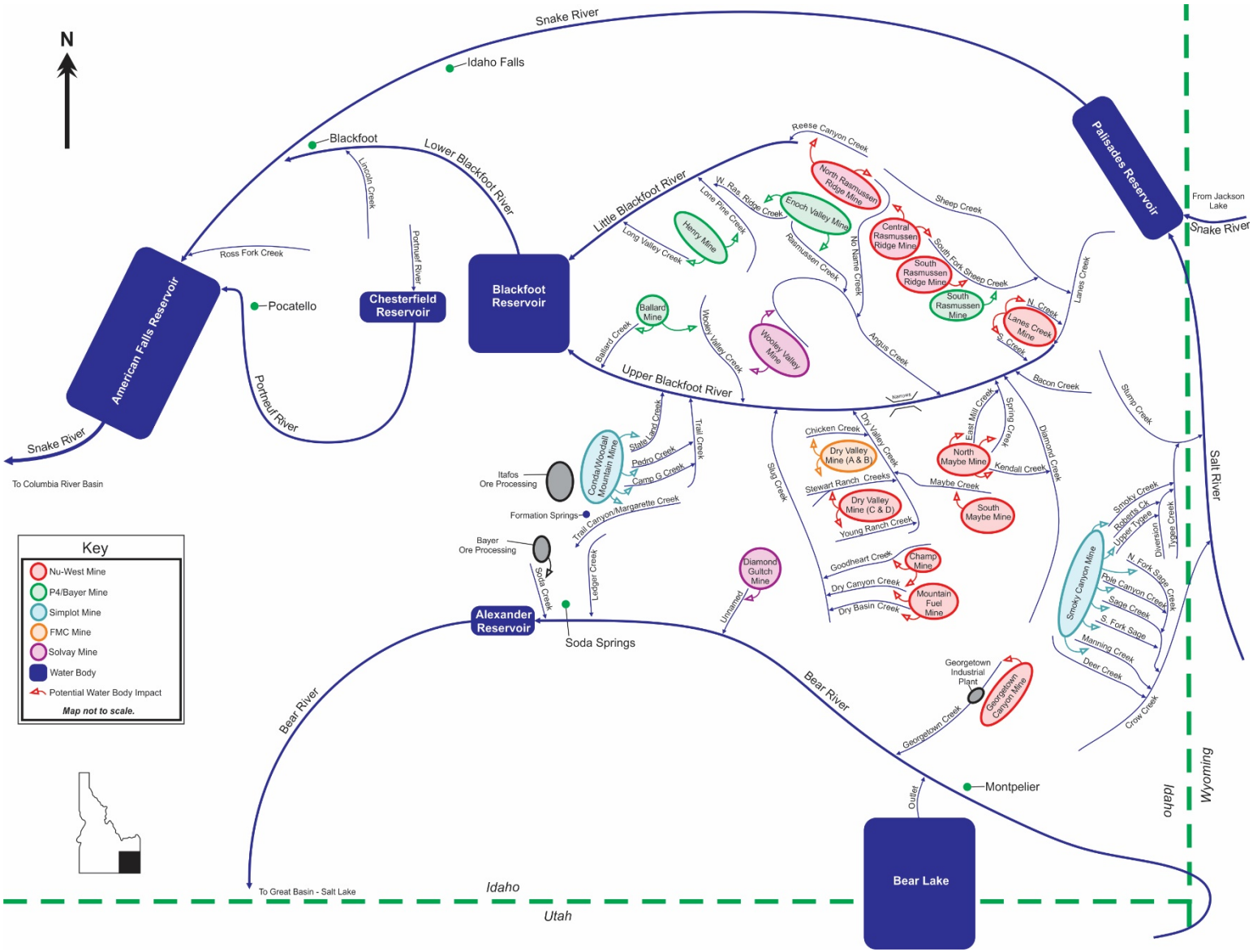


Exhibit 2. Schematic representation of individual mines and their potential release pathways into streams within the Assessment Area.

TRUSTEE AUTHORITIES

Natural resource trustees are designated by CERCLA (42 USC § 9607(f)), CWA (33 USC § 1321(f)(5)) and the National Contingency Plan (40 CFR §§ 300.600-300.612) as officials authorized to act on behalf of the public to recover damages to natural resources caused by releases of hazardous substances and to restore, replace or acquire the equivalent of such resources. In the context of NRDAR, "natural resources" are "land, fish, wildlife, biota, air, water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled" by the United States, a state, or a federally recognized tribe (42 USC § 9601(16)).

Pursuant to CERCLA, CWA, and other applicable legal authorities, the natural resource trustees for the Southeast Idaho Phosphate Mine Site Assessment Area include:

- DOI – represented by the U.S. Fish and Wildlife Service (FWS), U.S. Bureau of Land Management (BLM), and U.S. Bureau of Indian Affairs (BIA);
- USDA – represented by the U.S. Forest Service;
- The State of Idaho – represented by the IDEQ and Idaho Department of Fish and Game (IDFG); and
- The Shoshone-Bannock Tribes.

In 2015, DOI, USDA, the State of Idaho, and the Shoshone-Bannock Tribes formed the Southeast Idaho Phosphate Mine Site Natural Resource Trustee Council (Trustee Council). A Memorandum of Understanding was signed April 27, 2015 in order to facilitate the coordination and cooperation of the Trustees with regard to conducting NRDAR activities.

POTENTIALLY RESPONSIBLE PARTIES

The Potentially Responsible Parties (PRPs) in the Assessment Area include, but are not limited to the following:

1. FMC, which refers to all past and current owners/operators of mining operations at Dry Valley Mine. Though some of FMC's leases have been acquired from other companies (i.e., P_4/Monsanto and Kerr-McGee Oil Industries, Inc.), many of FMC's leases were initially acquired outright.
2. J.R. Simplot Company, which refers to all past and current owners/operators of mining operations at Smoky Canyon, Conda/Woodall Mountain, and Lanes Creek.
3. Nu-West, which refers to all past and current owners/operators of mining operations at North Maybe, South Maybe Canyon, Champ, Mountain Fuel, Georgetown Canyon, Rasmussen Ridge, Lanes Creek and Dry Valley Mines.
4. Solvay, which refers to all past and current owners/operators of mining operations at Wooley Valley, Diamond Gulch, and Rasmussen Ridge Mines.

5. P_4/Monsanto, which refers to all past and current owners/operators of mining operations at Ballard, Henry, Enoch Valley, and South Rasmussen Mines.
6. Huntsman Advanced Materials, Inc., which refers to all past and current owners/operators of mining operations at North Maybe Mine.
7. Wells Cargo, Inc., which refers to all past and current operators of mining operations at the North Maybe Mine.
8. CF Industries, Inc., which refers to all past and current owner/operators of mining operations at the Georgetown Canyon Mine.

THE NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION PROCESS

The purpose of the NRDAR process is for natural resource trustees to restore, replace, or acquire the equivalent of natural resources injured due to the release of hazardous substances, and thereby compensate the pubic for the loss of services those resources provide (43 CFR §§11.10 & 11.13). NRDAR is established under CERCLA and the associated CERCLA NRDAR regulations, 43 CFR Part 11, set forth a non-mandatory NRDAR process. These regulations establish guidelines and procedures for performing a NRDAR and define criteria for determining whether natural resources have been injured. In developing this IAP and conducting a NRDAR for the Assessment Area as described herein, the Trustees are following the CERCLA NRDAR regulations.

The overall process for conducting NRDAR includes the following phases:

1) Preassessment;
2) Assessment;
    a) Determination and quantification of the adverse effects (i.e., injury) to natural resources, caused by the release of a hazardous substance;
    b) Identification of actions to restore or replace the injured resources; and
    c) Calculation of damages to be recovered from the PRPs to pay for the restoration and the reasonable costs for conducting the assessment;
3) Restoration planning.

The Trustees completed the Preassessment Phase in 2015 with the issuance of a Preassessment Screen (PAS; SIPMSTC, 2015) and a determination to proceed with a formal assessment.

The Assessment Phase consists of (1) injury determination, (2) injury quantification, and (3) damage determination (43 CFR § 11.13(e)). This IAP describes the injury determination, and it has been developed to ensure the injury assessment is performed in a planned and systematic manner and that the chosen assessment methodologies are conducted at a reasonable cost (43 CFR § 11.13(c)).

The CERCLA NRDAR regulations set forth two types of assessments: Type A and Type B procedures (43 CFR § 11.33). The Type A procedure is a standardized assessment method that applies primarily to NRDARs for coastal and marine environments where limited field observation is needed to conduct an assessment (43 CFR § 11.40). Type B assessment procedures are used for site-specific assessments that often require data collection and studies (see 43 CFR §§ 11.35 & 11.60). Before including any Type B assessment methodologies in an injury assessment plan, trustees must confirm that at least one of the natural resources identified as potentially injured in the PAS has in fact been exposed to the released hazardous substance (43 CFR § 11.37).

The Trustees have elected to perform a Type B assessment. The Trustees' decision is based on the determination that: (1) the releases and exposures to mine-related contaminants are long-term and spatially and temporally complex; (2) substantial site-specific data already exist to support the assessment; and (3) additional site-specific data can be collected at reasonable cost, if needed. Moreover, Type B procedures are appropriate because, pursuant to 43 CFR § 11.37, the Trustees performed an exposure confirmation that involved reviewing existing hazardous substance concentration data previously summarized in the PAS. Based on the exposure confirmation, the Trustees conclude that potentially injured natural resources, including surface water and biota, have been exposed to mine-related hazardous substances. Specifically, multiple sampling efforts, spanning nearly two decades, have focused on exposure of the fishery resource to selenium releases from phosphate mining activities in the Assessment Area. Over 2,100 fish have been sampled for selenium in their tissues from locations across the phosphate mining region, including both mine-impacted and unimpacted streams. These data indicate that nearly half of the fish sampled, of which 46 percent are salmonids in mine-impacted streams, have tissue concentrations greater than 12.5 µg/g dry weight, a threshold above which impacts to sensitive life forms of resident trout may occur.

Consistent with the requirements for Type B assessments at 43 CFR § 11.31, this IAP describes possible studies for biological resources, including fish, birds, mammals, and invertebrates; surface water resources, including sediments; terrestrial resources, including soil and plants; and ground water resources. As required for Type B assessments, the Trustees developed a Quality Assurance Plan, which is available in Appendix A.

The Trustees plan to perform the injury assessment in three steps:

- **Injury determination** is the process through which the Trustees will determine whether a natural resource has experienced a measurable adverse change resulting from exposure to hazardous substance releases in the Assessment Area. As part of this assessment, the Trustees will also consider how the hazardous substances traveled, and continue to travel, through the ecosystem as well as how resources came to be exposed to those releases. The CERCLA NRDAR regulations describe the steps of the injury determination process at 43 CFR §§ 11.62-11.64.
- **Injury quantification** is the process the Trustees will use to measure the extent of the changes in the quantity and quality of natural resources and their associated services caused by the release of hazardous substances. The Trustees will measure the resource

effects relative to baseline, i.e., the "condition or conditions that would have existed at the assessment area had the discharge of oil or release of hazardous substance under investigation not occurred" (43 CFR § 11.14 (e)). Injury quantification includes measuring the effects to resources over space and time and includes assessing the length of time required for each injured resource to recover. The CERCLA NRDAR regulations describe the steps of the injury quantification process at 43 CFR §§ 11.71-11.73.

- **Damage determination** establishes the amount of money sought in compensation for injuries to natural resources resulting from a discharge of oil or release of a hazardous substance. Damages represent the cost of (1) restoration or rehabilitation of the injured natural resources to a condition where they can provide the level of services available at baseline, or (2) the replacement and/or acquisition of equivalent natural resources capable of providing such services,[4] and (3) reasonable and necessary assessment costs. Damages may also include the compensable value of all or a portion of the services lost. During the damage determination phase, the Trustees will identify actions to restore or replace injured resources and the services those resources provided. The CERCLA NRDAR regulations describe the damage determination process at 43 CFR §§ 11.80-11.84.

For each phase of the assessment, the Trustees' general approach includes first reviewing existing data and identifying potential data gaps. The Trustees' approach maximizes the use of existing information with the goal of minimizing assessment costs. Based on the initial review and any supporting analysis, the Trustees may develop additional individual investigations that, together, characterize injuries caused by hazardous substances released into the Assessment Area. These investigations may include additional testing, sampling, and analysis as needed to fill data gaps or otherwise conduct assessment activities.

The Trustees plan to perform evaluations to assess exposure, pathway, injury, or service losses associated with the following:

- Aquatic resources, including
    - surface water,
    - aquatic invertebrates,
    - fish, and
    - aquatic-dependent birds
- Geologic resources
- Biological resources, including
    - birds,
    - vegetation,

[4] Services are "the physical and biological functions performed by the resource including the human uses of those functions" and "are a result of the physical, chemical, or biological quality of the resource." 43 CFR § 11.14(nn).

    - invertebrates, and
    - mammals
- Ground water
- Response actions
- Tribal use
- Recreation

Injuries may occur in many forms, including death, physical deformities, reproductive impairment, exceedance of regulatory standards, and the presence of fish consumption advisories. Within each injury category, the Trustees may evaluate effects on natural resource services, which include the physical and biological functions performed by each resource, including the human and cultural interactions with those functions. The Trustees will also evaluate the effects of remedial actions within the Assessment Area.

At the conclusion of the injury assessment, the Trustees will present the damage determination in a Restoration and Compensation Determination Plan (RCDP; 43 CFR § 11.80(c)). The RCDP will describe a reasonable number of possible restoration alternatives and identify the preferred restoration alternative(s). The RCDP will also describe the methodologies that the Trustees will use to determine the costs of the selected alternative or alternatives and the compensable value of lost public services. The Trustees will release the RCDP for public review and comment.

ASSESSMENT ACTIVITIES

Summary of Assessment Approach and Timing

Given the scale and complexity of the Assessment Area, the Trustees plan to use a phased approach to complete the injury determination in a logical and efficient manner. The phased assessment approach will break out the individual mines within the larger Assessment Area into "Assessment Units." The makeup and scope of Assessment Units will be based on multiple factors, including, but not limited to, the location of an individual mine or facility within the subbasins of the Assessment Area; the presence of trust resources; contaminant release patterns across the Assessment Area and the potential for commingling of contamination across individual facilities; and the status of planned and ongoing remedial activities. The Assessment Units will be prioritized and NRDAR activities will be completed according to unit prioritization. Notwithstanding the proposed phased assessment approach outlined here, the Trustees may conduct Assessment Area-wide assessment activities and studies as needed.

This approach uses currently available information but allows for refinement and flexibility if needed as the Trustees continue assessment planning. The Trustees intend to use existing relevant and appropriate data to support the injury determination. These existing data have been collected as part of site investigation processes, mine permitting, and other procedures. Evaluation of the existing data will help focus additional data collection efforts.

The schedule for the completion of the injury assessment will be determined by a number of factors such as availability of funding, prioritization of studies, and the nature and timing of remedial alternatives. Likewise, environmental conditions (e.g., weather) and other variables influence the implementation of injury assessment activities. Lastly, assessment activities may be iterative in nature, with additional data collection possible pending results of earlier data collection efforts.

Coordination with Remedial Activities

The Environmental Protection Agency (EPA), IDEQ, and U.S. Forest Service (USFS) are currently leading efforts to conduct CERCLA Remedial Investigation/Feasibility Studies (RI/FS) at several individual mines within the Assessment Area. The purpose of these efforts is to evaluate the nature and extent of contamination at each mine, develop a baseline risk assessment for ecological and human health, and develop and evaluate appropriate remedial actions to reduce contamination. The mining companies are currently conducting RI/FSs with EPA, USFS, or IDEQ providing oversight. A number of agreements currently exist to govern the CERCLA RI/FS work and other CERCLA response actions at 10 mines. These agreements include, but are not limited to, Administrative Orders on Consent (AOCs), Administrative Settlement Agreements/Orders on Consent (ASAOC), and/or Unilateral Administrative Orders.

For those mines in the Assessment Area with the majority of their land ownership occurring on private or state land, EPA or IDEQ has the lead for the RI/FS activities. For those mines with the majority of their land ownership occurring on National Forest System lands, the USFS has the lead. The Department of Interior and Shoshone-Bannock Tribes serve as support agencies for the RI/FS activities. Because the nature and extent of contamination and the risks to human health and the environment have not yet been fully defined, it is unknown what final remedial actions will be proposed by EPA and the USFS across the Assessment Area. Several removal actions at individual mines within the Assessment Area have been completed, or are proposed. However, these actions may not fully address potential injury to natural resources.

In addition to CERCLA RI/FS work, the IDEQ has entered into consent orders at three mines not undergoing, or otherwise scheduled for RI/FS work, pursuant to the Idaho Environmental Protection and Health Act and the Idaho Hazardous Waste Management Act.

Because the remedial and NRDAR efforts will be ongoing concurrently, the Trustees have coordinated and will continue to coordinate with the EPA, IDEQ, and USFS as they implement RI/FS work and associated response actions. This coordination will help avoid duplication of effort, which will reduce costs and expedite restoration. Moreover, NRDAR also includes injuries that are not addressed by the remedial efforts (*see* 43 CFR § 11.15), or that are a result of remedial efforts. Therefore, the Trustees are committed to working with the agencies implementing remedial activities, as well as the PRPs, to ensure the NRDAR is coordinated with remedial planning, investigation, and associated corrective actions.

Cooperation with Potentially Responsible Parties

The Trustees have invited, and will continue to encourage, the active participation of PRPs in a cooperative NRDAR process (43 CFR § 11.32(a)(2)). On October 8, 2015, pursuant to 43 CFR §

11.32(a)(2), the Trustees sent a notice of intent (NOI) to conduct a formal assessment to known PRPs at the Assessment Area. The NOI described the releases and the Trustees' authorities, and invited the PRPs to participate with the Trustees to conduct the NRDAR. As appropriate, the Trustees will engage in cooperative assessment activities with PRPs to foster coordination and open communication. The Trustees believe coordination and communication with PRPs can enhance the acceptability of scientific studies and encourage relevant sharing of data. The Trustees will seek cooperative NRDAR activities to further the Trustees' goals to reduce assessment costs, promote restoration, and provide opportunities to reach early settlements with PRPs. Currently, the Trustees are engaged in cooperative assessment activities with Simplot, Nu-West, Solvay, and P_4/Monsanto under a Funding and Participation Agreement (March 23, 2018). Notwithstanding cooperative assessment activities, the Trustees maintain the ultimate authority relative to NRDAR decisions.

PUBLIC PARTICIPATION

Website and Other Media

The Trustees' public website for the Southeast Idaho Phosphate Mine Site NRDAR provides information regarding the status of the assessment and restoration process, as well as opportunities for public involvement.[5] Interested individuals can use the website to sign up for the Trustees' NRDAR newsletter.

Public Review and Comment

Per 43 CFR § 11.32, this IAP will be available for public review and comment. The public comment period will last for 30 days, with a reasonable extension granted, if requested and appropriate. The public comment period begins on the date that the notice of availability is published in the Federal Register. Comments on this IAP may be submitted electronically to sandi_fisher@fws.gov, or in writing to:

Sandi Fisher, Lead Administrative Trustee
U.S. Fish and Wildlife Service – Eastern Idaho Field Office
4425 Burley Drive, Suite A
Chubbuck, Idaho 83202

This IAP may be modified at any stage of the assessment. If significant modifications are made to the IAP, the Trustees will conduct additional public comment and review periods consistent with the requirements set forth in 43 C.F.R. § 11.32(e). The Trustees will append any modifications to this IAP.

STRUCTURE OF THE IAP

This IAP describes the Trustees' approach to the injury assessment process. The remainder of this document is organized as follows:

[5] https://www.fws.gov/idahonrdar/

- **Chapter 2 – Assessment Area Background & Release Pathway**: Chapter 2 provides an overview of mining and processing facility operations in the Assessment Area. The chapter also describes how mine-related hazardous substances are released into the environment.
- **Chapter 3 – Habitats, Natural Resources & Associated Ecological Services**: Chapter 3 describes the natural resources and habitats of the Assessment Area.
- **Chapter 4 – Human Use & Natural Resource Services**: Chapter 4 describes tribal and non-tribal human use services associated with the Assessment Area.
- **Chapter 5 – Injury Determination**: Chapter 5 describes the injury determination process. The chapter reviews applicable injury definitions and describes the evaluations that the Trustees intend to pursue to characterize natural resource injuries in the Assessment Area.
- **Chapter 6 – Injury Quantification, Damage Determination & Restoration Planning**: Chapter 6 briefly describes steps that will be undertaken to quantify injuries, scale restoration, and determine damages.
- **Appendix A– Quality Assurance Management**: Appendix A describes the elements of the Quality Assurance Plan, including project management, data generation and acquisition, assessment and oversight, and data validation and usability.
- **Appendix B – Mining Operations and Remedial Activities**: Appendix B provides an overview of historic mining operations in the Assessment Area and describes remedial activities at individual mine sites.

CHAPTER 2

ASSESSMENT AREA BACKGROUND & RELEASE PATHWAY

This chapter presents background information on mining and processing operations within the Assessment Area and describes the activities and conditions that result in the release of hazardous substances to the environment. The chapter also describes the pathway by which natural resources may be exposed to mine-related hazardous substances.

MINING OPERATIONS AND THE PHOSPHORIA FORMATION

The Assessment Area encompasses 18 major open pit phosphate mines and three ore processing facilities. Phosphate mining operations began in the early 1950s at several locations and continue to the present day. These large-scale mines are open pit or contour strip mines, developed near the surface exposures of the Phosphoria Formation, which is the target rock formation for economic phosphate recovery in southeast Idaho. Exhibit 3 summarizes the total area of the mining operations in acres for all mines in the Assessment Area. Appendix B provides additional details regarding the operations of each mine site.

According to the U.S. Geological Survey (USGS), phosphate operations in southeast Idaho account for about 30 percent of total U.S. reserves and represent one of only two commercially viable phosphate reserves in the nation (with the other located in Florida). The phosphate ore is transported by truck, rail, or slurry pipeline to processing facilities in Soda Springs or Pocatello, Idaho. In *Life Cycle of the Phosphoria Formation* (USGS, 2004), the western Phosphate Field is described as follows:

> "The western Phosphate Field encompasses an area of about 350,000 sq. km in adjacent parts of Idaho, Utah, Montana, Wyoming, Nevada and Colorado in the northern Rocky Mountains. The Western Phosphate Field of the United States contains one of the largest resources of phosphate rock in the world and it has been mined for nearly a century. The thick, high-grade phosphate deposits in the Meade Peak Member of the Phosphoria Formation constitute an important economic resource providing about 12-14% of total United States production. The remaining phosphates in the Western Field constitute about 3% of the world reserves and 30% of United States reserves. Since the opening of the first mine in 1906, 229 million metric tons of marketable phosphate rock have been produced from 70 mines in the four states that comprise the Western Phosphate Field. Of these 70 mines, 49 were underground, 17 were surface, and seven used both methods; however, since 1993, all production has been from surface mines. Early scientific studies and changes in US mining laws have contributed to the exploration and development of this valuable resource. Idaho has been the most significant producing state followed by Montana, Utah, and Wyoming. Currently, mining occurs only in Idaho and Utah at an average rate of approximately 5 million tons per year."

Exhibit 3. Phosphate mines in the Assessment Area as of 2014[1].

Mine	Approximate Years of Operation	Area (Acres)
Ballard	1952 to 1969	635
Diamond Gulch	1910 to 1912, 1960 to 1962	32
North and South Maybe Canyon	1950 to 1993	1,270
Wooley Valley	1955 to 1989	808
Mountain Fuel	1966 to 1967, 1985 to 1993	781
Henry	1969 to 1989	1,074
Lanes Creek	1978 to 1989, 2015 to present	214
Champ and Champ Extension	1982 to 1985	460
Enoch Valley	1990 to present	808
Rasmussen Ridge Mines[2]	1991 to 2018	1,400
South Rasmussen	2003 to present	390
Dry Valley	1992 to 2011	1,082
Conda/Woodall Mountain Mine	1906 to 1984	1,700
Georgetown Canyon Mine	1909 to 1963	189
Smoky Canyon Mine	1983 to present	1855 (Panels A-E and Pole Canyon)

[1] The Blackfoot Bridge Mine is not included as part of the Assessment Area.
[2] Includes North, South, and Central Rasmussen Ridge Mines

The Phosphoria Formation is divided into three vertical members. Starting from the top, they are the Cherty Shale (less than 100 feet thick), the Rex Chert (up to 300 feet thick), and the Meade Peak (180 to 200 feet thick). The Meade Peak member is generally divided into three major zones – a lower ore zone, the middle waste shales, and the upper ore zone. The upper and lower ore zones are typically targeted for phosphate ore recovery. The middle waste shale zone is about 25 to 30 meters thick. This zone is composed predominantly of low grade phosphate black shale that is typically not used for ore recovery and is stockpiled at the mine site. It is this middle zone that typically contains selenium and other potential contaminants. Throughout the Assessment Area, folding, faulting, and erosion have created ridges and valleys exposing bands of the Meade Peak member.

Release Pathways

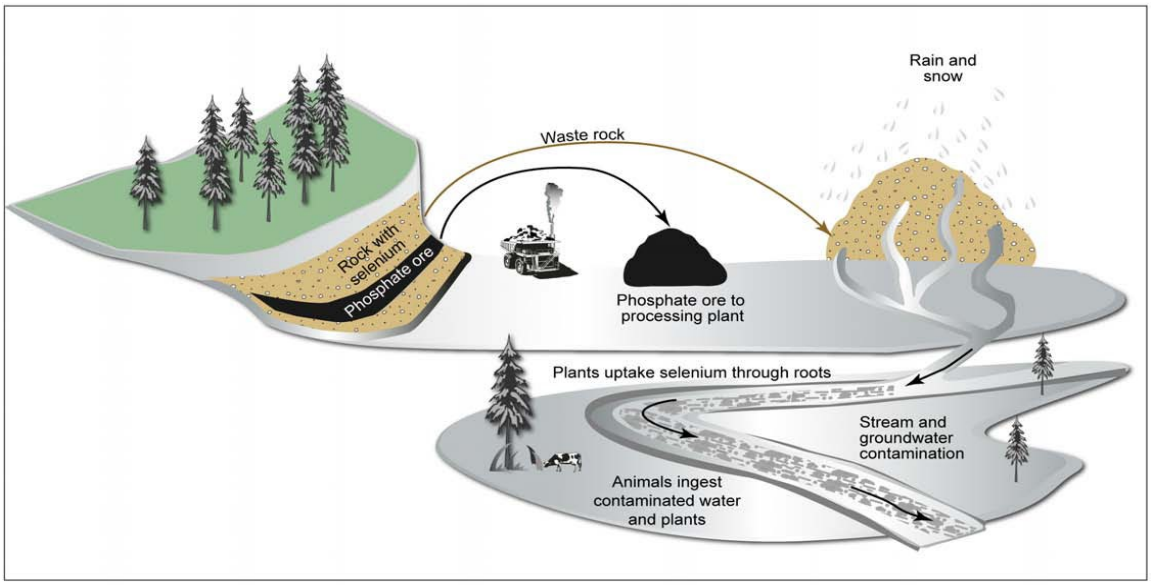
Weathering and transformation processes are the primary mechanisms by which selenium leaches from mine-related wastes, enters water bodies, and is introduced into the food web. Rain

and surface water that infiltrate waste rock piles mobilize selenium and other mine-related hazardous substances. The mobile selenium leaches from the waste rock and enters water systems, eventually absorbing to particles that disperse and settle in streams and low-lying areas throughout the Assessment Area. Exhibits 4 and 5 demonstrate the release pathways for mine-related hazardous substances to both surface water and ground water.

Mine-related hazardous substances that enter surface water may be transported downstream, deposited in sediment, or volatize into the air. Bacteria, plants, algae, and fungi (i.e., primary producers) integrate selenium into their tissues and provide the predominant pathway for selenium uptake in higher trophic levels of the food web. Benthic invertebrates, fish, and birds that prey on fish or aquatic insects absorb selenium during feeding and other biological or physical processes. Selenium may also be incorporated into plants or converted to a gas (e.g., dimethylselenide) via microbial processes. Additionally, plants may subsequently absorb mine-related hazardous substances through their root structures, bark, and leaf surfaces. Fish and wildlife absorb mine-related hazardous substances through dermal contact, respiration, inhalation, and ingestion of water, prey, vegetation and soil. IDEQ (2002) describes the pathways through which natural resources may be exposed to selenium and other mine-related hazardous substances at the Assessment Area (Exhibit 6).

Releases from Mining Operations

Historic phosphate mining operations involved removal of overburden soils and rock to access the phosphate ore. The overburden rock and waste shales were excavated and placed adjacent to mine pits, or backfilled into pits, known as Overburden Disposal Areas (ODAs). Rainfall and snowmelt infiltrate into the dumps/pits where the water leaches selenium and other hazardous substances from the mine wastes. These mine-related hazardous substances then infiltrate into the ground water or are transported into nearby streams.



Source: GAO analysis of BLM data; Art Explosion (clip art).

Exhibit 4. Surface water release pathway for phosphate mining-related wastes into the environment (adapted from GAO 2012).

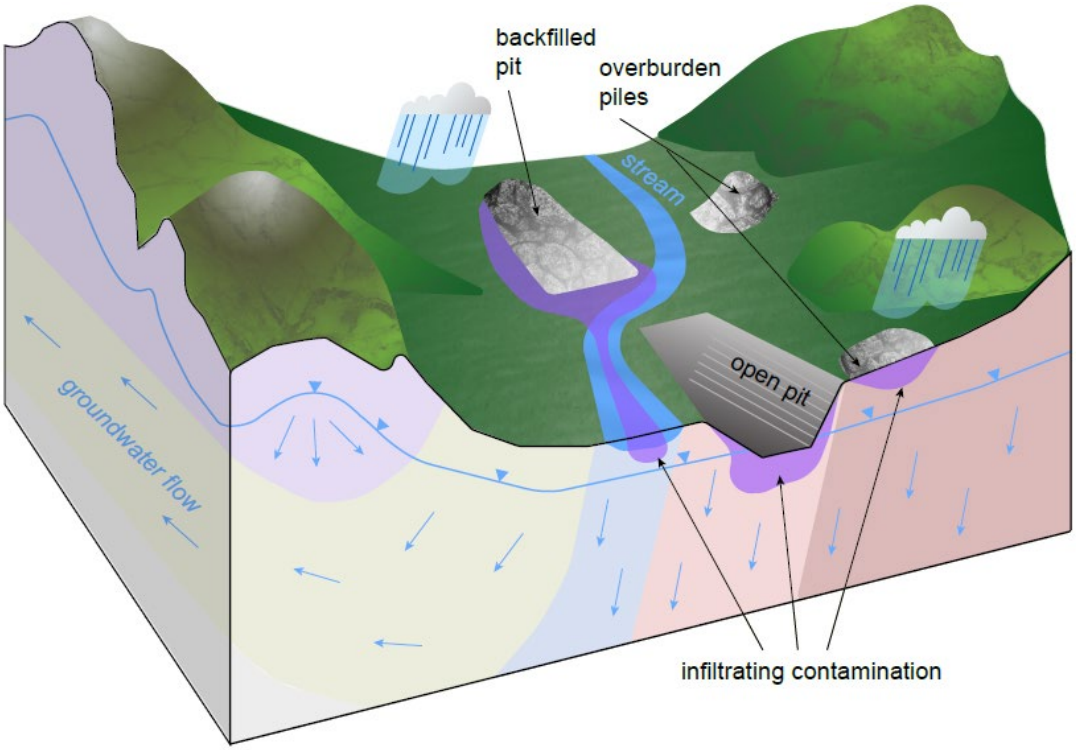


Exhibit 5. Ground water release pathway for phosphate mining-related wastes into the environment.

Releases from Processing Facilities

The sections below summarize operations and hazardous substance releases at the three major processing facilities located in the Assessment Area.

ITAFOS CONDA PHOSPHATE OPERATIONS

The approximately 2,400 acre Conda Phosphate Operations (CPO) is located north of Soda Springs, Idaho. The plant was originally owned and operated by APC. APC changed its name to Beker Industries, Inc., which acquired the plant and then sold it to Nu-West Industries. While historical records are limited, the best readily available information suggests that operations began in 1972. The plant was shut down briefly in 1986, but has run continuously since 1987. In 1995, Agrium, Inc. acquired Nu-West Industries Inc. and assumed operation of the plant. CPO consists of the Rasmussen Ridge and Lanes Creek phosphate mines and the Conda production facility. Each year, CPO produces approximately 550,000 tons of phosphate fertilizers. Phosphate ore, sulfuric acid, sulfur and anhydrous ammonia are the principle raw materials used to manufacture fertilizers at the Conda production facility. In November 2017, Itafos purchased the Conda production facility.

On December 27, 2006, over four million gallons of low pH water (pH of 2) was released through a dike on one of the gyp stacks. Approximately 3.7 million gallons of this low pH water was discovered in the field behind the Torgeson Family farm house. The rest was contained onsite at the Agrium facility. Several other smaller volume releases have also occurred throughout CPOs operational history. To date, no health effects to humans or wildlife have been reported. Extensive ground water contamination has been observed at the facility and is currently being investigated by CPO and regulatory agencies. Chemical releases are summarized in EPA's Toxics Release Inventory.

P4 MONSANTO PROCESSING PLANT

The 800-acre P4 plant has been in operation since 1952. The site includes the 540-acre plant operating area and a 260-acre buffer area. Monsanto purchased the property in 1952 to use local phosphate-rich ore to manufacture elemental phosphorus. Ore is stockpiled on-site prior to being processed for introduction into electric arc furnaces along with coke and silica. All process waters, with the exception of non-contact cooling water, are held and treated on site and then reused. The non-contact cooling water is discharged from the site to Soda Creek, and a portion of the flow downstream of the discharge is diverted for irrigation.

Site activities and waste disposal practices at the P4 processing plant have exposed soil and ground water to hazardous substances and radioactive constituents. Process wastes, previously stored in unlined ponds or impoundments, are responsible for ground water contamination. Ground water under and near the site is contaminated with cadmium, selenium, fluoride, and nitrate. The site is now under a CERCLA action for ground water contamination.

In 2013, P4/Monsanto, in consultation with EPA and IDEQ, began to develop and perform additional studies to learn why selenium and other contaminants in the ground water are not decreasing at the rates originally anticipated. EPA is in the process of determining whether alternative ground water cleanup approaches are needed.

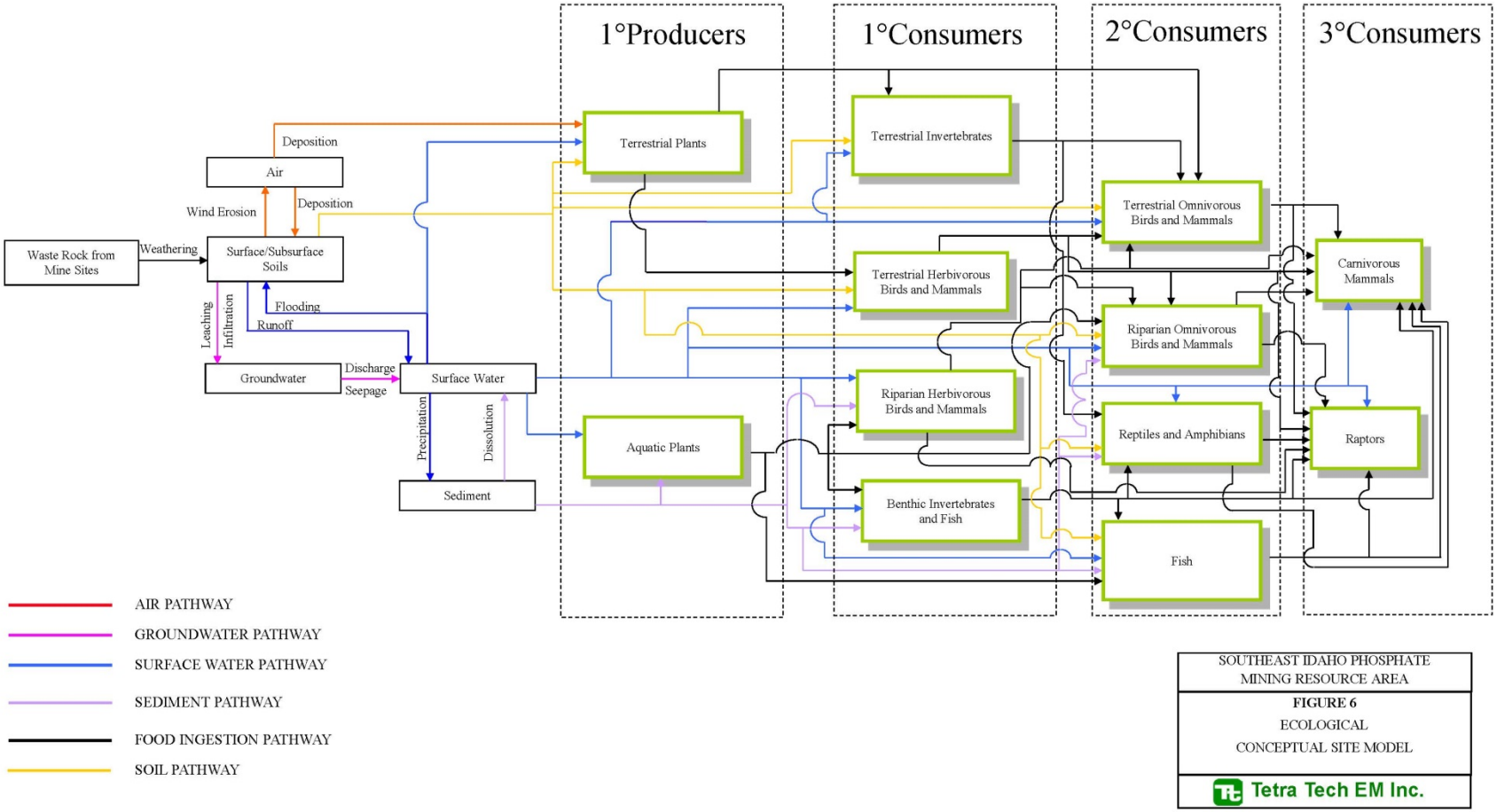
P4/Monsanto's annual monitoring indicates selenium in ground water extends south from the P4/Monsanto Plant extending under the northern part of Soda Springs. Studies to date have found no contamination of the drinking water supply for Soda Springs or other drinking water supplies. Based on the locations of the drinking water withdrawal points and a domestic-well study performed under the direction of EPA, the affected ground water is not consumed or used domestically. Operation and maintenance activities and monitoring are ongoing.

In 2015, P4/Monsanto was fined for uncontrolled releases of chemicals from the P4 plant. P4/Monsanto agreed to pay $600,000 for not reporting hundreds of uncontrolled chemical releases from its Idaho phosphate plant. According to EPA and DOJ, between 2006 and 2009, the plant emitted hydrogen cyanide, sulfur dioxide, nitrogen oxides and mercury into the atmosphere. Chemical releases are summarized in EPA's Toxics Release Inventory.

GEORGETOWN CANYON MINE INDUSTRIAL COMPLEX AREA

IDEQ entered into a consent order with Nu-West to address historic releases of hazardous waste from the former Industrial Complex Area at Georgetown Canyon Mine, which is no longer in operation. To address Site contamination, Nu-West agreed to conduct a Site Investigation, including field sampling, and to implement a Remedial Action Plan. Remedial actions were performed at the Industrial Complex Area during 2009 and 2010. These activities were designed to prevent the migration of potentially hazardous materials from the Site and reduce potential exposure routes from hazardous materials to humans and/or environmental receptors on-site. Major components of the remedial actions included: capping of the slurry pit and the arc furnace and clarifier; removing the remaining phosphate ore from Phosphoria Gulch; and daylighting Georgetown Creek, which entailed re-establishing a creek channel and removing the 60-inch corrugated metal pipe through which the creek formerly flowed. Additional tasks were implemented to de-water saturated soils near the slurry pit, re-channel the creek in Phosphoria Gulch to prevent over-land flow onto the Site, and make improvements to the settling pond. Institutional controls are currently in place on the Site to restrict land use, and the site is maintained and monitored under an Operations and Maintenance Plan.

Exhibit 6. Assessment Area Ecological Conceptual Site Model (IDEQ, 2002).



CHAPTER 3

HABITATS, NATURAL RESOURCES & ASSOCIATED ECOLOGICAL SERVICES

The Assessment Area supports a variety of natural resources potentially affected by releases of hazardous substances, including surface water, ground water, geologic resources, and biological resources. In turn, these resources have physical and biological characteristics that support fish and wildlife, contribute to habitat and landscape level functions, and create opportunities for human use and enjoyment of the resources. Ecological services include key life-cycle functions such as reproduction, growth and mortality, as well as feeding, nesting, rearing offspring, wintering, and migration. Human uses include outdoor recreation opportunities such as fishing, hunting, trapping, boating, swimming, traveling (including hiking, biking, recreating on ATV's, etc.), camping, and observing wildlife. This chapter characterizes natural resources and habitats within the Assessment Area and describes some of the ecological services those resources provide.

AQUATIC RESOURCES

Surface Water Resources

Surface water resources are defined as "the waters of the United States, including the sediments suspended in water or lying on the bank, bed, or shoreline and sediments in or transported through coastal and marine areas" (43 CFR § 11.14(pp)). Surface waters provide essential habitat for aquatic organisms, including aquatic plants, invertebrates, and fish. Surface waters also provide ecological services to terrestrial biota, both in the form of drinking water and foraging habitat. Some surface waters provide services to humans in the form of subsistence and recreational opportunities.

Surface water resources in the Assessment Area include the Blackfoot, Salt, and Bear Rivers, and their tributaries.

- The **Blackfoot River Subbasin** emanates from its headwaters of Lanes Creek and Diamond Creek, in southeast Idaho, where it flows northwest into the Blackfoot Reservoir, ultimately discharging into the Snake River at the Fort Hall Reservation. Most of the individual mines within the Assessment Area occur in the Blackfoot River Subbasin, and consequently drain to the Blackfoot River. One mine, Conda/Woodall Mountain, straddles the ridge between the Blackfoot River Subbasin and the Bear River Subbasin. The east slope of this mine drains into State Land Creek and Pedro Creek, which subsequently discharge into the Blackfoot River.
- The **Salt River Subbasin** flows west out of the mountains in Wyoming, then north along the Idaho/Wyoming border, continuing its northward meander until its confluence with the Snake River at Palisades Reservoir in Idaho. Smoky Canyon Mine drains into several streams, including Stump Creek and Crow Creek, which are tributaries to the Salt River.

- The **Bear River Subbasin**, originates in the Uinta Mountains in northeast Utah, meandering in a northerly direction between Wyoming and Utah. The basin then turns to the northwest in Idaho, running in a northwest direction until Alexander Reservoir, just outside the town of Soda Springs, Idaho. It then makes a sharp southerly turn, where it flows back into Utah until its terminus in the Great Salt Lake. Several mines drain into the Bear River before it crosses into Utah, including Conda/Woodall Mountain, Diamond Gulch, and Georgetown Canyon Mines. Additionally, both the P4/Monsanto Soda Springs Facility and the Itafos Conda Phosphate Operations Plant areas drain to the Bear River Subbasin.

Stream-flow originates from springs in the mountain and valley areas. These springs are discharge points for ground water systems that range from isolated alluvial aquifers to large bedrock aquifers. Many headwater streams at higher elevations only flow during snowmelt runoff, but others are fed by large perennial springs.

Fractured limestone beds, and some of the more permeable sandstone beds, are likely the main source of water for numerous springs in the area. These springs are a source of perennial flow for several surface water streams in the region. Eighty-eight springs were identified in a survey of the southeast Idaho phosphate field (Winter, 1980; Ralston, *et al.*, 1980). Forty-two flow from the Thaynes or Dinwoody formations at an average discharge rate of 25 gallons per minute. The Phosphoria formation supported the fewest springs (three) while the eight springs from the Wells formation flowed at the highest average rate, 130 gallons per minute (Montgomery Watson, 1999).

Ground Water Resources

Ground water resources in the Assessment Area include water in a saturated zone or sub-surface stratum, and the rocks or sediments through which the ground water moves (43 CFR § 11.14(t)). Such resources include aquifers and hyporheic ground water (shallow ground water beneath a streambed that is mixed with surface water). Some ground water resources serve as drinking water supplies. The following discussion of ground water has been adapted primarily from Montgomery Watson (1999).

Ground water in the Assessment Area can be divided into basin-filling alluvium and bedrock flow systems. Alluvium up to 150 feet thick in the valleys is recharged by direct precipitation and streamflow. Locally, ground water in the valleys may be perched on bedrock where static water levels in alluvium and nearby bedrock water wells differ by 100 feet (BLM, 1999). Alluvial ground water typically has a horizontal component flowing in the direction of surface drainages and a vertical component. Structures and stratigraphy control much of the ground water flow systems within the Dinwoody, Phosphoria, and Wells Formations where phosphate mining primarily occurs (Ralston, *et al.*, 1980).

With respect to ground water, the Wells formation is the most transmissive of any bedrock unit in the region (BLM, 1999). In general, ground water flow systems in the bedrock follow the dip of the unit. Ground water recharge occurs during the snowmelt runoff season.

The upper Phosphoria Formation member, the Rex chert, has low to moderate permeability. The main ore-bearing unit of the Phosphoria Formation, the Meade Peak member, is relatively impermeable. Field tests conducted in the 1970s demonstrate that orders of magnitude differences exist in transmissivity and hydraulic conductivity values between fractured and non-fractured members of the Phosphoria Formation.

Ground water use in the Assessment Area is dependent on several variables, including population; land use; availability and quality of surface water; and availability and quality of ground water. In the more remote regions, ground water use is generally limited to livestock watering. In the surrounding valleys, ground water is used for livestock watering and mining operations (primarily for dust abatement or beneficiation, a method which improves ore's economic value by removing unwanted minerals). In and around the Assessment Area communities, ground water is used for municipal supplies, irrigation, industrial uses, and domestic supplies.

GEOLOGIC RESOURCES

In the context of NRDAR, geologic resources are defined as "those elements of the Earth's crust such as soils, sediments, rocks, and minerals, including petroleum and natural gas, that are not included in the definitions of ground water and surface water resources" (43 CFR § 11.14(s)).

Geology at the Assessment Area is generally composed of deformed Paleozoic and Mesozoic sedimentary rocks, including thick marine clastic units, cherts, and limestones, and is situated within the northern region of the Basin and Range Physiographic province (Montgomery Watson, 1999). The valleys are largely filled with Quaternary alluvium and colluvium that overlay Pleistocene basalt flows. Thick rhyolite flows of the Snake River Plain region, and rhyolite domes, located south of the Blackfoot Reservoir, make up the remaining volcanic sequences in the area (IDEQ, 2002). The Phosphoria Formation was deposited during Permian time, forming the western phosphate field that is partly located in the Assessment Area.

BIOLOGICAL RESOURCES

The Assessment Area provides habitat for various types of wildlife, including mammals, birds, reptiles, fish, amphibians, and insects. The CERCLA NRDAR regulations broadly define "biological resources" to encompass living organisms, including "marine and freshwater aquatic and terrestrial species; game, nongame, and commercial species; and threatened and endangered, and State sensitive species" as well as "shellfish, terrestrial and aquatic plants" (43 CFR § 11.14(f)). Previous studies indicate that the Assessment Area supports or contains up to 75 species of mammals, 272 species of birds, 16 species of reptiles, 16 species of fish, and seven species of amphibians (USGS, 1977; USFS, 1985). Several species present within or near the Assessment Area are listed as federally threatened or endangered or are species of concern. The sections below provide a general overview of fish and wildlife occurring within or near the Assessment Area, adapting information from Montgomery Watson (1999).

Vegetation

Vegetation across the Assessment Area is transitional between the Great Basin vegetation to the south and Rocky Mountain vegetation to the north. The different vegetation types result from multiple factors, including: elevation, moisture, temperature, soil type, slope, and aspect. The major vegetation cover types include: conifer-aspen communities; mountain brush communities; sagebrush-grass communities; riparian communities, marshland communities, and agricultural and urban lands (Montgomery Watson, 1999).

Mammals

Elk, mule deer (*Odocoileus hemionus*), and moose (*Alces alces*) are common across the Assessment Area. Studies conducted by IDFG indicate that most elk tend to be nomadic, but do not migrate long distances between summer and winter ranges (Kuck, 1984). A more recent study of summer-winter elk migrations in the Greater Yellowstone Ecosystem finds that elk generally migrate just 40-60 km between their seasonal ranges (Nelson *et al.*, 2012). Kuck (1984) also reported that moose appear to be widely dispersed in aspen and conifer communities year-round. Mule deer typically spend spring, summer, and fall in the higher elevations and migrate in the winter to lower elevations that hold less snow (Kvale, 1980; Kuck, 1984; D'Eon and Serrouya, 2005).

Mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), black bear (*Ursus americanus*), and coyote (*Canis latrans*) are the largest carnivores in the Assessment Area. Mountain lions are generally solitary and tend to be found where deer and elk are more numerous. Black bears tend to be ubiquitously distributed across the Assessment Area. Coyotes are the most common predator across the Assessment Area and utilize all habitat types. Bobcats are smaller predators, and less common, but also are dispersed across all habitat types. Other common mammalian predators include: short-tail (*Mustela erminia*) and long-tail weasel (*Mustela frenata*), mink (*Mustela vison*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), and red fox (*Vulpes fulva*). Small mammals also found across the Assessment Area include: rabbits, mice, voles, ground squirrels, beaver, muskrat, otter, yellow-bellied marmot, porcupine, and a variety of bat species.

Birds

As many as 272 different bird species may frequent habitats found within the Assessment Area (USGS, 1977). Approximately 25 species of raptors use habitats in the Assessment Area for nesting, foraging, and rearing of young. These include: bald eagle, golden eagle (*Aquila chrysaetos*), peregrine falcon (*Falco peregrinus anatum*), prairie falcon (*Falco mexicanus*), osprey (*Pandion haliaetus*), northern goshawk (*Accipiter gentilis*), sharp-shinned hawk (*Accipter striatus*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), ferruginous hawk (*Buteo regalis*), northern harrier (*Circus hudsonius*), and American kestrel (*Falco spariverius*).

Eight species of owl are known to forage or nest within or near the Assessment Area, among them: barn owl (*Tyto alba*), screech owl (*Otus kennicottii*), flammulated owl (*Otus flammeolus*), burrowing owl (*Athene cunicularia*), great gray owl (*Strix nebulosa*), great horned owl (*Bubo*

virginianus), long-eared owl (*Asio otus*), and saw-whet owl (*Aegolius acadicus*). Owl prey mainly on small rodents and birds.

The Assessment Area is located within the Pacific Flyway and provides waterfowl with stopover habitat to forage and replenish nutritional reserves during migration. Additionally, the Assessment Area aquatic habitats offer waterfowl an area for nesting and brood rearing. Many types of waterbirds depend on the Assessment Area, such as Canada goose (*Branta canadensis*), canvasback (*Aythya valisineria*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), redhead (*Aythya americana*), lesser scaup (*Aythya affinis*), and various other aquatic-dependent birds, including belted kingfisher (*Megaceryle alcyon*), great blue heron (*Ardea herodias*), sandhill crane (*Grus canadensis*), and American white pelican (*Pelecanus erythrorhynchos*).

Several species of upland game birds, including sage grouse, are found in various habitats within the Assessment Area, and various shorebirds and passerines utilize numerous habitats within the Assessment Area to nest and rear young.

Aquatic Species

The river and stream systems within the Assessment Area support an abundant aquatic biota population, including benthic macroinvertebrates, periphyton, and fish. Yellowstone cutthroat trout and mountain whitefish (*Prosopium williamsoni*) are indigenous salmonid species in the Blackfoot River, while the Bonneville cutthroat trout (*Oncorhynchus clarkii Utah*) is indigenous to the Bear River. Snake River finespot cutthroat trout (*Oncorhynchus clarki behnkei*) can be found in the Salt River drainage. Although the fine-spotted cutthroat trout is not genetically distinct from the Yellowstone cutthroat trout, agencies tend to manage them as a distinct subspecies. Non-indigenous salmonid species present within the Assessment Area include brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*). Other common fish fauna found throughout the Assessment Area include families of Cyprinidae (chubs), Catostomidae (suckers), and Cottidae (sculpin).

Threatened, Endangered, and Sensitive Species

The threatened Canada lynx (*Lynx canadensis)* may occur as a transient species within the Assessment Area. Several species classified as sensitive by Federal and state agencies also potentially occur at the Assessment Area including: the North American wolverine (*Gulo gulo luscus*), northern goshawk, Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), greater sage-grouse (*Centrocercus urophasianus*), trumpeter swan (*Cygnus buccinator*), harlequin duck (*Histrionicus histrionicus*), great gray owl, flammulated owl, boreal owl (*Aegolius funereus*), three-toed woodpecker (*Picoides triadactylus*), western big-eared bat (*Corynorhinus townsendii pallescens*), spotted bat (*Euderma maculatum*), Columbia spotted frog (*Rana luteiventris*), Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), northern leatherside chub (*Lepidomeda copei*), starveling milkvetch (*Astragalus jejunus var. jejunus*), Payson's bladderpod (*Lesquerella paysonii*), and cache beardtongue (*Penstemon compactus*).

AIR RESOURCES

Air resources are those naturally occurring constituents of the atmosphere, including those gases essential for human, plant, and animal life (43 CFR § 11.14(b)). Although injury to air can be assessed in the context of NRDAR, air resources are generally considered a pathway for the movement and resuspension of contaminants by which other natural resources may be exposed to hazardous substances.

CHAPTER 4

HUMAN USES & NATURAL RESOURCE SERVICES

Releases of hazardous substances in the Assessment Area may affect natural resources that support a wide variety of human uses.

NATURAL RESOURCE SERVICES AND TRIBAL COMMUNITIES

The Shoshone-Bannock Tribes of Fort Hall are comprised of the eastern and western bands of the Northern Shoshone, and the Bannock, or Northern Paiute bands. Ancestral lands of both tribes occupied vast regions of land encompassing present-day Idaho, Oregon, Nevada, Utah, Wyoming, Montana, and into Canada. When the Northern Paiutes left the Nevada and Utah regions for southern Idaho in the 1600s, they began to travel with the Shoshones in pursuit of buffalo. The Tribes are culturally related, and though both descend from the Numic family of the Uto-Aztecan linguistic phylum, their languages are dialectically separate.

The Tribes generally subsisted as hunters and gatherers, traveling during the spring and summer seasons, collecting food for the winter months. They hunted wild game, fished the region's abundant and bountiful streams and rivers (primarily for salmonids), and collected native plants and roots such as the camas bulb. Buffalo served as the most significant source of food and raw material for the Tribes. After the introduction of horses during the 1700s, hundreds of Idaho Indians of various tribal affiliations would ride into Montana on cooperative buffalo hunts. The last great hunt of this type occurred in 1864.

By Executive Order of June 14, 1867, President Andrew Jackson designated the Fort Hall Reservation for various Boise and Bruneau Bands of the Shoshone who occupied the area from time immemorial. On July 3, 1868, the Shoshone and Bannock Tribes concluded the Second Treaty of Fort Bridger. Article IV of the Fort Bridger Treaty reserved the Fort Hall Reservation as a "permanent home" for the signatory tribes and gives the Shoshone-Bannock Tribes "…the right to hunt on the unoccupied lands of the United States so long as game may be found thereon…." Article IV of the of the Agreement of February 5, 1898 between the Shoshone-Bannock Tribes and the United States, ratified by the Act of June 6, 1900, 31 Stat. 674, also states that "[the Tribes] shall have the right, without any charge therefor, to cut timber for their own use, but not for sale, and to pasture their livestock on said public lands, and to hunt thereon and fish in the streams thereof."

The Shoshone-Bannock Tribes still claim their treaty rights to the unoccupied lands of the United States, are support agencies on the CERCLA response actions, and are a Trustee in the NRDAR process. The treaty does not include all the present rights of the tribes; many of those rights are products of federal law or executive orders and agreements. As of August 2015, there were 5,859 enrolled Shoshone-Bannock tribal members; 4,038 of those members reside on the Fort Hall Reservation.

The Assessment Area is located on the ancestral lands of the Shoshone and Bannock people. The Shoshone and Bannock people and their culture are intertwined with the natural resources. They

have a long history of hunting and gathering; plants and animals were their source of food, clothing, and shelter. They knew the migratory patterns of the animals and when to hunt them. They relied on the land and its many resources to construct lodges, tools, and weapons.

Ancestors of the current Shoshone and Bannock people used trails known as “Indian Road” and the Great Medicine Road as major crossroads for traveling north and south through areas that eventually were called Idaho and Utah. The crossroads served as a meeting location where people from the Shoshone and Bannock bands would gather. The area between Soda Springs and Pocatello, Idaho was widely used as a meeting place and roadway for all Shoshone and Bannock bands.

Along the Great Medicine Road are hot pools and thermal springs used by the Shoshone and Bannock people for medicinal and ceremonial purposes; these practices continue to this day. Many different resources such as plants and minerals, especially red and white rocks and soils, are collected for use in medicinal practices. Women, in particular, play an important role in collecting and administering these medicinal items.

The Great Medicine Road provided access to many life-sustaining resources used by the Shoshone and Bannock people, including a variety of plants and animals, chalks and paints, willows and other materials used in crafts and art, and materials for hunting and fishing. The waters of the area are of central importance to both subsistence practices and cultural identity.

Historically the gathering of food was vital for survival. In modern day, the gathering of food may not mean life or death but remains vital for sustaining the well-being of the custom and cultural practices. Some tribal members practice as the elders did, gathering plant foods when they are ripened. In the later part of May and June certain roots are gathered as a main food source. Bulbs are cooled and dried for winter storage, much like the non-tribal members can and freeze. Tribal members are careful not to overharvest an area to allow plants to regenerate for the next season. Some plants gathered include early greens, watercress, bitterroot, wild onions, wild carrot, and wild potato. Digging sticks, scraping tools, and constructed baskets are still used to harvest the plants. Cattails, tulles, and grasses are harvested and woven together to make mats. Chokecherries harvested in late summer/fall are made into puddings and dried for the winter months.

Medicinal plants are gathered by the elders and stored for use by the Tribes. As is the case with some religions, only allowing certain individuals into temples to practice scriptures and readings and keeping things confidential, so too is the practice with gathering locations and use of medicinal plants. Plants have historically been gathered and are currently gathered in the Assessment Area. Contamination of soils, plants, streams, sediments and ground water in and around the mined pits has affected this practice. This in turn has caused a loss to the practice of culture and customs for families who have used this area.

In early Shoshone-Bannock culture, all things were made by hand. Nature provided the materials needed to make clothing and items for personal adornment. The people used animal hides, fur and plant fibers for clothing. They made obsidian (volcanic rock) knives to cut the hides. Sinew from animals was used to sew clothing together. Buttons made from bone or antlers was used to

tie together shirts, dresses, leggings, breechcloths, moccasins, bags, and robes. Earth paints and porcupine quills were used to add color to clothing. They fashioned earrings from shells and made necklaces from bone, claws, and rocks. Men made their feather head dresses, and both men and women wrapped their hair with otter fur. Shells obtained through trade held sacred significance because of their ties to the sacred waters.

Today, members still practice these skills creating clothing, tools, and other crafts, which are sold or made for ceremonial purposes. One such craft is the making of the Cedar Bark Bag. The cedar bark is made to tote berries, roots, or other items that can stain or be crushed. The Cedar Bark Bag is constructed out of tree bark and soaked for ease in shaping then bounded together with buckskin to form a bag with straps for easy toting. Tribal members travel to special areas to obtain cedar bark. In mined areas known to contain contamination, members no longer can use this resource and lose not only the cultural value of the area, including the songs for the area but also the economic value lost from no longer being able to obtain adequate resources from the area.

Tribal members view the earth, plants, animals, and water as gifts from the creator and express their gratitude through song and dance. The great appreciation for nature was shown through artwork and designs that were passed down from their family or that have spiritual significance, with some designs considered sacred. As many people may congregate in churches or temples and pray to statues or adorn themselves in church garments, the Shoshone-Bannock people hold reverent the natural resources for spiritual significance and may pray to or design artwork reflecting resources that hold spiritual significances including: eagles, eagle feathers, hawks, buffalo, turtles, four directions, horse, deer, elk, mountain lions, big horn sheep, mountains, rivers, flowers, plants, birds, insects, and fish.

Hunting is an integral part of the Shoshone-Bannock Tribes' lifeway. Hunting for large and small game is practiced throughout Idaho by tribal members utilizing their treaty protected rights. Every part of the deer, elk, moose, and buffalo is used and still remains a vital part of the customs, culture, and economics of the Shoshone and Bannock people. For instance, the use includes, but is not limited to:

- **Bladders** are used for pouches and medicine bags;
- **Blood** is used in soups, puddings, and paints;
- **Bones** are used as fleshing tools, pipes, knives, arrowheads, shovels, splints, sleds, saddle trees, war clubs, scrapers, quirts, awls, paintbrushes, game dice, table ware, toys, and jewelry;
- **Brain** is used in hide preparation and for food;
- **Buckskin** is used in cradles, moccasins tops, winter robes, bedding, shirts, belts, leggings, dresses, bags, quivers, tipi covers, tipi liners, bridles, backrests, tapestries, sweat lodge covers, and mittens;
- **Fat** is used for tallow, soaps, hair grease, and cosmetic aids;
- **Gallbladde**r is used for yellow paint;

- **Hair** is used for headdresses, pad fillers, pillow, ropes, ornaments, hair pieces, halters, bracelets, medicine balls, moccasin lining, and doll stuffing;
- **Horns** are used for arrow points, cups, fire carriers, powder horn, spoons, headdresses, toys, and medicine;
- **Liver** is used for tanning agents;
- **Meat** is used for consumption, sausages, cached meats, jerky, and pemmican;
- **Muscles** are used in glue preparation, bows, thread, arrow ties, and cinches;
- **Rawhide** is used for containers, shields, buckets, moccasin soles, drums, splints, mortars, cinches, ropes, sheaths, saddles, saddle blankets, stirrups, bull boats, masks, parfleche, ornaments, and snow shoes;
- **Scrotum** is used for rattles and containers;
- **Skull** is used for Sundance, medicine prayers, or other rituals;
- **Tail** is used for medicine switch, fly brush, decorations, and whips;
- **Teeth** are used for ornamentations;
- **Tendons** are used for the sinew for sewing and bowstrings;
- **Tongue** is viewed as a choice meat or the rough side may be used as a comb;
- **Hind Leg Skin** is used as pre-shaped moccasins;
- **Hoof, Feet, and Dewclaws** are used for glue, rattles, and spoons;
- **Paunch Liner** is used for wrappings, collapsible cups, basins, and canteens;
- **Stomach Contents** are used as medicine and paints; and
- **Stomach Liner** is used for water containers or cooking vessels.

Tribal members hunt small mammals including but not limited to squirrel, rabbit, and rock chuck. As with the large game, when areas historically used for hunting and gathering purposes are no longer available because of contamination, there is a service loss.

Water is the source of life and holds great reverence to the Tribes. Both ground water and surface water resources have hazardous substances present in them as a result of releases from mining in the Assessment Area. Water provides tribal services including:

- Sundance and other ceremonies,
- Fishing,
- Swimming, and
- Riparian habitat for sacred plants/animals.

Storytelling is tied to the rivers and tributaries in Southeast Idaho. Subsistence practices along with the traditional ecological knowledge that is conveyed to younger generations are tied to the

waters. Information, education, observation, language inspiration, community, family cohesion, and heritage are also tied to the waters and tribal uses.

Hazardous substances including selenium have been measured in the soils, vegetation, waters, and sediment throughout the Assessment Area. CERCLA provides an avenue by which the affected sites and resources can be remediated through a risk-based remedial approach that is designed to reduce current and future risks to public health and the environment to acceptable levels. The Tribes utilize resources more intensely and are not always protected by the contaminant levels federal agencies allow. Because of this, tribal members that hunt, fish, and gather and use the surface water, sediments, and ground water for their cultural and customary practices may be exposed to greater contamination than the general public. Therefore, it is necessary that the unique exposures and contaminant impacts on resource use be fully considered.

Mine-related hazardous substances affect the customs and use of the area by tribal members, including the language, linguistic landmarks, cultural recognition, association with the area and practice, heritage and multi-generational ties, and treaty rights education.

Tribal traditions and customs remain strong with the Shoshone-Bannock Tribes. Some tribal members make a living from resources obtained in the Assessment Area. Loss of hunting big and small game due to contamination of the resources or perception of contaminated feed sources and thus contaminated animals has a trickle-down effect not only on the custom and cultures that are lost for hunting in the area but also on the economic value lost from the animals as a food source and the trade value of the items crafted.

Mine-related hazardous substances affect tribal members' use of natural resources, and the well-being they derive from such uses. Changes in their use of the resources include service losses from not utilizing the area including spiritual sites, sacred grounds, landmarks and landscape features, and traditional use areas including their stories and songs. Changes in the use due to the presence of hazardous substances may result in the need for specific restoration actions to restore the scale and quality lost including tribal services as a result of injury to natural resources.

NATURAL RESOURCE SERVICES AND THE GENERAL PUBLIC

Public lands in and around the assessment area provide wide-ranging recreational opportunities to the public. These lands support wildlife-dependent recreational activities such as hunting, as well as water-based recreational activities such as fishing, boating, and swimming. This section provides an overview of those recreational activities that the general public most commonly pursues in and around the Assessment Area.

Fishing

Fishing is a popular recreational activity throughout the Assessment Area due to the large number of lakes, streams, and reservoirs. Statewide, anglers spend 3.9 million days fishing Idaho waters, which results in $586 million contributed to Idaho's economy annually from fishing and fishing-related expenditures. In Caribou County, which encompasses most of the assessment area, anglers typically spend 25,000 days fishing each year, generating nearly $2 million in

economic revenues. About 25% of Idaho residents purchase a fishing license in a given year, and most Idahoans consider themselves a sportsman even if they do not purchase a license annually (Grunder *et al.* 2008).

BLACKFOOT RIVER AND BLACKFOOT RESERVOIR

Blackfoot Reservoir covers 18,000 surface acres and has a capacity of 350,000 acre-feet. The Blackfoot River is the reservoir's major tributary and has a mean annual flow of 168 cubic feet per second. Flow is also diverted from Grays Lake via Meadow Creek for additional storage water. The river upstream from the reservoir extends 35 miles to its origin at the confluence of Lanes and Diamond creeks, where much of the phosphate mining occurs.

Fish species found in this drainage include the following native species: mountain whitefish, Yellowstone cutthroat trout, Utah chub (*Gila atraria*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), Utah sucker (*Catostomus ardens*), mountain sucker (*Catostomus platyrhynchus*), Paiute sculpin (*Cottus beldingii*), mottled sculpin (*Cottus bairdii*), and northern leatherside chub (*Lepdomeda copei*). Introduced species include rainbow trout, brook trout, common carp (*Cyprinus carpio*), and yellow perch (*Perca flavescens*).

The reservoir currently supports a popular recreational fishery for hatchery rainbow trout as well as fishing for Yellowstone cutthroat trout. Fishing occurs year around, with boat, bank and even ice fishing being popular activities. Anglers spent over 14,000 days fishing on the reservoir and tributaries in 2003, which generated over $1.3 million in angling related spending (Grunder *et al.* 2008). Several fishing tournaments are hosted annually on the reservoir, again demonstrating the importance of this fishery to Idaho anglers.

SALT RIVER

Salt River (Wyoming) tributaries that originate in Idaho include Jackknife, Tincup, Stump, and Crow creeks. Fish species native to this drainage include mountain whitefish, Yellowstone cutthroat trout, Utah chub, longnose dace, speckled dace, redside shiner, Utah sucker, mountain sucker, Paiute sculpin, mottled sculpin, and northern leatherside chub. Introduced species include rainbow trout, brown trout, and common carp. The Salt River and its tributaries are utilized for recreational fishing year-round, although estimates of angler use and the associated value with that use are not currently available. Fisheries interaction between the Salt River and its tributaries and Palisades Reservoir is not clearly understood, but interchange between these waters is likely a component of both fisheries to some extent.

BEAR RIVER

The Bear River flows through a large portion of the southern portion of the Assessment Area, beginning in Wyoming, traveling through Idaho, and then terminating in the Great Salt Lake in Utah. Once a stronghold for Bonneville cutthroat trout, the Bear River is now dominated by nonnative trout species. Fish surveys of Georgetown Creek show robust trout populations, and few Bonneville cutthroat trout located in lower reaches. Fish communities in the Left Hand Fork and mainstem of Georgetown Creek above the Georgetown Irrigation Company's diversion are primarily composed of brook trout and rainbow trout. A review of IDFG historical fish stocking records in Georgetown Canyon generally indicated annual stocking of rainbow trout from 1968 through 2011. Regardless of the native/nonnative status of fish species, it's clear that the Bear River provides a lot of value to anglers; fishing associated with the Bear River generated 17,500 angler days and $1.4 million in angler spending in 2003 (Grunder *et al.* 2008).

Hunting & Trapping

The public uses the regions surrounding the Upper Blackfoot River, Blackfoot Reservoir, Salt River, and Bear River to hunt a variety of mammalian and avian species in riparian and shrub-steppe habitats during the fall and winter hunting seasons (with specific dates varying by species). Trapping also comprises a segment of the recreational use of this drainage. Species open to hunting include mule deer, elk, moose, mountain lion, and species of waterfowl including mallard, teal (*Anas crecca* and other species), gadwall (*Mareca strepera*), northern pintail, American wigeon (*Mareca americana*), and Canada goose. Upland game species include blue grouse (*Dendragapus* species), ruffed grouse (*Bonasa umbellus*), sharp-tailed grouse, as well as sage grouse. Species routinely pursued during trapping seasons include beaver, muskrat, mink, fox, coyote, beaver, skunk and bobcat.

Water-Based Recreation

Recreationists utilize the Blackfoot Reservoir, Upper Blackfoot River, Bear River, and Bear Lake for both motorized and non-motorized boating. While boating in the reservoir is primarily driven by anglers, an increasing number of visitors paddle canoes, kayaks and other non-motorized watercraft to observe scenery and wildlife and to interact with the outdoors. The public also participates in boating-related recreation activities such as water-skiing, wake boarding and use of personal watercraft (i.e., jet skiing). Swimming is also a common activity during the summer months.

Wildlife Observation and Photography

The public also utilizes the region defined by the Blackfoot, Salt, and Bear Rivers, and particularly the Blackfoot River Wildlife Management Area, for wildlife and nature viewing and photography. These areas offer a diverse range of scenic habitats and flora, and support numerous bird and mammalian species throughout the year. Most, if not all, of the species pursued by hunters and trappers are readily available for wildlife viewing year around in the three drainages mentioned above.

Camping, Hiking, and Terrestrial-Based Recreation

The public utilizes the region surrounding the Upper Blackfoot River, the Blackfoot Reservoir, the Salt River, and the Bear River for camping and hiking. These activities occur throughout the area on public lands, primarily lands managed by USFS. Unpublished reports suggest that the lands in the Upper Blackfoot drainage are among the most popular summer recreation and camping areas found in Southeast Idaho, due mainly to the scenic nature of the area coupled with abundant public land that provides the opportunity for camping. Use of all-terrain vehicles (e.g., four wheelers and UTV's) have become exceedingly popular over the past two decades. These vehicles are used throughout the assessment area, on open public roads and trails, primarily on lands managed by the USFS and BLM.

CHAPTER 5

INJURY DETERMINATION

Injury determination is the process of evaluating and documenting whether Assessment Area resources have been adversely impacted by exposure to hazardous substances. "Injury" refers to an observable or measurable adverse chemical or physical change in a natural resource or impairment of a natural resource service resulting from a release of a hazardous substance (43 CFR § 1114(v)). The CERCLA NRDAR regulations (43 CFR § 11.62) identify several broad categories of injury:

1. Exceedance of regulatory standards or criteria, including exceedance of established standards (e.g., water quality standards) or the existence of advisories that limit or ban the consumption of natural resources (e.g., fish consumption advisories).
2. Adverse changes in an organism's viability, including death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including impaired reproduction), and physical deformations. The CERCLA NRDAR regulations identify a wide array of potential adverse effects, or injuries, in surface water, ground water, air, geologic resources, and biological resources (e.g., fish and wildlife).
3. Concentrations of a hazardous substance in a natural resource sufficient to cause injury to another natural resource.

As part of the process of evaluating injuries, the Trustees will document the pathway by which potentially impacted natural resources are exposed to hazardous substances. The CERCLA NRDAR regulations define "pathway" to be "the route or medium through which oil or a hazardous substance is or was transported from the source of the discharge or release to the injured resource" (43 CFR § 11.14(dd)). The regulations further state that the pathway may be determined "by either demonstrating the presence of the oil or hazardous substance in sufficient concentrations in the pathway resource or by using a model that demonstrates that the conditions existed in the route and in the oil or hazardous substance such that the route served as the pathway" (43 CFR § 11.63(a)(2)).

INJURY DETERMINATION OVERVIEW

The Trustees' intend to pursue a stepwise approach for evaluating potential injuries that combines evaluation of existing data with supplemental studies, if needed. This approach includes first reviewing existing data and identifying potential data gaps. These data gaps may be filled through supplemental investigations that involve additional testing, sampling, and analysis as needed. Based on the results of these activities, the Trustees will develop a comprehensive picture of any injuries caused by hazardous substances released into the Assessment Area.

For each resource, the Trustees will gather existing information about past, present, and predicted future concentrations of hazardous substances in the environment. In addition, the Trustees will review existing site-specific community structure and toxicity information. The

existing data will provide the basis for an initial assessment of potential injury, including evaluating whether the information is adequate to (1) characterize the extent and magnitude of contaminant exposure and associated impacts to natural resources, and (2) identify and scale restoration projects. The results of this evaluation will guide the Trustees' effort to characterize potential injury and, if necessary, to identify additional data collection or evaluations to complete the injury evaluation.

The analytical techniques used to implement the injury determination comprise several broad methodologies. These techniques may be used in combination, or as iterative steps in the evaluation of a specific type of resource or injury. This structure reflects the Trustees' overall approach of reviewing existing data to assess potential injury, identifying data gaps, and developing investigations to fill those data gaps. The general analytical techniques include:

Threshold evaluations will compare existing contaminant concentration data to thresholds that are indicative of potential adverse effects. To perform these investigations, the Trustees will compile available exposure data and identify thresholds specific to the natural resources in question. These thresholds may include promulgated standards, ecological benchmarks, or published effect concentrations. The Trustees will then evaluate the data with respect to the relevant thresholds to evaluate the likelihood of adverse effects to natural resources. As a result of this evaluation, the Trustees will assess potential injuries and may determine that supplemental studies are needed to fully evaluate the condition of the resource relative to the CERCLA NRDAR regulations.

Laboratory studies include measurement of contaminant concentrations, toxicity testing, and bioaccumulation experiments. When conducting these evaluations, the Trustees may expose test organisms to contaminants using spiked media, site media, or a combination of both. The Trustees may also compare the effects of different degrees of exposure to the organisms to an uncontaminated control group. The Trustees may use laboratory toxicity testing to demonstrate causality and to quantify the extent to which hazardous substances bioaccumulate within the test organisms. Depending on the study, the Trustees' laboratory studies may use wild species or surrogate test organisms. The Trustees may conduct toxicity tests over different lengths of time, depending on the test organism and whether the study is evaluating longer-term (chronic) exposures or short-term (acute) exposures.

Field studies are used to evaluate whether potential injuries are occurring in wild biota under actual environmental conditions. While field studies are often important to document injuries, the myriad of field conditions or the timing of the exposure sometimes adds complexity to assessing causality. Additionally, field studies represent contaminant exposure at the time investigations are conducted rather than conditions that may have existed in the past. The Trustees will consider the relationship between field conditions and study objectives when designing any evaluations and interpreting results.

INJURY DETERMINATION STUDIES

The Trustees have identified natural resources for injury assessment activities based on their role in the ecosystem, potential exposure to hazardous substances, and the feasibility of collecting data and performing studies. The Trustees' assessment approach creates a comprehensive picture of injuries resulting from exposure to mining-related hazardous substances. Exhibit 7 summarizes the injury determination studies that the Trustees may use to evaluate potential injuries in the Assessment Area. Each study is described in more detail below and reflects the Trustees' current plans for injury determination.

The IAP describes the Trustees' possible injury determination evaluations in general terms. Many details of these studies – for example, species selection, exposure and test methods, sample sizes, and endpoints – will be documented in study-specific work plans. These work plans will include study design details and identify standard operating procedures relevant to study implementation. They will also specify anticipated statistical approaches and quality assurance procedures. The Trustees expect that work plans will be peer reviewed and released to the public for review and comment. The results of any Trustee studies will be peer reviewed and released upon completion of the studies.

Several studies described in the IAP are designed to characterize the extent of mine-related releases. These studies include evaluating hazardous substance concentrations across the Assessment Area and documenting exposure through the food web. The Trustees will also evaluate potential hazardous substances originating from offsite sources and estimate baseline conditions (i.e., the natural resource services that would be present in the absence of hazardous substances releases by the PRPs). These studies will contribute to the Trustees' understanding of the pathways through which natural resources may have been exposed to hazardous substances in the Assessment Area.

The Trustees' injury determination efforts are based on existing information related to hazardous substance releases, contaminant pathways, resource exposure, and potential injuries. Overall, the studies included in this IAP have been carefully selected with the intent that their joint results will comprehensively capture injuries and associated compensatory restoration needs associated with the release of hazardous substances to the Assessment Area. Although this IAP does not include specific studies of all natural resources present at the site that are expected to have been injured (e.g., the IAP does not currently include studies of small mammals, terrestrial birds or for large mammals), the Trustees expect that the identified studies will likely capture such injuries or ensure appropriate restoration for all potentially injured resources.

In addition, the IAP does not commit the Trustees to the completion of each step and study as set forth herein. The Trustees will continue to review assessment activities to ensure they are appropriate and cost-effective at the time they are planned and performed. If significant changes to the assessment steps are warranted, whether these consist of the addition, modification, or elimination of studies, the Trustees will prepare addenda to this IAP pursuant to 43 CFR § 11.32(e).

Exhibit 7. Potential injury determination studies.

Category	Resource	Study
Aquatic	Surface water	Comparison to regulatory criteria
	Invertebrates	Benthic health screening
	Fish	Fish health screening
		Assessment of fish abundance, diversity, and age distribution
		Yellowstone cutthroat trout evaluation
	Birds	Aquatic-dependent bird reproduction
Terrestrial	Soils	Comparison with toxicity effects thresholds and EPA/IDEQ's Removal Action Level
	Invertebrates	Soil toxicity and bioaccumulation
Ground Water	Ground water	Comparison to regulatory thresholds
Response Actions	Multiple	Impacts of remedial activities
Tribal Use	Multiple	Effects on tribal use
Recreation	Multiple	Effects on recreation

Aquatic Resources

Aquatic resources include invertebrates, fish and birds that live in or near riparian habitats of the Assessment Area's ecosystem. Mining activities have affected and continue to affect aquatic resources in the area. The Trustees plan to conduct some or all of the studies described below to determine injury to aquatic resources.

SURFACE WATER

Surface water resources are defined as "the waters of the United States, including the sediments suspended in water or lying on the bank, bed, or shoreline" (43 CFR § 11.14(pp)). In addition to being a natural resource, the Assessment Area's surface waters support a wide variety of aquatic resources and provide both ecological and human services. Existing data indicate that surface water resources in the Assessment Area have been exposed to hazardous substance releases. The studies described below are designed to evaluate potential injuries to surface water resources, primarily through comparison of measured concentrations to regulatory criteria.

Bed, bank, and shoreline sediments, including suspended sediments, are part of the surface water resource. Sediments provide essential ecological services as habitat, as a foundation for primary and secondary productivity, and through nutrient cycling. Sediments also can serve as a pathway for contaminants to enter the aquatic food web. Many species utilize sediments as their primary source of sustenance or incidentally ingest sediment during foraging. The contaminants ingested by these organisms may be absorbed into their tissues and transferred through the food web, resulting in bioaccumulation in upper trophic-level organisms. Depending on the type of sediment and flow patterns, sediment-associated contaminants may be transported downstream or buried. These sediments can serve as a reservoir of contaminants that are exchanged with the water column over time.

A review of readily available information suggests surface waters across the Assessment Area are potentially affected by mine-related contaminants. IDEQ (2011) lists the Blackfoot River subbasin as water quality impaired due to selenium. This listing indicates that portions of the Blackfoot River do not meet applicable water quality standards for one or more beneficial uses due to selenium. Numerous tributaries to the Blackfoot River are also identified as impaired, including State Land Creek, Goodheart Creek, Dry Valley Creek, Chicken Creek, Maybe Creek, Mill Creek, Spring Creek, upper, middle, and lower Sheep Creek, and Rasmussen Creek. Mine-affected tributaries to the Salt River are also included in IDEQ (2011) due to selenium concentrations, including Pole Canyon Creek, North Fork Sage Creek, South Fork Sage Creek, and the confluence of Sage Creek with North Fork Sage Creek to its mouth.

Surface water is injured when contaminant concentrations exceed applicable water quality criteria. These criteria include, but are not limited to, the following:

- Drinking water standards established by Sections 300g through 300g-5 of the Safe Drinking Water Act, 42 USC § 300f, *et seq.*, or by other federal or state laws or regulations that establish such standards for drinking water, can be used to assess surface water that was potable before the discharge or release (43 CFR § 11.62(b)(1)(i)); and
- Water quality criteria established by Section 304(a)(1) of CWA, or by other federal or state laws or regulations that establish such criteria, can be used to assess surface water that, before the release, met the criteria and is a committed use as habitat for aquatic life, water supply, subsistence, or recreation (43 CFR § 11.62(b)(1)(iii)).

The Trustees plan to evaluate whether surface water and sediment concentrations of various contaminants exceed relevant thresholds outlined in the CERCLA NRDAR regulations. The first step in this process involves compiling existing data. Such data are routinely collected by USGS and as part of RI/FS efforts conducted in the Assessment Area. Next, the Trustees will compile and evaluate a wide range of standards, including relevant water quality criteria, drinking water standards, and sediment removal action levels. After assembling and reviewing the data and identifying appropriate thresholds and criteria, the Trustees will then compare the available contaminant concentration data to applicable standards for purposes of developing an injury determination for the Assessment Area's surface water resources. As part of this process, the Trustees will identify any data gaps that have the potential to affect the results of the analysis or

inform future efforts. If necessary, the Trustees will undertake additional studies to fill these data gaps.

In conducting the surface water investigation, the Trustees will use water quality criteria that are relevant to the waterway's designated committed uses, as defined in the Idaho Administrative Procedures Act (IDAPA) 58.01.02 § 100. Designated uses, such as support of cold water aquatic communities or primary/secondary contact recreation, have been established for a number of the waterways in the affected area (IDAPA 58.01.02 § 150 - Upper Snake Basin and IDAPA 58.01.02 § 160 - Bear River Basin).

AQUATIC INVERTEBRATES

Aquatic invertebrates are an integral part of freshwater ecosystems. They serve as the base of the food chain and comprise a significant component of the diet for many fish species, such as cutthroat trout and other higher trophic-level organisms. In addition, benthic populations are often indicators of aquatic ecosystem health.

The CERCLA NRDAR regulations state that biological organisms are injured when contaminant exposure is sufficient to cause an adverse change in the viability of the organism or its offspring (43 CFR § 11.62(f)(i)). Adverse changes relevant to aquatic invertebrates include death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, reproductive impairment, and physical deformations.

Benthic Health Screening

Sediment-derived contaminants may accumulate to levels that adversely affect benthic invertebrates, and a broad literature describes the toxicity of inorganic compounds to aquatic invertebrates in freshwater systems (e.g., Ingersoll *et al.*, 2001; MacDonald *et al.*, 2000; Besser *et al.*, 2008; Wang *et al.*, 2007). To support the determination of injuries to benthic invertebrates, the Trustees will collect and evaluate available data on contaminant concentrations in Assessment Area sediment. In addition, the Trustees will review the scientific literature for applicable toxicity thresholds for benthic invertebrates. The Trustees will then compare the available contaminant concentration data to applicable thresholds for purposes of developing an injury determination of the Assessment Area's benthic invertebrates. As part of this process, the Trustees will identify any data gaps that have the potential to affect the results of the analysis or inform future efforts. If necessary, the Trustees will undertake additional studies to fill these data gaps.

FISH

Fish are integral to the functioning of aquatic communities and they support a wide range of natural resource services such as food provision, habitat enhancement, and recreational fishing. Fish are also considered exceptionally sensitive to selenium (Janz *et al.*, 2010; DeForest *et al.*, 2017). Exposure to contaminants from the Assessment Area may adversely affect fish health by impairing their survival, growth, or reproduction.

The CERCLA NRDAR regulations state that biological organisms are injured when contaminant exposure is sufficient to cause an adverse change in the viability of the organism or its offspring (43 C.F.R. § 11.62(f)(i)). Adverse changes relevant to aquatic vertebrates include death, disease,

behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, reproductive impairment, and physical deformations. To evaluate potential injuries to fish that inhabit the Assessment Area, the Trustees are considering the studies discussed below.

Fish Health Screening

Fish primarily accumulate hazardous substances through the consumption of contaminated prey, sediment ingestion, and respiration. Fish within the Assessment Area exhibit elevated selenium concentrations (SIPMSTC, 2015). Fish tissue is considered to be a useful indicator of potential toxicity to fish (DeForest *et al.*, 2017), and the importance of tissue-based exposure metrics as an indicator of potential adverse effects in fish is recognized in EPA's ambient water quality criteria. Although ambient water quality criteria for most hazardous substances are based on concentrations in water, EPA established water quality criterion for selenium based, in part, on fish tissue concentrations.[6]

In this investigation, the Trustees will compare measurements of selenium in fish tissue to tissue-based effects thresholds or exposure-response relationships such as ambient water quality criteria and literature-based thresholds. However, existing fish tissue health thresholds only provide a partial picture because they are typically ill-suited for measuring the severity of effects and often cannot be used to characterize the relationship between effects and varying exposures. Therefore, the Trustees plan to examine available literature and consider fish tissue-based exposure/response relationships for selenium. As part of this work, the Trustees may undertake related activities such as the collection of additional fish tissue data, fish health evaluations, and statistical analysis.

Assessment of Fish Abundance, Diversity, and Age Distribution

The Trustees may undertake a study to evaluate whether fish abundance, diversity, growth, age distribution, and mortality rates in the Assessment Area differ from reference sites. Abundance and diversity are important because they are measures of population and community-level effects. Further, growth, age distribution, and mortality rates are critical in determining the long-term viability of fish populations. Similarly, a shift to younger fish can be an indicator of increased mortality rates. In addition, age distribution may have advantages over other measures of community richness since fish assemblages in cold, temperate regions may have relatively low species richness and can be dominated by sculpin and trout, which has the potential to reduce the utility of diversity-based metrics (Janz *et al.*, 2010). The study, if undertaken, will assess existing data to determine if they are sufficient to develop a robust analysis. If additional data are needed, the Trustees would identify cost-effective means of sample collection. The study would develop data related to the stated endpoints at a relevant spatial and temporal scale, and would include collection of appropriate habitat and subbasin characteristics for comparisons between potentially affected and reference areas.

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[6] EPA (2016) establishes a selenium aquatic life criterion of fish whole body concentration of 8.5 µg/g dw (or 11.3 µg/g dw in skinless, boneless filet), and a concentration in fish eggs/ovaries of 15.1 µg/g dw.

Yellowstone Cutthroat Trout Evaluation

The Yellowstone cutthroat trout (YCT) is a native trout species in the Assessment Area that is prized by recreational anglers. YCT is indigenous to the Snake River system upstream of Shoshone Falls and exhibits biological and life history traits that are well characterized for purposes of evaluating potential contaminant effects across several related trout species. YCT primarily feed on aquatic insects such as mayflies, stoneflies, and caddisflies, but they feed opportunistically on small aquatic animals and terrestrial insects that fall into the water. While YCT populations have been declining over time due to competition from non-native species, Meyer *et al.* (2006) report that native YCT appear to have healthy populations and are among the most abundant and widely distributed species of trout in Upper Snake River Basin streams. YCT share genetic commonalities with the Bear River Bonneville cutthroat trout (Teuscher and Capurso, 2007).

Fluvial and resident life history strategies are exhibited by YCT in the Blackfoot River drainage. Fluvial YCT migrate from streams and rivers into tributaries to spawn while resident forms are not migratory. Spawning streams are most commonly perennial with ground water and snow-fed water sources, although spawning in intermittent streams has been observed in other systems (Varley and Gresswell 1988; Thurow and King 1994). YCT are selective with respect to spawning habitat, and homing, as the practice of returning to the same spawning stream in successive years has been observed in the Blackfoot and South Fork Snake rivers in Idaho (Thurow *et al.*, 1988). Research has shown that water depth, water velocity, water temperature, substrate type, channel slope, elevation, and cover are all important factors in spawning habitat selection (Thurow and King, 1994; Carter *et al.*, 1997). Adult YCT spawn from early May through late July, and remain in their spawning streams for approximately 6 to 25 days (Varley and Gresswell, 1988). Juveniles of migratory life history forms may emigrate as fry or spend 1 to 3 years in natal tributaries before emigrating to the main stem Blackfoot River (Thurow *et al.*, 1988; Varley and Gresswell, 1988).

Adfluvial YCT in the Upper Blackfoot River watershed migrate from Blackfoot Reservoir into tributaries in the upper basin to spawn. Adult spawners generally enter the river in late April or early May depending on runoff. The duration of the run typically lasts for about four to six weeks. Once Adult adfluvial YCT reach their spawning tributaries, they typically remain there for one to two weeks. Yellowstone Cutthroat Trout may emigrate from their natal streams as fry or as Age 1 or Age 2. Juvenile YCT begin to migrate to the reservoir in late spring, however, the bulk of the outmigration occurs in the fall. Juvenile YCT that reach the reservoir typically rear there until they reach maturity at which time they return to spawn.

The Trustees may conduct one or more studies to assess whether YCT in streams are affected by Assessment Area contamination. An initial evaluation would assess habitat characteristics in affected streams and reference locations to evaluate the suitability of those streams as potential YCT spawning habitat. The study would document habitat parameters at multiple locations and use predictive tools to estimate the extent of potential spawning habitat present for YCT in the Assessment Area. The Trustees may also characterize the range occupied by spawning YCT, and analyze the discrepancy between available and occupied spawning habitat. Additional elements

of the sampling efforts could assess the presence or absence of YCT and other species, and assess immigration and movement of YCT. The Trustees may also quantify abundance, diversity, age distributions, and spawning activity at the Assessment Area and reference sites, and calculate mortality rates both within the study area and in comparative reaches nearby. Depending on the findings of these efforts, the Trustees may then consider laboratory toxicity evaluations to investigate effects on reproduction and early life stage development. As part of this process, the Trustees will identify any data gaps that have the potential to affect the results of the analysis or inform future efforts. If necessary, the Trustees will undertake additional efforts to fill these data gaps.

BIRDS

Southeast Idaho supports more than 250 species of birds, including waterfowl, wading birds, songbirds and rare species such as the bald eagle, peregrine falcon, and osprey (IBRC, 2007; USGS, 1977). These birds are an integral part of the aquatic ecosystem and provide a number of important ecosystem services such as seed distribution, plant pollination, and insect control. Birds are also an important source of prey to other species. Birds may be exposed to mine-related hazardous substances through direct ingestion of contaminated water, sediment, and soil. Additionally, birds may consume food items that contain hazardous substances derived from Assessment Area wastes. Contaminated food may include fish, amphibians, benthic invertebrates, aquatic larvae and insects, and plants.

Exposure to contaminants from the Assessment Area may adversely affect avian health by impairing survival, growth, or reproduction. The CERCLA NRDAR regulations state that biological organisms are injured when contaminant exposure is sufficient to cause an adverse change in the viability of the organism or its offspring (43 CFR § 11.62(f)(i)). Adverse changes relevant to birds include death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, reproductive impairment, and physical deformations.

To evaluate potential injuries to birds that inhabit the Assessment Area, the Trustees may study reproduction in aquatic-dependent avian species. Characteristic effects of selenium on birds at other sites have been documented in both field and laboratory studies, including embryo mortality and increased incidence of developmental abnormalities (Ohlendorf and Heinz, 2011). Selenium-associated abnormalities typically include defects to the eyes, feet, legs, beak, brain, and abdomen (Ohlendorf and Heinz, 2011). USDOI (1998) states: “Among vertebrates, reproductive toxicity is one of the most sensitive endpoints; however, egg-laying vertebrates … seem to have substantially lower thresholds for reproductive toxicity than placental vertebrates (mammals).” Janz *et al.* (2010) similarly identifies egg-laying vertebrates as “the most sensitive” to selenium.

Several studies have evaluated the effects of selenium on wild birds (e.g., Ohlendorf *et al.*, 1986; Skorupa, 1998; Harding *et al.*, 2005; Harding, 2008; Yamamoto *et al.*, 1998, Wiemeyer and Hoffman, 1996). The results of these studies generally show differential sensitivity among species, which suggests the need to evaluate selenium toxicity in a site-specific context. Further, existing site-specific data on selenium exposure (e.g., Skorupa *et al.*, 2002, Ratti *et al.*, 2002) indicate the potential for adverse effects on avian resources that utilize the Assessment Area.

The Trustees may conduct fieldwork to evaluate the reproductive effects of contaminant exposure to Assessment Area birds, with a focus on aquatically-linked birds. This study would include measures of reproductive success. The Trustees would focus on reproduction not only because reproduction is essential for population stability but also because the embryo "is the avian life stage most sensitive to selenium" (Ohlendorf and Heinz, 2011).

More specifically, the Trustees may evaluate embryo lethality and teratogenic effects. They also may consider collecting eggs to evaluate contaminant exposure and may use other methods of exposure characterization. The study may also include additional metrics such as glutathione peroxidase activity in nestlings. As part of this process, the Trustees will identify any data gaps that have the potential to affect the results of the analysis or inform future efforts. If necessary, the Trustees will undertake additional efforts to fill these data gaps.

Terrestrial Resources

Terrestrial resources include plants and animals that live on and comprise upland habitats of the Assessment Area's ecosystem. Mining activities have affected and continue to affect terrestrial resources in the area. The Trustees may conduct some or all of the studies described below to determine injury to terrestrial resources.

SOILS: COMPARISON WITH TOXICITY EFFECTS THRESHOLDS AND IDEQ'S REMOVAL ACTION LEVEL

Assessment Area soils fall within the definition of geologic resources in the CERCLA NRDAR regulations. Specifically, geologic resources are "those elements of the Earth's crust such as soils, sediments, rocks, and minerals, including petroleum and natural gas that are not included in the definitions of ground and surface water resources" (43 CFR § 11.14(s)). The Assessment Area's soils support key terrestrial habitats such as sagebrush/steppe, grass/forb, and aspen/Douglas fir communities (SIPMSTC, 2015), and these habitats provide food and shelter for the Assessment Area's terrestrial plants and animals. In addition, a wide variety of insects, worms, and small mammals live in cavities or burrows within the soil.

The Trustees will conduct a literature review to identify information on the toxicity of selenium in soil to plants and to soil invertebrates. The Trustees will also compare available measured values in soil to IDEQ's established removal action levels for selenium in soils (IDEQ, 2004). The Trustees may also include geospatial evaluation of exceedances of relevant soil thresholds and evaluations to consider Assessment Area-specific concentration-response relationships.

TERRESTRIAL INVERTEBRATES: SOIL TOXICITY AND BIOACCUMULATION

Invertebrates that inhabit the soil include a wide range of organisms such as worms, protozoa, nematodes, mollusks, and arthropods. Soil invertebrates typically consume detritus or prey on organisms that consume detritivores. The various organisms that fall within the broad category of soil invertebrates generally play important roles in supporting a healthy soil ecosystem. This includes increasing soil organic matter and enhancing soil organic matter decomposition. Benefits of soil organic matter include improving soil structure, increasing soil fertility, mediating erosion, and increasing moisture available to plants. Soil invertebrates are valuable

indicators of soil quality and most terrestrial organisms rely, directly or indirectly, on biological processes that occur in or are associated with the soil.

Due to the limited literature examining the bioaccumulation of selenium and toxicity to terrestrial invertebrates, the Trustees may design a study to examine the bioaccumulation and effects of selenium on one or more terrestrial invertebrate species. The Trustees may employ selenium-spiked growth media as well as site soils, and may also include a range of endpoints in the study (e.g., abundance, biomass, density, and reproductive success). The Trustees may also conduct field sampling to evaluate species richness, trophic structure, food web structure, or microbial communities. As part of this process, the Trustees will identify any data gaps that have the potential to affect the results of the analysis or inform future efforts. If necessary, the Trustees will undertake additional efforts to fill these data gaps.

Ground Water

Ground water resources consist of "water in a saturated zone or stratum beneath the surface of land or water and the rocks or sediments through which ground water moves," including ground water that serves as a drinking water supply (43 CFR § 11.14(t)). Mining activities may affect and may continue to affect ground water resources in the Assessment Area (SIPMSTC, 2015). Additionally, ground water may serve as a pathway for conveying contaminants to other resources. The studies described below are designed to evaluate the nature of potential injuries to ground water resources.

COMPARISON TO REGULATORY THRESHOLDS

The Trustees plan to evaluate whether ground water concentrations of various contaminants exceed relevant thresholds outlined in the CERCLA NRDAR regulations. The first step in this process involves compiling existing data. Such data are routinely collected in the context of the RI/FS conducted in the Assessment Area. In addition, the Idaho Department of Health and Welfare (IDHW) conducted limited sampling of private wells within the Assessment Area (IDHW, 2006). Concurrently, the Trustees will determine the applicable ground water uses and compile and evaluate the relevant standards and criteria. After assembling and reviewing the data and identifying appropriate criteria, the Trustees will then compare the available contaminant concentration data to applicable standards for purposes of developing an injury determination for the Assessment Area's ground water resources. In conducting this study, the Trustees will use water quality criteria that are relevant to the ground water resource's designated committed uses, as defined in IDAPA 58.01.11. As part of this process, the Trustees will identify any data gaps that have the potential to affect the results of the analysis or inform future efforts. If necessary, the Trustees will undertake additional efforts to fill these data gaps.

Response Actions

Trustees may recover damages associated with injuries that are "reasonably unavoidable as a result of response actions taken or anticipated" (43 CFR § 11.15(a)(1)). Response actions include steps taken to treat or remove contaminants, engineering controls, and institutional controls intended to prevent or limit exposure to hazardous substances. Treatment/removal actions and engineering controls may affect the environment due to the physical activities associated with

these actions, infrastructure in support of the efforts, or planning activities. Institutional controls may result in restrictions that could affect access to recreational opportunities or influence other human uses.

The Trustees will evaluate the extent and magnitude of response actions in the Assessment Area. The Trustees anticipate undertaking this review as response actions are planned, implemented, and completed.

Effects on Tribal Use

Members of the Shoshone-Bannock Tribes may have altered their use of natural resources in the Assessment Area as a result of mine-related hazardous substance releases. For example, tribal members may fish less frequently or decrease their use of traditional foods. Similarly, the presence of hazardous substances may affect ceremonial and cultural traditions. Tribal members may limit their use of a resource or modify their behavior at contaminant concentrations that are lower than that which would lead a member of the general public to change his or her behavior. In the context of injury determination, it is appropriate to consider those resources that provide services to tribal members, particularly resources that support cultural integrity and continuity.

This evaluation will develop a better understanding of the role of hazardous substances in tribal use of natural resources and evaluate whether the natural resource services that flow within tribal communities have been diminished. Consideration of tribal-specific uses of natural resources during the injury determination phase will help to assure that the full suite of possible natural resource injuries of concern are considered in the context of the injury assessment, in turn providing a sound basis for restoration planning.

Effects on Recreation

Natural resources in the Assessment Area support a wide range of recreational activities, including hunting, fishing, trapping, camping, hiking, boating, swimming, horseback riding, off-roading, cycling, mountain biking, and wildlife viewing. Parts of the Assessment Area are located within the boundaries of the Caribou-Targhee National Forest, which extends over 2.63 million acres that border Yellowstone National Park, Grand Teton National Park, and Bridger-Teton National Forest. The National Forest contains numerous campgrounds, boating access, and approximately 1,600 miles of back-country roads and trails. Native cutthroat trout and other species of interest to recreational anglers are found in the streams and lakes throughout the National Forest and the surrounding area. Recreational fishing occurs regularly in the Blackfoot Reservoir, Blackfoot River, Little Blackfoot River, Diamond Creek, Bear River, and numerous small streams found in the Assessment Area.

The Trustees plan to evaluate effects to recreationists resulting from hazardous substance releases in the Assessment Area. For example, IDHW issued a fish consumption recommendation for East Mill Creek (IDHW, 2016). In addition, IDHW has formulated recommendations regarding the amount of elk liver from the Assessment Area that can be safely consumed (IDHW, 2005). These institutional controls and other factors related to hazardous substance releases may have altered and may continue to alter the behavior of anglers, hunters, or other recreationists. Common responses to contamination and associated advisories often

include reduced avidity, participation in less desirable activities, decreasing time spent at preferred locations, reduced consumption of fish and game, altered cooking methods, increased travel to access different sites, and other behavioral changes. These types of responses may reflect the impacts that individuals experience when faced with contamination in the context of recreation choices. The Trustees will document the nature and timing of recreational effects, and measure such effects in terms of lost trips, diminished experiences, or other suitable metrics.

CHAPTER 6

INJURY QUANTIFICATION, DAMAGE DETERMINATION & RESTORATION PLANNING

INJURY QUANTIFICATION

Once the Trustees determine that natural resources have been injured, the Trustees will quantify those injuries to establish a basis for scaling restoration and determining damages. Consistent with the CERCLA NRDAR regulations, the Trustees will measure the extent of the injury, estimate the baseline conditions, calculate the recovery periods for injured resources and estimate the reductions in services caused by the releases of hazardous substances in the Assessment Area (*See* 43 CFR § 11.70).

The Trustees plan to review each facility and mine's permitting history as well as any applicable environmental analyses before quantifying natural resource injuries. Section 11.71(g) of 43 CFR directs trustees to exclude from quantification those resource injuries and losses that are caused by a federally permitted release or were deemed an irreversible and irretrievable commitment of natural resources pursuant to an environmental analysis for the issuance of a permit or license. The Trustees will compile relevant permitting and environmental records for each mine and processing facility, and consider that information during the injury quantification process.

Injuries to natural resources may be quantified by measuring the change in the specific resource(s), and/or the services that the injured resource would have provided had the release not occurred (43 CFR § 11.71). Common injury quantification metrics include counts of affected organisms, changes in the number of offspring, number of acres affected, the number of steam miles affected, frequency of effects within an area or group of organisms, and number of affected recreation trips. When quantification includes measuring the change in services provided by the affected resource, the Trustees will consider a range of potential measures such as habitat quality, food production, recreation, flood control, or ground water recharge.

An important feature of injury quantification involves calculating effects over time. This process looks both backward and forward and typically involves estimating contaminant concentrations and exposures as conditions in the Assessment Area change. To understand conditions over time, the Trustees will evaluate factors specific to the Assessment Area, such as mining practices, remedial actions, and the interactions between contaminants and natural processes. This information is used to develop estimates of the duration and magnitude of exposure, the type and severity of adverse effects, and the ability of the resource to recover. Evaluation of these factors typically requires predicting future conditions and may include developing models of release patterns, exposure, and hazardous substance attenuation. As a result of such evaluations, the Trustees will estimate the effects of hazardous substance releases on natural resources until the injured resources have recovered to the baseline condition.

The Trustees plan to perform quantification studies consistent with the results of the injury determination. The Trustees anticipate that some injuries will be quantified with the goal of

restoring specific natural resources. Other injuries may be addressed within a habitat-based restoration context, such that one or more injuries characterize the condition of the ecosystem through analysis of natural resource services. These measures of ecosystem health often serve as a bridge to habitat restoration projects that support or enhance a wide range of resources and the services they provide.

DAMAGE DETERMINATION

NRDAR focuses on restoring injured resources to their baseline conditions and compensating the public for resources and associated services lost during the period of injury. Damages are calculated as the cost of:

> (i) restoration or rehabilitation of the injured natural resources to a condition where they can provide the level of services available at baseline, or (ii) the replacement and/or acquisition of equivalent natural resources capable of providing such services (43 CFR § 11.80 (b)).

Damages may also include:

> the compensable value of all or a portion of the services lost to the public for the time period from the discharge or release until the attainment of the restoration, rehabilitation, replacement, and/or acquisition of equivalent of baseline (43 CFR § 11.80 (b)).

The CERCLA NRDAR regulations identify a range of methods that may be applied to estimate damages (43 CFR § 11.83). The Trustees will apply methods consistent with the regulations and the results of the injury quantification.

RESTORATION PLANNING

After determining the amount of restoration necessary to compensate the public for lost services, the Trustees will prepare a Restoration Plan pursuant to 43 CFR § 11.93 (a). The Restoration Plan will evaluate and describe how the calculated amount will be utilized for restoration. The Trustees may accomplish restoration through rehabilitation, replacement, and/or acquisition of equivalent resources (43 CFR § 11.81 (a)). Efforts often focus on direct restoration of the injured resources. However, in the absence of opportunities for direct restoration, restoration may, if appropriate, include actions that improve the quality of natural resources located away from the Assessment Area. The Trustees will issue additional documents pursuant to the CERCLA NRDAR regulations to obtain input from the public on restoration planning efforts and decisions.

APPENDIX A - QUALITY ASSURANCE MANAGEMENT

The CERCLA NRDAR regulations require the Trustees to develop a Quality Assurance Plan (QAP) that "satisfies the requirements listed in the [National Contingency Plan] and applicable EPA guidance for quality control and quality assurance plans" (43 CFR § 11.31 (c)(2)). The Trustees recognize the importance of data quality: many of the management decisions involved to conduct the NRDAR for the Assessment Area ultimately require that the Trustees utilize environmental data. The collection, compilation, evaluation, and reporting of environmental data are necessary to perform the functions of the assessment. The origin and quality of the data that the Trustees will use to make these decisions must be properly documented so that data gaps can be identified; assessments of the severity, location, and extent of injury are accurate; and thus, appropriate decisions may eventually be made as to the needed type and scale of restoration actions.

The Trustees will develop a Quality Management Plan (QMP) to document the Trustees Quality Systems and to provide a blueprint for how the Trustees will plan, implement, and assess Quality Systems for work performed by or on behalf of the Trustees. Consistent with EPA (2001), the Trustees' QMP will present the organizational structure of the team; functional responsibilities of management and staff; lines of authority; and required interfaces for those planning, implementing, and assessing all activities conducted under the assessment. Key elements of this Quality Management Plan are summarized below, including the requirement that natural resource damage assessment work plans include study-specific Quality Assurance Project Plans (QAPPs).

PROJECT MANAGEMENT

The Trustees will create an overall program management plan for the natural resource damage assessment. The plan will address, at minimum, the following roles and responsibilities:

- The **Case Manager** is responsible for the management and communication of specific quality assurance activities, with advisory input from Technical Work Groups, if necessary. Technical Work Groups will also work closely with Principal Investigators in the technical design of work plans to help ensure that these documents meet the Trustees' needs.
- The **Data Manager** will be responsible for assembling documents and data collected in support of the assessment (both current and historical) in an accessible and complete format for assessment purposes.
- **Principal Investigators** are responsible for study-specific design and implementation of the quality assurance/quality control (QA/QC) activities.
- **The Quality Assurance Coordinator** oversees QA program implementation, contributing to the work plan development, data review, and documentation processes. Specific responsibilities of the Assessment Area Quality Assurance Coordinator may include:

- Annually reviewing the Assessment Area natural resource damage assessment QMP, revising it if changes are necessary, and obtaining appropriate document approvals.
- Overseeing the verification and validation of the historical and newly acquired data for this NRDAR.
- Identifying and delegating responsibility for responding to specific QA/QC needs, and ensuring timely answers to requests for guidance or assistance, including interpretation of the QMP and providing guidance on compliance.
- Ensuring that all work plans, QAPPs, and standard operating procedures (SOPs) are technically reviewed and approved prior to collection and/or analysis of environmental data.
- Ensuring that problems and deficiencies identified in technical audits and data assessments are resolved.

QUALITY SYSTEM DESCRIPTION

The goal of the Quality System is to ensure that the acquisition and use of environmental data, whether historical or generated under the oversight of the Trustees, includes sufficient up-front planning and review to ensure that data quality is adequate to meet study goals. For data to be useful in the natural resource damage assessment, the data must be of known and documented quality. Specifically, data must be accompanied by sufficient supporting documentation, allowing data users to evaluate whether the data meet their needs. This objective is achieved by ensuring that adequate quality assurance tools are used throughout the entire data collection and assessment process, from initial planning through data usage. The tools used in the Quality System may include the following:

- QMP;
- Data Management Plan;
- Work plans, including associated QAPPs that may be developed to support assessment activities;
- SOPs;
- Peer reviews;
- Technical systems audits;
- Field and laboratory audits; and
- Data verification and validation.

Quality system components shall be consistent with, and supportive of, study objectives. In other words, the level of application of quality system controls to an environmental data program can vary according to the intended use of the results and the degree of confidence needed. For example, if historical data are being used to support planning for additional sampling, the degree

of review and documentation may be less than the degree of review and documentation if historical data are to be used for injury determination.

Specifically, it is the responsibility of the QA Coordinator, working with the Technical Work Groups and Principal Investigators, to ensure that the following objectives are achieved:

- All environmental data used and generated must be of known and acceptable quality for the intended use. The data quality information developed with all environmental data should be documented and available within the Data Management System.
- If new data are to be collected, the intended uses of the data should be defined before the data collection effort begins so that appropriate QA measures can be applied, thereby ensuring a level of data quality commensurate with the study data objectives. The determination of this level of data quality should consider the prospective data needs of secondary users. The assigned level of data quality, specific QA activities, and data acceptance criteria must be explicitly described in each individual QAPP.
- The general audit and data review procedures must be stated during the planning process for the acquisition and use of any data used in the assessment process. The audits and data assessments should be documented and provided with the final data reports.

DATA GENERATION AND ACQUISITION

New Data Generation Activities

All Assessment Area studies that involve the generation of new environmental data (i.e., activities that involve the measurement, monitoring or collection of physical, chemical, or biological data) are required to document all aspects of the study's sampling design, sample collection, analysis, quality control, and data management activities in a work plan. Work plans should generally include, but are not necessarily limited to, the following elements:

- Cover page with title and date;
- Signatory page (including the Principal Investigator(s) and QA Coordinator);
- Background/introduction;
- Study measurement endpoints;
- Sampling design strategy (e.g., numbers and types of samples, sampling locations, sampling timing, and identification of analyses that will be conducted on the samples);
- Detailed methods, including new, study-specific SOPs or references to SOPs;
- A description of the statistical methods to be used in interpreting results;
- Provisions for health and safety, as applicable;
- Descriptions of all permissions needed to conduct the study (e.g., collection permits); and
- References.

A study-specific QAPP must accompany the work plan, and must describe the methods for documenting and assessing environmental data, QA, QC, and other technical activities implemented to ensure that the results of the work performed will satisfy the stated performance criteria. The QAPP should follow the EPA guidelines for QAPP preparation (EPA 2002a).

Work plans must be peer-reviewed, signed by the Principal Investigator(s) and the QA Coordinator, and then approved by the Trustees. The QA Coordinator shall ensure appropriate QA/QC measures are included in all technical guidance documents. The Principal Investigator and the QA Coordinator will be jointly responsible for the proper use of these documents, which is ensured through the training and audit processes. The Case Manager will provide higher-level oversight to ensure that documents are consistent with overall Trustee priorities.

Historical Data Acquisition and Use

If a historical dataset is potentially useful for formulating or performing a study, the QA Coordinator will review the request for inclusion of the dataset. The dataset will be assigned a QA Category, as described in the Trustees' QMP, and the Trustees will approve final inclusion of the historical dataset in the Data Management System.

Reports relying on historical data shall describe the data review procedures undertaken as part of report development, as well as the results of those efforts (i.e., whether specific data sets were included/excluded from use). The QA Coordinator shall advise as to the appropriate nature and type of data review procedures for use during specific efforts.

Treatment of Non-Detects in Studies Analyzing Existing Data

In May of 2016, EPA released ProUCL Version 5.1 (ProUCL v.5.1) software. ProUCL v.5.1 employs state-of-the-art parametric and nonparametric upper confidence limit, upper percentile limit, and upper tolerance limit computation methods useful for treating non-detects in existing data. The methods can be used on uncensored data sets (those without non-detect values) and on left-censored data sets (those with non-detect values) (EPA, 2007). This latest version of ProUCL includes a variety of approaches for calculating summary statistics with left-censored data that employ distributional (e.g., normal) proxies or that do not require a proxy value to be assigned for each non-detect value (where the latter adjust the summary statistics based upon the detection limits and frequency of detects). For the purposes of this NRDAR, researchers should use the recommended statistical tools within ProUCL v.5.1 software package to generate various summary statistics. In addition to the use of ProUCL v.5.1, researchers shall employ statistical practices consistent with EPA guidance.

This summary is not intended as comprehensive direction on statistical reporting of data since statistical analyses are complex and a number of guidance documents are available. There are many other vital factors that must be considered to avoid introducing unacceptable uncertainty and bias to summary statistics, including: inadequate sample size; incorrect distributional assumptions; inadequate treatment of outliers; and other factors (including representativeness and data quality issues). Thus, statistical summaries must be supported by narrative discussion of sources of uncertainty and bias and graphical depiction of data sets. Several EPA publications are useful and provide additional guidance on these matters (EPA, 1989, 2002b, 2006).

Data Sharing

Pursuant to 43 C.F.R. § 11.31 (a)(4), the Assessment Plan will contain "procedures and schedules for sharing data, split samples, and results of analyses," with PRPs and any other trustees, when requested.

ASSESSMENT AND OVERSIGHT

The appropriate type of assessment activity for specific studies will be determined during the planning process. Assessment tools include technical systems audits, laboratory and field audits, peer reviews, and data verification and validation. For evaluating specific activities, the work plan will describe the appropriate assessment tool and identify personnel responsibilities. Data quality verification, validation, and assessment shall be consistent with EPA Guidance on Environmental Data Verification and Data Validation (QA/G-8) (EPA, 2002c). The QA Coordinator determines if appropriate actions have been implemented in response to assessment findings. The QA Coordinator, in a timely manner, determines the effectiveness of responses to assessments and maintains the documentation and correspondence relating to assessments and actions. Following any assessment event, the QA Coordinator prepares a written summation of needed changes and actions, and then presents this summation in a timely manner to the Case Manager.

DATA VALIDATION AND USABILITY

The purpose of data validation is to verify that data are of known quality, are technically valid, are legally defensible, satisfy project objectives, and are usable for their intended purpose. Work plan QAPPs shall describe the criteria that should be used for accepting, rejecting, or qualifying project data. Understanding the extent to which historic data have been validated is integral to evaluating their usability for natural resource damage assessment and is an important aspect of the categorization of historical data described above. Overall, data quality verification and validation shall be consistent with EPA Guidance on Environmental Data Verification and Data Validation (QA/G-8) (EPA 2002c).

APPENDIX B - MINING OPERATIONS AND REMEDIAL ACTIVITIES

This appendix describes the operations history of the mine sites, as well as the status of remedial activities. Ongoing administrative, investigative, reclamation and remedial activities are occurring at these mines, and the statuses included in this appendix are subject to change.

OVERVIEW OF MINING OPERATIONS

The sections below discuss the historical progression of mining operations at each individual mine site.

Ballard, Henry, and Enoch Valley Mines

BALLARD MINE

Phosphate-related activity in the area of the Ballard mine began in 1912 when a U. S. Geological Survey field party explored the area. No further activity occurred until 1947 when the J. R. Simplot Processing Company (later the J. R. Simplot Company) filed an application to lease the phosphate from the Federal government. Simplot was issued lease BL-055875 in 1948. Simplot never developed the lease and in 1951, assigned the lease to the Monsanto Chemical Company (Monsanto), at which time exploration activities began.

Concurrent with the development of the Ballard Mine, Monsanto completed construction of an elemental phosphorous plant at Soda Springs in 1952. Monsanto also contracted with the Morrison Knudsen Company of Boise, Idaho to construct an 11-mile road connecting the mine and the plant; the project was completed in 1959.

Actual mining in the Ballard Pit started early in 1952 and continued out of the Ballard Pit into the area known as the North Ballard area.

In 1954, exploration identified a large volume of ore existing outside of lease BL-055875. In 1955, Monsanto was issued a new BLM lease, I-05723, to obtain that ore and developed as the West Ballard Pit. In 1962, Monsanto contracted with Wells Cargo to be the mine operator, while Morrison Knudsen Company retained the contract to haul the ore to the processing plant. Mining continued in various places on the two leases until late 1969 when deposits were exhausted.

Even before the mining was completed, reclamation had started on the earlier pits. As early as 1958, the Ballard Mine dumps were used for experimental plantings for reclamation. Additional experimental plantings were done in the 1960s, and in the early 1970s USFS Experimental Station at Logan, Utah planted a total of 78 different types of trees, shrubs, grasses, forb seeds, seedlings, and cuttings on the dumps (USGS, 1977). These experimental reclamation plantings had varying degrees of success.

During the 18 years of production, about 11 million tons of phosphate rock was mined and removed from about 191 acres at the Ballard Mine on the two Federal leases. Over 20 million cubic yards of waste rock were stripped; of this amount two million cubic yards were used to backfill the pits with the remaining 18 million cubic yards hauled to external dumps. About 317

acres of land were covered by the dumps and an additional 96 acres were used as service areas for the mine (USGS, 1977). Monsanto filed for, and the BLM accepted, relinquishments for the two Federal leases in 1984, after which the leases were closed.

ENOCH VALLEY MINE

The Enoch Valley Mine is located in Caribou County, Idaho about 19 air miles northeast of Soda Springs, Idaho. Mining is conducted on three Federal phosphate leases and two State of Idaho phosphate leases. Phosphate leases for this mine were initially awarded to Food Machinery Corporation (FMC). Monsanto received the leases as part of a lease exchange with FMC. In 1960, the Ruby Company filed an application for a prospecting permit, and in 1963 discovered significant phosphate ore reserves. In 1964, the FMC Corporation was issued a prospecting permit for lands adjacent to the Ruby Company lease and the FMC Corporation started exploration. In 1968 Federal phosphate lease, I-015033, was issued to the FMC Corporation.

Meanwhile, in 1964, Monsanto and FMC expressed interest in another nearby land tract on which BLM held a lease. FMC was the high bidder for the lease (I-015122) and began exploration immediately. Monsanto, although losing the bid, maintained an interest in this parcel of land. Under an agreement with FMC, Monsanto performed some exploratory drilling between 1972 and 1980. Monsanto also applied for and was awarded a State lease E-07957 in 1978.

In 1981, FMC assigned both Federal leases I-015033 and I-015122 to Monsanto as part of a lease exchange. It became apparent to Monsanto that the phosphate resource on their new leases could not be fully developed without some additional adjacent State-owned land, so they acquired State lease E-08379 in 1981.

Concurrently, in 1966, the Ruby Company (renamed Simplot Industries, Inc.) assigned the Federal lease I-011683 to the Bannock Chemical Company. This lease was subsequently assigned to the J. R. Simplot Company in 1983.

Monsanto began to develop their leaseholds in preparation for mining in late 1987, seeking to replace production from Henry Mine, where output was diminishing. The company completed construction of a haul road into the mine area in 1989. Construction of a load-out tipple was also started. Stripping of the overburden near the south end of lease I-015122 began in 1989. The plan for mining the Enoch Valley phosphate reserves called for mining to progress from both ends towards the center of the deposit. The mining operations were performed by the mining contractor Dravo-Soda Springs. Ore was hauled 21 miles from the new Enoch Valley Mine to Monsanto's elemental phosphorous plant near Soda Springs beginning in the spring of 1990.

Monsanto completed their planned reserve leasing at the Enoch Valley Mine in 1990, when Simplot assigned their Federal lease I-011683 to Monsanto. Monsanto's first production from Federal lease I-011683 occurred in 1990. By 1992, the phosphate ore reserves on this lease were mined out and Monsanto began mining on Federal lease I-015033. By 1993, these phosphate reserves were mined out as well.

On September 1, 1997, Monsanto spun off its traditional chemical business to form Solutia. Solutia and Monsanto formed a joint venture called P4 Production L.L.C. (P4). The phosphate leases were assigned to P4. P4 also owns the Soda Springs elemental phosphorous plant and all

other mineral rights formerly held by Monsanto. Operation of the joint venture, originally with Solutia, was transferred to Monsanto in June 2000. By 2004 Enoch Valley Mine was considered mined out. In 2015, Monsanto restarted the mine to obtain ore to blend with their Blackfoot Bridge Mine ore in their elemental phosphorous plant. The mine was idled again in 2017.

HENRY MINE

The Henry Mine, operated by Monsanto, is located just to the southeast of the small village of Henry, Idaho. USGS first explored the phosphate resources in the area of the North Pit of the Henry Mine in 1912. In 1960, Monsanto was issued Federal lease I-011451. Monsanto's intent was to use the ore on this lease as replacement for the dwindling resources at their Ballard Mine. Exploration on their newly acquired Federal lease soon led Monsanto to seek additional adjacent acreage. In 1965 BLM issued Monsanto a Federal preference right lease I-013814.

Mining at the Henry Mine began in 1969. Approximately five miles of phosphate outcrop was eventually developed and mined with the entire output of the mine going to Monsanto's P4 elemental plant at Soda Springs. The mining plan called for five mine panels or pits: Pits I and II were the site of the initial mining; Pit III was the South Henry Continuation; Pit IV was the Center Henry Continuation; and Pit V was the North Henry Continuation. Monsanto contracted with Dravo-Soda Springs for mining and ore hauling. Dravo-Soda Springs was a joint venture between the Dravo Corporation and N. A. Degerstrom, Inc.

Ore was shipped from the mine to the elemental phosphorous plant at Soda Springs by trucks with two or three belly-dump trailers. These truck-trailer combinations were called "trains" and ran on the private heavy-duty haul road that was initially built for the Ballard Mine and later extended to the Henry Mine. The haul road extends 18 miles from the mine to the plant at Soda Springs.

Mining in the South Henry Pit (Pit III) started in the fall of 1976. Mining operations in that pit were completed in 1980, and mining then started in Center Henry Pit (Pit IV) in the summer of 1981. Mining in the Center Henry Pit was completed in the fall of 1985. The North Henry Pit (Pit V) was opened and mining operations started at the beginning of the summer mining season in 1986. Mining operations were completed at North Henry in mid-October, 1989, bringing to a close the active phase of the Henry Mine.

Reclamation of the Henry Mine progressed throughout the active mining phase, with excavated waste rock being used to backfill the pits as mining advanced. Once the mine closed in late 1989, other forms of reclamation took place, including reseeding and hydromulching of the highwalls. Reclamation continued for a number of years after mining and monitoring of the reclamation effort continued even longer.

Monsanto applied for, and the BLM accepted, relinquishment of the two Federal leases in 1993, ending mining at the Henry Mine.

Champ Mine

The Champ Mine and its extension are located in the upper Dry Valley, Caribou County, Idaho. The mine was an open-pit operation located on two low hills on the valley floor. Phosphate ore

was known to exist in the area of the Champ Mine as early as 1911. The BLM held a lease sale, and in 1954, Federal phosphate lease (I-04979) was issued to Mr. Frederick P. Champ. In 1954, Mr. Champ hired the Boyles Brothers Drilling Company of Salt Lake City to drill on the lease. Modifications of the lease added acreage, but no mine development occurred.

In 1973, Mr. Champ assigned the lease to the Williams Family Partnership (50 percent) and the Champ Family Partnership (50 percent). One month later, the lease was further assigned to APC of Greenwich, Connecticut and Conda, Idaho, a wholly-owned subsidiary of Beker Industries. APC was then absorbed into the parent company, Beker Industries, Inc., in 1975. In 1978, Beker joined with the Western Cooperative Fertilizers (US), Inc. to form the Conda Partnership. In 1979, Beker Industries, Inc. partially assigned (50 percent) the lease to the Western Cooperative Fertilizer, at which time Western Cooperative Fertilizer reassigned the lease to the Conda Partnership.

The Conda Partnership initiated mining operations on Federal lease I-04979 in 1982, with limited production through the remainder of that year and into 1983. The initial mine plan called for two open pits on the lease. Ore was loaded onto trucks and transported six miles via a private haul road to the rail head loading tipple at the Maybe Canyon Mine where the ore was loaded into rail cars and shipped to the Conda Partnership plant at Conda, Idaho.

In 1983, the Conda Partnership estimated that all of the available ore on Federal lease I-04979 would be mined out of the Champ Pit by 1984, and that additional reserves of phosphate ore were located just off-lease to the north on land leased by the FMC Corporation. The location of this additional ore made it logical to mine it with the current operations of the Champ Mine and not as a separate mining operation. In 1983, FMC assigned part of their adjacent Federal phosphate lease to the Conda Partnership. This additional land was given a new lease number, I-19602. Mining on this new acquisition, the Champ Mine Extension, commenced later in 1983.

In 1984, mining intensified. Railroad service was extended to the Champ mine and an onsite loading tipple was completed. All economically recoverable phosphate ore reserves in the Champ Pit on the original lease, I-04979, were mined out, and mining operations moved onto the Federal lease I-19602 to the Champ Mine Extension. In 1985, a lease modification added more acreage.

By late in 1985, all recoverable phosphate reserves in the Champ Mine Extension Pit (lease I-19602) had been mined. Overburden from the Champ Pit was placed in external dumps, including the East Dump and West Dump and was used to partially backfill the Champ Pit. Overburden from the Champ Mine Extension Pit was placed in the North Dump and used to partially backfill the Champ Mine Extension Pit. Backfilling of the pits with overburden and waste occurred continuously during active mining.

Beker filed for Chapter 11 bankruptcy and in 1985. In 1987, Nu-West Industries, Inc. purchased Beker's 50 percent interest in Conda Partnership out of the bankruptcy estate of Beker, and formed a new Conda partnership with Western Cooperative Fertilizer, Ltd.. In 1992, Nu-West Industries Inc. bought out Western Co-operative Fertilizer, Ltd., and formed a wholly owned subsidiary named Nu-West Mining, Inc. (Nu-West). In 1995, the Conda Partnership was

dissolved and all of its mine properties were assigned to Nu-West. In October of 1995, Nu-West was acquired by Agrium, Inc., a Canadian firm based in Calgary, Alberta. As discussed in Chapter 1, Agrium merged with Potash, Inc in 2018 to form Nutrien, Inc. The mine property currently remains idle under the ownership of Nu-West.

Conda/Woodall Mountain Mine

In October, 1906, the Brown, Perkins Company located a group of 23 association placer claims for phosphate about six miles northeast and east of Soda Springs, Idaho. The Southern California Orange Grove Fertilizer Company acquired this group of placer claims shortly thereafter. The Southern California Orange Grove Fertilizer Company was a growers' co-operative that was formed to explore for and develop fertilizer sources for the members of the co-operative. The company was drawn to this area of Idaho because of the reported finding of rich phosphate rock by C. C. Jones in his explorations of 1903-1904. The claim group was explored by a series of open cuts, pits, trenches, and approximately 22 short tunnels prior to patenting. The Brown, Perkins Company, acting as an agent for the Southern California Orange Grove Fertilizer Company, mined and shipped a 40-ton test load of ore to California in 1910. This ore came from a pit in the SE¼SW¼ of Section 23, T. 8 S., R. 42 W., B.M., on the Agnes Placer mining claim.

After the Southern California Orange Grove Fertilizer Company patented the 23 placer mining claims in 1917, the Anaconda Copper Mining Company expressed an interest in purchasing the claims. The Anaconda Copper Mining Company was, at that time, faced with a large excess of sulphuric acid derived from smelter fumes from their copper smelting operations in Montana. The production of fertilizer was a use of this excess acid and Anaconda started investigating phosphate deposits throughout the newly defined western phosphate field. The company constructed a fertilizer plant at Anaconda, Montana and started purchasing phosphate rock while investigating deposits of their own. After a period of negotiation, the Anaconda Copper Mining Company bought all 23 patented placer mining claims from the Southern California Orange Grove Fertilizer Company on February 10, 1920.

On April 1, 1920, Anaconda started underground mining by developing a mine on the Emma and Maud patents. Also in 1920, Anaconda started to construct a rail line north from Soda Springs, a distance of about eight miles. In late 1920 and on into 1921, Anaconda started construction of a planned community (Conda) for housing workers, as well as on a crushing and screening plant to support the mine. The phosphate mill at Conda screened, crushed, washed, and dried the phosphate rock in preparation for rail shipment to the Anaconda Company's processing plant at Anaconda, Montana. The first shipment of Conda phosphate ore to the mill at Anaconda, Montana, was made in March, 1921. Due to its high organic content, the Conda ore had to be calcined before further processing could occur. The phosphate was then processed and sold as a concentrate of triple super-phosphate fertilizer. As time went on, the plant at Conda was enlarged to keep pace with the advances in the mine and the increasing volume of phosphate ore being removed.

By 1924, the underground workings of the mine included 1,335 feet of drifts, 3,050 feet of crosscuts and tunnels, and more than 500 feet of raises. The underground mine would eventually be developed and enlarged until 1952, when transition from to surface operations started. On

April 1, 1956, underground operations ceased permanently. From that point, all production came from surface open-pit mining. Production increased, and later in 1956 Anaconda upgraded the Conda plant, adding a new washing plant.

During this same time, Anaconda also expanded their operations to new areas. In 1952, the company acquired Federal phosphate lease I-01603 on property in Middle Sulphur Canyon, and in 1954, the company acquired Federal phosphate lease I-04494. These two leases were adjacent to the patented mining claims of Anaconda and increased their reserve base for future mining. From 1952 to 1958, Anaconda subcontracted the surface mining operations to the Morrison Knudsen Company.

In 1959, the J. R. Simplot Company (Simplot) and the Anaconda Copper Mining Company created a joint venture under which Simplot assumed management of the mine and supplied both partners to the agreement with phosphate rock. In 1960, Anaconda exited fertilizer market. The joint venture and ancillary agreements with Simplot were terminated, and all of Anaconda's fertilizer production facilities were sold outright to Simplot. Likewise, the mines in Idaho were leased to Simplot on a long-term royalty basis. The fertilizer plant at Anaconda, Montana, was dismantled and shipped to Idaho, where Simplot reassembled the plant and put it into operation.

On April 1, 1961, the Simplot Company acquired 80 percent of the two Federal leases that were held by Anaconda and constructed a new mill to replace the Conda facility. On August 1, 1965, two additional Federal phosphate leases (I-015523 and I-015820) were issued to the Ruby Company, a subsidiary of Simplot. In the case of lease I-015523, the Ruby Company assigned the lease to Anaconda in 1967, and 80 percent of the lease was quickly reassigned to Simplot. In 1984, Simplot gained the remaining 20 percent of the lease, as well as the remaining 20 percent of the two earlier leases (I-01603 and I-04494).

In addition to the surface mining on the patented mining claims at Conda, surface mining was conducted on lease I-04494 in 1955 and the last minable ore was removed in April of 1984. Mining started on lease I-015523 in 1970 and the ore was depleted in 1972.

Mining at Conda ceased in January of 1984, although portions of the reserves on the patented mining claims and on two of the adjacent Federal leases remain untouched, and are therefore available for future mining. Over the period from 1984 to 1987 (when all operations at Conda were terminated) the town was vacated and buildings eliminated.

Diamond Gulch Mine

In 1905, the San Francisco Chemical Company located the Diamond Placer mining claim, and two years later located the Dodo Placer mining claim, adjacent to the Diamond Placer. During the summer of 1910, San Francisco Chemical Company conducted extensive exploration, and although phosphate ore was discovered, the company chose not to patent the property under the Mining Law. The property remained inactive until 1956 when extraction at their Waterloo Mine began to close. In order to maintain their position, the company sought other phosphate sources. In 1957, San Francisco Chemical Company bid and won a competitive lease for 320 acres covering essentially the same ground covered by the two placer claims, plus an additional 40 acres that BLM added to the desired parcel.

Following the issuance of the Federal phosphate lease (I-07881), San Francisco Chemical Company began mining in 1960. Operations were conducted by two subcontractors, Cherf Bros., Inc., and the Sankey Contractors, Inc. The mine consisted of two connected open pits. The ore was transported by trucks to a pulverizing plant at Montpelier, Idaho. About 84,000 tons of phosphate ore were shipped from the mine during 1960, but further mining proved difficult because of extensive faulting and pinching of the ore. Reclamation was conducted on the mine site in 1961 and 1962.

Dry Valley Mine

The Dry Valley Mine is located about 17 miles northeast of Soda Springs, in Caribou County, Idaho. The leasehold for the mine extends a length of six miles in a northwest-southeast direction, while actual mining extends about two miles (as of the writing of this report).

Known exploration for phosphate ore in the vicinity of the Dry Valley Mine started in 1910. A competitive lease sale was held in 1951. Simplot and FMC bid, and Simplot was the high bidder, taking control of Federal lease I-0678. Simplot assigned the lease to Monsanto in 1956. In 1981, Monsanto assigned the lease to FMC.

In 1962, a prospecting permit was issued to Mr. Larsen who assigned it to FMC Corporation. FMC explored the permit area by drilling during the field seasons of 1962, 1963, and 1965. The exploration findings prompted FMC to apply for a preference right lease in 1966; this lease was issued as Federal phosphate lease, I-011866 in 1967.

The next round of phosphate interest in this area occurred when Kerr-McGee Oil Industries, Inc. applied for a Federal prospecting permit on un-leased lands in 1963. From 1963 to 1965, the company drilled to investigate the phosphate resources covered by the permit. Kerr-McGee assigned the prospecting permit to FMC in 1965. FMC conducted additional exploration throughout 1966. FMC applied for, and was issued, preference right lease Federal lease I-014184 in 1968. The last round of Federal leasing activity was in 1964, when FMC was issued Federal phosphate lease I-015097.

Throughout the period when FMC amassed Federal phosphate leases, there was action to lease the State of Idaho lands in the vicinity of the future mine as well. Monsanto was issued the State of Idaho lease 3059 in January, 1948. This lease was renewed in 1953, 1958, and 1968. Monsanto allowed the lease to expire in 1978 but applied for a new state lease on the same land

on February 16, 1978. State of Idaho lease 7962 was issued to the company on May 1, 1978. The lease was assigned to FMC on May 29, 1981. Similarly, Kerr-McGee Oil Industries, Inc. was issued State of Idaho lease 3823 in 1963. The lease was assigned to FMC on May 11, 1967.

By 1981, FMC had consolidated all the Federal and state leaseholds. Concurrently, FMC obtained three private fee leases to obtain continuity in the total leasehold. These three private leases are the Holmgren/Anderson lease, ML-767, the Allen lease, ML-769, and the Bollar lease, ML-762. These leases were acquired prior to 1974. FMC controlled over six miles of phosphate reserves with their mix of Federal, state, and private leases. In addition, FMC purchased or leased the surface rights to all private lands overlying or adjacent to the Federal, state, and private mineral leases.

In anticipation of actual mining, FMC built a railroad spur into the mine area and constructed a tipple during the summer of 1991. A mine-office complex was completed and occupied in 1992, and excavation started on the northern-most "A" pit portion of the Dry Valley Mine. The area of "A" pit is a small hill located near the mouth of Dry Valley. The first phosphate ore shipped from the "A" pit of the Dry Valley Mine on August 23, 1993, and went by rail to the FMC elemental phosphorous plant in Pocatello. All of the economically retrievable phosphate ore was removed from "A" pit by the summer of 1995.

The area of "B" pit is located along a northwest-southeast trending ridge. Stripping of overburden started in the "B" pit area during the summer of 1994. All of the economically retrievable phosphate ore was removed from "B" pit by early 2001.

In 1998, FMC and Monsanto formed a joint venture named Astaris. Astaris was assigned the lease in 2000. That same year, the BLM authorized the mining of "C" and "D" pits, known as the Dry Valley Mine South Extension. In 2001, FMC assigned Astaris the leases encompassing "C" and "D" pits. From 2001 to 2004, Astaris shipped ore out of the existing stockpile from pit "B" and stripped "C" pit.

In March 2004, Nu-West acquired the Dry Valley Mine South Extension and conducted mining from June 2005 to May 2011. In 2011, the South Extension was mined to completion.

FMC reclaimed the "A" pit, "B" pit, and associated dumps on the north Dry Valley Mine property; reclamation of the "B" pit was completed in October 2007. The majority of reclamation activities at the South Extension were performed in 2011 and 2012 and were completed in 2013. The mine is currently reclaimed with operations focusing on ground water monitoring required by DEQ and BLM. In May 2019, IDEQ published a Preliminary Assessment which made a No Remedial Action Planned determination for Dry Valley Mine South Extension. This determination means, based on current conditions at the site, DEQ did not find any significant evidence indicating the potential for adverse toxicological effects to human or ecological receptors on the property, and no additional work is necessary to manage those potential effects (IDEQ 2019).

In 2016, Monsanto proposed to use the existing partially filled "D" pit to dispose some overburden from their proposed Caldwell Canyon Mine. The Record of Decision for this action was signed on 14 August 2019.

As of 2019, the South Extension of the Dry Valley Mine site is owned by Nu-West Industries, Inc., a subsidiary of Nutrien Ltd.

Georgetown Canyon Mine

The Georgetown Canyon Mine was opened under the leases assigned to the Utah Fertilizer and Chemical Manufacturing Company. While limited mining occurred starting in 1909, Utah Fertilizer and Chemical Manufacturing Company sold their interests in the patented mining claims to Stockholders Syndicate of Los Angeles, California in 1928. The company began mining in 1953, but found the mine unproductive and idled it in 1955.

In 1955, Stockholders Syndicate of Los Angeles sold their interests to CFFC. CFFC constructed a processing plant, electric furnace and kiln near the mine beginning in 1957. CFFC constructed a railroad spur in 1957 to ship product from the plant. The mine transitioned from underground to open pit mining methods in 1958 and open pit mining by CFFC continued until 1964 when El Paso purchased the leases from CFFC. The mining ceased and parts of the infrastructure were moved to Conda for a new plant. CFFC had an initial public offering in 2005 through which it became CF Industries Holdings, Inc.

Since its closure, ownership of the Georgetown Canyon Mine has changed several times. In May of 1972, APC purchased the mine properties from El Paso. APC was a wholly owned subsidiary of Beker. In 1972, APC was dissolved and all of their property holdings, including the Georgetown Canyon mine were assigned to the parent company, Beker. In January of 1979, Beker sold 50 percent of their holdings, including the Georgetown Canyon mine, to Western Co-operative Fertilizer, Ltd., USA and formed the Conda Partnership. In 1987, Beker filed for Chapter 11 bankruptcy; Nu-West Industries, Inc. purchased Beker's 50 percent interest in Conda Partnership out of the bankruptcy estate of Beker, and formed a new Conda partnership with Western Cooperative Fertilizer, Ltd. In 1992, Nu-West Industries Inc. bought out Western Co-operative Fertilizer, Ltd., and formed a wholly owned subsidiary named Nu-West Mining, Inc. (Nu-West). In 1995, the new Conda Partnership was dissolved and all of its mine properties were assigned to Nu-West. In October of 1995, Nu-West was acquired by Agrium, Inc., a Canadian firm based in Calgary, Alberta. As discussed in Chapter 1, Agrium merged with Potash, Inc. in 2018 to form Nutrien, Inc. The mine properties currently remain idle under the ownership of Nu-West.

Lanes Creek Mine

The Lanes Creek Mine is located near the southern end of Rasmussen Ridge, on private land/private minerals owned by the Bear Lake Grazing Association, a cooperative of about 54 area ranchers. Initially, the land was patented under the Desert Land laws to George M. Pugmire of Bear Lake County on May 4, 1888.

In the early 1970s John Archer leased the lands in the current private leasehold from the Bear Lake Grazing Company. Archer sold the lease to the Alumet Company (Alumet) while retaining

an overriding royalty. Alumet was a partnership between Earth Science, Incorporated (20 percent), National Steel Corporation (40 percent), and the Southwire Company (40 percent).

The mine opened in August, 1978, with the HK Contractor's Company performing the work. Ore was trucked through the Blackfoot Narrows to the Wooley Valley loadout facility, and then sent by rail to the Valley Nitrogen Company of Helm, California. During the summer of 1983, Alumet shipped approximately 50,000 tons of ore to the Simplot plant at Conda, Idaho. In 1987, and 1988, ore was trucked to the Maybe Canyon railroad facilities and shipped to the Conda plant of Agrium Corp. Production from the mine was suspended in late 1988 or early 1989; however, the mine was never officially closed and remained available for production.

Simplot acquired Lanes Creek Mine in 1997, along with all of Alumet's other phosphate interests. Simplot performed limited reshaping and reclamation of the waste dump and the mine was closed but not abandoned or reclaimed.

In 2012, Agrium entered into an agreement with Simplot to reopen and operate the Lanes Creek Mine. As part of this proposed Plan, remaining features associated with historical mining on the Lease will be appropriately removed and reclaimed. All previously excavated materials on the existing OSA will be treated as run-of-mine waste and incorporated into mine pit backfill.

In 2018, Agrium's interests in the Lane Creek Mine were transferred to Itafos.

Maybe Mines (North Maybe and South Maybe Canyon)

The Maybe Mines are located on the east side of Dry Valley, about 25 miles northeast of Soda Springs, in Caribou County, Idaho. The mines together are over 4 miles long and are located on Federal Lease I-04. In 1949, the BLM held a competitive lease sale for the phosphate resources of the Maybe Canyon area. Western Fertilizer Association of Salt Lake City, Utah was the successful high bidder and was issued Lease I-04 on October 1, 1950.

Western Fertilizer Association consisted of the following organizations:

- Washington Cooperative Farmers Assoc. Pacific Supply Cooperative;
- Northwest Wholesale, Inc. Grange Cooperative Wholesale;
- Idaho Egg Producers Idaho Potato Growers, Inc.;
- Idaho Farm Bureau Federation, Inc. Utah Poultry and Farmers Cooperative; and
- Utah State Farm Bureau Federation Utah Cooperative Association.

In 1953, Western Fertilizer Association successfully bid on the lease and the lands were incorporated into the Lease I-04. Later that year, a lease modification added 200 acres to Lease I-04. In the period from late 1951 to early 1959, Western Fertilizer Association conducted low-level mining, including removal of overburden along the ridge immediately south of Maybe Canyon in preparation for mining, as well as scattered exploration activities throughout the leasehold.

In July 1958, Central Farmers Fertilizer Company (CFFC) consolidated its operations with Western Fertilizer Association, thereby absorbing its members and acquiring Western Fertilizer

Association's phosphate assets, including its interests in Lease I-04, which was assigned to CFFC in 1959. CFFC was a large phosphate operator in the Georgetown Canyon area south of the Maybe Canyon property where it had developed a phosphate mine and processing facilities on private land. CFFC did nothing on the Lease I-04 for the next five years. In 1964, the El Paso Natural Gas Products Company (El Paso) purchased all of CFFC's interests in the Georgetown Canyon area. El Paso moved most of the Georgetown Canyon phosphate processing facility to a new plant in Conda, Idaho dedicated to manufacturing phosphoric acid and phosphate fertilizer.

Also, in 1964, Lease I-04 was assigned to El Paso, which began mine development as well as construction of an 18-mile railroad spur between the new plant and the mine area. Shipments began arriving in 1965. Overburden stripping, mining and hauling of ore at the mine was contracted to Wells Cargo, Inc., of Las Vegas, Nevada.

In 1966, El Paso Natural Gas Products Company changed their name to El Paso Products Company. Mining continued in the North Canyon Mine until 1967. El Paso Products Company closed the mine and the associated mill facility at Conda, primarily due to the high cost of sulfur and the low price received from fertilizer sales.

In 1972, the lease was assigned to APC and the mine was reopened. APC was a wholly owned subsidiary of Beker Industries, Inc. (Beker). At this same time, Beker acquired title to the Charles F. White phosphate plant at Conda. Mining operations and ore hauling were done by the Conda Mining Division of the Washington Construction Company, a mining contractor headquartered in Missoula, Montana. In 1975, APC was merged into its parent company, Beker.

The mine underwent a major expansion during the 1974 phosphate boom. Reclamation of the southern end of the North Maybe Mine pit also had started by 1975. Mining activities ceased in the North Maybe Mine and by 1977, all mining was focused in the South Maybe Canyon Mine. This portion of the mine was plagued with slope stability problems in the waste dump areas. Because of these stability problems, french drains were constructed under the new dumps to drain surface water.

In 1979, Beker assigned 50 percent of the Lease I-04 to Western Co-operative Fertilizer (US), Inc., combining with Beker to create the Conda Partnership. All of the phosphate properties, including the processing facility at Conda were transferred to the new partnership. Beker ran the South Maybe Canyon Mine for the partnership as a truck/shovel and scraper/dozer operation, with the Conda Mining Division of Washington Construction Company performing the stripping, mining, hauling, loading, and unloading activities. In November, 1979, the Conda Partnership reactivated the North Maybe Mine and began to mine both the north and south mines simultaneously until 1984.

Beker filed for bankruptcy reorganization relief under Chapter 11 in 1985. In May, 1986, the two mines and the Conda mill were closed. In July 1987, Nu-West Industries, Inc. purchased the Conda mill and Beker's 50 percent interest in Conda Partnership out of the bankruptcy estate of Beker, and formed a new Conda partnership with Western Cooperative Fertilizer, Ltd. The new partnership restarted operations in August 1987 and resumed full-scale production in April 1988. Moderate production continued and in 1993, the North Maybe Mine was mined out and closed,

although reclamation activities continued through 1995. The South Maybe Canyon Mine went inactive in 1995, but has not been formally closed.

In October of 1995, Nu-West was acquired by Agrium, Inc., a Canadian firm based in Calgary, Alberta. As discussed in Chapter 1, Agrium merged with Potash, Inc. in 2018 to form Nutrien, Inc. The mine properties currently remain idle under the ownership of Nu-West.

Mountain Fuel Mine

In 1962, BLM issued Federal phosphate lease I-012989, covering 560 acres, to J.D. Archer and W. J. Colman. In 1963, W. J. Colman assigned his portion of the lease to J. D. Archer. Archer assigned the entire lease to the Mountain Fuel Supply Company, retaining a 15 cents/ton overriding royalty. In 1977, the lease was assigned to Beker Industries, Inc., and two years later the Conda Partnership was formed between Beker and Western Cooperative Fertilizers Inc.

The mine was inactive until 1981 when the Conda Partnership started exploration activities and extended a railroad line approximately two miles south from their Champ Mine to the Mountain Fuel Mine. In addition, the load-out tipple was relocated at the Mountain Fuel Mine from the Champ Mine. In 1985, the Mountain Fuel Mine started ore production. Mining development moved from the northern part of the lease in the North Pit and continued in stages southward to the central portion of the North Pit. During mining of the North Pit, overburden was placed on external dump areas including the Saddle Dump, Canyon Dump, and North Pit Dump. After mining activities concluded in the North Pit, consistent with common practice, waste rock was used to partially backfill the North Pit and additional overburden was placed on the Valley Dump. Mining continued until May of 1986, after one of the Conda Partners (Beker) declared bankruptcy and the mine was shut down. In the summer of 1987, the new Conda Partnership reopened the mine (see discussion under Georgetown Canyon Mine). Exploration in the southern part of the mine continued and the new Conda Partnership was granted four lease modifications between 1989 and 1991, expanding the total acreage of the lease to approximately 1,120 acres.

In 1995, the lease was assigned to Nu-West Mining, Inc., the parent company of Nu-West. In October of 1995, Nu-West was acquired by Agrium, Inc., a Canadian firm based in Calgary, Alberta. As discussed in Chapter 1, Agrium merged with Potash, Inc. in 2018 to form Nutrien, Inc. The mine property currently remains idle under the ownership of Nu-West.

Rasmussen Ridge – North, South and Central Rasmussen Ridge Mines

The Rasmussen Ridge Mines are located about 20 air miles northeast of Soda Springs, Idaho. The mine is developed in the eastern limb of the Snowdrift Anticline and is divided into three named mines: South Rasmussen Ridge Mine, Central Rasmussen Ridge Mine, and North Rasmussen Ridge Mine.

The first phosphate exploration activity in the immediate area of the mine took place in 1912. The BLM held a lease sale in 1953, offering several tracts, two of which covered the area of the future Rasmussen Ridge Mines. The first of these two tracts, Rasmussen Ridge, was issued as lease I-04375 to J.A. Terteling & Sons in 1953. The second tract, North Rasmussen, was issued as lease I-07619 to J.A. Terteling & Sons in 1957.

Terteling assigned both leases to Terteling Land Company (TLC) in 1959. In 1967, TLC assigned the two leases to Stauffer who explored the area throughout the 1970s and into the 1980s. Stauffer was holding this mine development in reserve while mining their Mill Canyon and Little Long Valley Mines.

In 1985, Stauffer's phosphorous operations were acquired by the Chesebrough-Ponds Company, which was soon acquired by Unilever N.V. Unilever N.V. sold the operations to the Imperial Chemical Company in 1986, who immediately sold the operation to Rhône-Poulenc (Bennett, 1994). During 1988, the Monsanto Chemical Company contracted to drill five holes on the leases. Monsanto holds a State lease immediately to the southeast of the Rasmussen Ridge Mines.

With the closing of mining activities and the exhaustion of phosphate ore in the Little Long Valley Mine, Rhône-Poulenc initiated activities to open the South Rasmussen Ridge Mine. Construction of an eight-mile haul road between the Little Long Valley facilities and the new mine was completed 1991. During the fall of 1990, Rhône -Poulenc opened a wash plant adjacent to the loading tipple at Little Long Valley Mine, seeking to upgrade the phosphate ore.

Mining at the South Rasmussen Ridge Mine (the southern end of lease I-04375) was initiated in 1991. The ore was transported by end-dump trucks along the haul road to a stockpile at the old Little Long Valley Mine. A contractor, Circle A Construction Company, hauled the ore. From there, the ore was moved via conveyor to the wash plant and tipple. The ore was initially shipped to Rhône-Poulenc's elemental furnace plant at Silver Bow, Montana.

In 1993, Rhône Poulenc and Nu-West reached a seven-year agreement whereby Rhône-Poulenc would provide approximately 1.3 million tons of phosphate ore to Nu-West's Conda plant annually. Almost the entire production of the mine went to the Conda plant. The mine pit advanced northwestward. At the load-out facility, the use of the conveyor was phased out in 1994, and ore was directly hauled to the wash plant and the tipple by truck.

In 1996, Rhône Poulenc applied for approval to mine the northern portion of I-04375, known as Central Rasmussen Ridge Mine. Mining started in Central Rasmussen Ridge Mine in 1998. In 1998, production from South Rasmussen Mine was complete and Rhône Poulenc assigned the leases to Rhodia, Inc. Rhodia (a subsidiary of Rhône-Poulenc) then then assigned the two leases to Agrium, Inc.

In early 2000, in anticipation of needing pit space to continue mining into lease I-07619, Agrium received approval to place additional overburden from Central Rasmussen Ridge Mine onto the pit backfill of the South Rasmussen Ridge Mine. In late 2000, Agrium submitted a mine and reclamation plan to mine the rest of I-04375, and I-07619 immediately north, calling it North Rasmussen Ridge Mine. In late 2001, a supplemental mine and reclamation plan was submitted, which superseded the previous mine and reclamation plan.

In 2001, BLM approved Nu-West's (Agrium) request to allow mine waste from Monsanto's South Rasmussen Mine, a state lease, to be placed on the south portion of South Rasmussen Mine lease I-4375, in exchange for Nu-West placing mine waste from Central Rasmussen Ridge

Mine, lease I-4375, into a pit on Monsanto's Enoch Valley Mine, lease I-015122. These dump swaps occurred through 2006.

In late 2003, BLM approved the mine and reclamation plan for North Rasmussen Ridge Mine. Mining at the North Rasmussen Ridge Mine began in 2003. In 2004, Agrium acquired the Dry Valley Mine and decided to temporarily suspend operations at Rasmussen Ridge and move mining operations to the Dry Valley Mine.

In early 2008, as they reached the end of ore reserves at their Dry Valley Mine, Agrium received authorization to restart mining at the Rasmussen Ridge Mines. In 2011, Agrium contracted Kiewit as the mine operator. Mining continued northward at through Central Rasmussen Ridge Mine and onto North Rasmussen Ridge Mine. In January 2018, the Conda Phosphate Operations were sold to Itafos, but the Rasmussen Ridge Mine leases remained with Nu-West. Mining was complete at North Rasmussen Ridge Mine in March 2018. Reclamation activities at North Rasmussen Ridge Mine have been on going and are expected to be completed by spring 2020. These activities include: completely backfilling Panel-A and a portion of Panel-B pits; sloping and reshaping to control water; placing low selenium material over the high selenium waste material; and placing a Dinwoody and topsoil cover as a final cover. Additionally, the haul roads are being narrowed, ripped, contoured (to meet the natural grade), and seeded, and groundwater monitoring wells have been placed in the mine area. Reclamation activities at the South and Central Rasmussen Ridge Mines include the placement of a geosynthetic liner on a portion of the South Rasmussen Mine's external dump as a pilot study. A detailed Remedial Action Plan is under review for a phased reclamation of the two mines. These reclamation activities cannot occur until the Rasmussen Valley Mine no longer needs the haul road and shop facilities at the South Rasmussen Ridge Mine. Nu-West continues to manage the remediation of historic mine sites that Itafos did not acquire.

Smoky Canyon Mine

The Smoky Canyon Mine is located in Caribou County, Idaho, about 24 air miles east of Soda Springs, Idaho and six air miles west of Afton, Wyoming. The J. R. Simplot Company operates the mine on seven Federal phosphate leases: I-012890, I-015259, I-26843, I-27801, I-30369, I-27512 and I-01441.

Following exploration in the first half of the 20th century, Wells Cargo, Inc. filed an application for a Federal phosphate lease with the BLM. However, the Ruby Company was the successful high bidder and was issued Federal phosphate lease I-012890 in 1962. Exploration on lease I-012890 by the Bannock Chemical Company indicated that phosphate ore could be found outside the bounds of the existing lease. In 1983, the lease was assigned to Simplot.

On 1964, John D. Archer, explored for phosphate on lands immediately adjacent to the Ruby Company lease. Phosphate was discovered on the lands, and in 1969, Federal phosphate lease, I-015259, was issued to Mr. Archer. In 1975, John Archer assigned lease I-015259 to a partnership that included Earth Science, Inc. (50 percent), National Steel Corp. (25 percent), and Southwire Company (25 percent). The lease was further assigned to Alumet Company in late 1975. Alumet was a formalization of the 3-way partnership.

USFS and the Department of Interior prepared the Environmental Impacts Analysis for the Smoky Canyon phosphate mine in the early 1980s. The Record of Decision issued after the review in 1983 permitted the development of the Federal phosphate leases with five open pit mine panels known as Panels A, B, C, D, and E. The ROD allowed permanent disposal of overburden external to these pits in approved locations. In 1989, Simplot was issued fringe lease I-26843 to access additional ore. The ore is milled on site and tailings are disposed in two tailings ponds located on Simplot property east of the mine. In 1990, the U.S. Corps of Engineers (USCOE) prepared an Environmental Analysis for the full development of the tailings facility and subsequent approval of the project included mitigation plans for disturbance of designated wetlands.

Construction of the Smoky Canyon Mine began in the summer of 1982 and construction of an on-site mill began in 1983. The Smoky Canyon Mine was initially designed for ore to be milled and beneficiated at the mine, a unique arrangement in the region. The Smoky Canyon Mine complex consists of an open-pit mine, as well as an ore beneficiation plant that comprises a flotation circuit, a phosphate concentrate slurry line, a tailings thickener and tailing pipeline system, and a tailings impoundment. Ore transport was accomplished using a slurry pipeline, an unprecedented design. Construction of the first section of the 8-inch slurry pipeline was completed to the Simplot plant facility at Conda, Idaho, a distance of about 27 miles, in 1983.

In 1982, USGS approved the following activities for Smoky Canyon Mine:

- Open pit mining operations in five mine panels, Panels A through E;
- On-site disposal of mine overburden in two main disposal sites external to the pits;
- Construction and operation of a mill and associated power line, water supply wells, and access road;
- Construction of a tailings pipeline to the tailings ponds as well as a return water line;
- Development of two tailings ponds located east of the mine for disposal of mill tailings;
- Installation of the ore concentrate slurry pipeline from the Smoky Canyon Mine to the former Conda/Woodall Mountain Mine (hereafter, “Conda Mine”); and
- Reclamation of the facilities upon completion of operations.

The Smoky Canyon Mine was brought online early in 1984. The pipeline went into operation in May of that year. After the ore was processed and slurried, it was pumped to the Simplot Conda facility. At Conda, the ore was dewatered and part of the ore was calcined. The calcined ore was then shipped by rail to a Simplot plant in California for further processing. The uncalcined ore was shipped by rail to the Simplot plant at Pocatello for manufacturing into fertilizer products. The Conda calciner was eventually shut down in 1985 and all ore was rail shipped to the Pocatello facility.

Exploration continued on the Simplot leases throughout the 1980s. Simplot entered into an agreement with Alumet in 1987 to explore the Alumet lease I-015259, leading Simplot to obtain another fringe acreage lease, Federal phosphate lease I-27801 in 1991. Also in 1991, the slurry

pipeline was extended 59 miles from Conda to the Simplot plant at Pocatello (for a total length of 86 miles) and a booster pump facility at Conda was added.

The Simplot Company obtained a third fringe acreage phosphate lease I-30369 in 1995 and acquired the Alumet Lease I-015259 in 1996.

The discovery of the release of selenium and other constituents of concern into vegetation and waters of the State prompted the agencies to prepare a Supplemental EIS and Record of Decision for the mining of Panels B and C. This 2002 action was consistent with the 1982 Record of Decision.

In 2003, Simplot Company proposed an extension of its current open pit phosphate mining operations south into two Federal phosphate leases. The Manning Creek lease I-27512 was referred to as the Panel F lease area, and the Deer Creek lease I-01441 was referred to as the Panel G lease area. Simplot obtained approval to mine the two leases in 2008. After prevailing in a court challenge to the BLM's mining approval, Simplot began mining in Panel F in 2009; at the same time mining was continuing on Panel B at the north end of the mine.

In 2015, a haul/access road and power line were built to connect Panel F and Panel G. Mining began on Panel G in 2016. Initial overburden from the open pit at Panel G has been placed in an external location southwest of the pit. As of this writing, Panels B, F and G continue to be mined.

South Rasmussen Mine

South Rasmussen Mine is located 17 miles northeast of Soda Springs. In 1989, Monsanto was issued Federal fringe phosphate lease I-023658, which lies adjacent to state mineral lease #7058. The state lease is located on State School Trust Section 36, which is contiguous with Agrium's Rasmussen Ridge Mine to the north. In 1997, Monsanto assigned Federal fringe lease I-023658 to its subsidiary, P4 Production.

P4 planned to blend ore from the Enoch Valley Mine with the South Rasmussen Mine as the Enoch Valley Mine phased out and South Rasmussen Mine phased in. In February, 1999, the Idaho Department of Lands approved P4's mine and reclamation plan, allowing P4 to begin mining on state land. In April 1999, the BLM approved mining of the adjacent federal fringe lease. Operations at the South Rasmussen Mine began in 2001.

Overburden from the mining process was permanently stored as pit backfill and placed in two external overburden areas, one on the west side and one on the east side of the deposit. Overburden was deposited at the overburden area on the east side of the deposit, known as the Horseshoe Overburden Area (HOA), primarily from 2001 to 2006. The HOA has a core of seleniferous material surrounded by chert fill. On top, overlapping shingles of compacted clay are designed to serve as a barrier to minimize infiltration of water through the core material, thus reducing the potential for release of selenium and other constituents of concern. Most of the HOA has been reclaimed. To address releases of selenium and other constituents discovered in water downstream of the HOA, P4 has constructed trenches, subsurface drains, and diversion ditches. P4 has also introduced a permeable reactive barrier to capture and treat surface and subsurface water that leaves the HOA, as well as lined ponds to capture runoff and shallow interflow prior to infiltration into the HOA.

In 2016, P4 had mined out the South Rasmussen Mine and had started final reclamation. That reclamation is now on hold, pending the backfilling of the South Rasmussen Pit Mine with overburden coming from Agrium's recently approved Rasmussen Valley Mine (located immediately to the south). Rasmussen Valley Mine overburden will be placed in the South Rasmussen Mine pit, after which P4 will pursue final reclamation of the South Rasmussen Mine.

On April 20, 2011, the Department of Justice and EPA announced that P4 agreed to pay a $1.4 million dollar civil penalty for alleged Clean Water Act violations at its South Rasmussen Mine. In addition to the penalty, P4 will spend an estimated $875,000 on monitoring and other measures. According to the complaint, P4 allegedly discharged wastewater containing high concentrations of selenium and heavy metals from a waste rock dump at the mine without a required permit. Further, P4's unpermitted discharges – which contained selenium levels far above Idaho's state water quality standards – allegedly polluted a nearby wetland and an unnamed tributary of Sheep Creek, as well as downstream waters that drain to the Snake River. Under the terms of the consent decree, P4 will pay the penalty and continue collecting selenium-contaminated leachate from the waste rock pile. P4 will also prevent leachate from entering nearby creeks and wetlands until such time as the company either obtains a National Pollution Discharge Elimination System permit, or undertakes restoration of the waste rock dump under another state or Federal order. Finally, P4 agreed to perform downstream monitoring for a period of five years to ensure that selenium-contaminated water is no longer leaving the site.

Wooley Valley Mine Complex

WOOLEY VALLEY UNIT #1 (BLACKFOOT NARROWS MINE; TERTELING PIT)

The Wooley Valley Unit #1 Mine, also known as the Blackfoot Narrows Mine, is located north of the Blackfoot Narrows on western slope of the Wooley Valley Range about 15 miles northeast of Soda Springs, Idaho.

In 1955, the J. A. Terteling and Sons Company (Terteling) was issued Federal lease I-04775. Terteling immediately started stripping operations on the lease with actual mining and production starting in September, 1955. Initially Terteling stockpiled ore at the mine in three separate piles according to grade, pending development of load-out facilities in Soda Springs. Terteling essentially consider the operation experimental, and after the mining season of 1956 and some ore shipments in 1960, the mine was shut down.

In 1959, Terteling assigned the Federal lease to the Terteling Land Company (TLC). In 1967, the Stauffer Chemical Company (Stauffer) entered into negotiations with the TLC to obtain phosphate reserves. To that end, TLC assigned Lease I-04775 to Stauffer in 1967.

In 1967, Stauffer shipped some stockpiled ore to their Victor Chemical Works plant in Silver Bow, Montana. Stauffer contracted with Terteling to act as operator of the reopened mine. Terteling subcontracted the mine operations to the MacGregor Triangle Company. Plans were developed in 1967 for a two-mile spur railroad line to connect with the existing El Paso Products railroad and run northward to a new Wooley Valley tipple site. At the end of the 1967 mining season, the pit was 4,800 feet in length. According to an unpublished Bureau of Mines report dated September 12, 1967, surface structures at the mine included railroad-loading facilities with

weigh scales for scrapers, two buildings, and two trailers. Mining was suspended and the mine was closed in August, 1969.

In 1985, the Cheseborough-Ponds Company purchased Stauffer's Idaho phosphorous operations, and then sold them Unilever N.V. in 1986. Unilever sold all of the Idaho/Montana phosphate operations to the Imperial Chemicals Industries Company of Great Britain. This company promptly sold some of Stauffer's basic and specialty chemical businesses. By September, 1987, all of Stauffer's Idaho operations were owned by Rhône-Poulenc, Inc., the U.S. subsidiary of the French company, Rhône-Poulenc SA. On February 1, 1998, Rhone-Poulenc assigned I-04775 to Rhodia, Inc. Effective October 1, 2013, the Solvay Group United States corporate legal entity currently known as Rhodia Inc. changed its name to Solvay USA Inc.

WOOLEY VALLEY UNIT #3 MINE (LITTLE LONG VALLEY MINE)

The Wooley Valley Unit #3 Mine, also known as the Little Long Valley Mine, is located on the east slope of the Wooley Valley Range about 15 miles northeast of Soda Springs, Idaho, and northwest of the Mill Canyon Mine.

In 1953, the BLM held a competitive phosphate lease sale and issued Federal Lease I-04373 to Terteling. Terteling assigned the lease to TLC in 1959. The only work conducted on the lease was exploratory in nature. In 1966, the Stauffer Chemical Company was designated as the operator of the future mine and in 1967, TLC assigned the lease to the Stauffer. Still no mining occurred on the lease. Stauffer immediately designated the Terteling as the operator, and they in turn subcontracted operations to the Triangle Mining Company (a wholly owned subsidiary of the Terteling and Sons Company) in 1973.

Phosphate ore was not confined to the limits of lease I-04373, however, and to complete the land acquisition, more land had to be leased. Terteling was assigned a prospecting permit for additional land, and Stauffer was assigned lease I-04373 in 1967. In 1969, Stauffer acquired a preference right lease (Federal lease I-97) for the area of the prospecting permit.

Mining actually started on lease I-04373 during the summer of 1976, approximately the time that an all-weather haul road to the mine was completed. The mine was divided into four sections, or mine panels. Mining started on panels 1 and 4, with the waste from panel 4 being used in the final construction of the haul road, and the waste from panel 1 being hauled to the an external waste pile. That same year, the operators also constructed a series of sediment control basins to prevent sediment run-off from the mining activity from entering Angus Creek. Mining was completed in Panel 1 in May, 1977, with operations moving on to Panel 2.

In 1978, Stauffer terminated their operating contract with Triangle Mining Company, thereby assuming full control of the Mine.

Mining on lease I-97 occurred on two of three parcels. Parcel 1, the northernmost parcel, produced ore while Parcel 2, the central parcel, was acquired to cover segments of lease I-04373 pit footwall which extended off-lease. However, Parcel 3, the southernmost parcel, was found to hold no phosphate.

Mining on Parcel 1 started in 1980 and was completed in 1981. The mined-out pit was to serve as a run-off catchment basin and only a small area in the south end of the pit was backfilled. Ore was hauled to the belt conveyor built at the Mill Canyon Mine, just to the southeast of the new mine. There, the ore was carried downhill to the rail loading facility and hauled to the Stauffer mill at Silver Bow, Montana.

To link the mine with the Mill Canyon Mine, Stauffer acquired the 120-acre Federal lease I-015040 from FMC in 1974. This lease lay between the two Stauffer mines. Mining was conducted on this lease as Panel 5 and less than one million tons of ore was produced. In 1990, Stauffer assigned 78.7 percent of the lease back to the FMC. The lease is now owned by Solvay.

By late 1989, all economically recoverable phosphate reserves located within the area of leases I-04373, I-97, and I-015040 had been recovered. Reclamation was completed and the mine was closed.

In 1985, the Cheseborough-Ponds Company purchased Stauffer's Idaho phosphorous operations, and then sold them Unilever N.V. in 1986. Unilever sold all of the Idaho/Montana phosphate operations to the Imperial Chemicals Industries Company of Great Britain. This company promptly sold some of Stauffer's basic and specialty chemical businesses. By September, 1987, all of Stauffer's Idaho operations were owned by Rhône-Poulenc, Inc., the U.S. subsidiary of the French company, Rhône-Poulenc SA. On February 1, 1998, Rhone-Poulenc assigned I-04775 to Rhodia, Inc. Effective October 1, 2013, the Solvay Group United States corporate legal entity currently known as Rhodia Inc. changed its name to Solvay USA Inc.

WOOLEY VALLEY UNIT #4 (MILL CANYON MINE)

The Mill Canyon Mine, also part of the Wooley Valley Mine complex, is located on Federal lease I-04374. Extensive geologic mapping disclosed a northwest-plunging anticline. This plunging anticline forms a "nose" and would become the centerpiece of mining in the future mine.

In 1953, Terteling was the successful bidder for lease I-04374. In 1959, the lease was assigned to TLC, an adjunct to the original Terteling lessee. In 1966, TLC contracted with and designated Stauffer as the mine operator, but no timely mining development occurred. In 1967, the lease was assigned to Stauffer after Terteling divested themselves of all of their phosphate holdings in southeast Idaho.

Stauffer began stripping overburden in the mine area in late 1968, with actual mining of phosphate ore starting in the summer of 1969. Stauffer designated TLC as the operator of the mine, and Stauffer immediately subcontracted all stripping, mining, hauling, and loading to the MacGregor Triangle Company. Mining started on the west limb of the anticline, but the phosphate ore was badly broken and contaminated with limestone blocks. Mining was rapidly redirected to the east limb in 1969, and a conveyor belt from the mine area to the railhead was built.

Mining in the "nose" area of the plunging anticline started mid-1971. In November, 1971, the mine operator placed about 80,000 cubic yards of waste, ice, snow, frozen ore, and frozen mud on the crest of Dump #4, raising the elevation of the dump by about 15 feet. This material was

later pushed over the side of the dump. In June, 1972, the material thawed and ran down the face of the dump and into the wooded area below. Silt overfilled the retention ponds and was released to Angus Creek. Mudflows from the dump measured approximately 600 feet long by 70 feet wide and three feet deep. The operator attempted to restabilize the dump by removing about 20 feet from the top of the dump and all of the loose material on the face of the dump. Benches were cut into the face and reshaping and reseeding of the dump was implemented. By 1973, Dump #4 was stabilized against any further failures.

Eventually, the Mine consisted of two large pits, six waste dumps, one sub-ore pile, and approximately 2½ miles of haul and service roads. All mined ore was shipped to the Stauffer plant in Silver Bow, Montana, for use in manufacturing elemental phosphorous.

By late 1974, all of the minable ore had been removed from the mine. Reclamation of the pit areas and the dumps proceeded. Some ore remains on the east end of the lease near the Mill Canyon drainage, but it may not be economically recoverable.

As outlined previously, in 1985, the Cheseborough-Ponds Company purchased Stauffer's Idaho phosphorous operations, and then sold them Unilever N.V. in 1986. Unilever sold all of the Idaho/Montana phosphate operations to the Imperial Chemicals Industries Company of Great Britain. This company promptly sold some of Stauffer's basic and specialty chemical businesses. By September, 1987, all of Stauffer's Idaho operations were owned by Rhône-Poulenc, Inc., the U.S. subsidiary of the French company, Rhône-Poulenc SA. On February 1, 1998, Rhone-Poulenc assigned I-04775 to Rhodia, Inc. Effective October 1, 2013, the Solvay Group United States corporate legal entity currently known as Rhodia Inc. changed its name to Solvay USA Inc.

STATUS OF REMEDIAL ACTIVITIES

The sections below discuss the status of remedial activities at each individual mine site.

Ballard, Henry, and Enoch Valley Mines

In 2003, IDEQ, EPA, USFS and P4/Monsanto voluntarily entered into an AOC to perform a site investigation and EE/CA at Ballard, Henry and Enoch Valley Mines. IDEQ was designated as the lead agency for this site, with EPA implementing CERCLA under the AOC. The BLM, USFS, FWS, BIA, and Tribe elected to participate as support agencies.

Given the complexity and widespread nature of contamination at the three P4/Monsanto Mines, the agencies and P4/Monsanto determined that a RI/FS would be a better mechanism to address remediation at the Mine. Therefore, in November 2009, an AOC to conduct a RI/FS at Ballard, Henry, and Enoch Valley Mines was signed, superseding the 2003 AOC. The RI/FS work plan was finalized in May 2011 with work to begin at Ballard Mine first, followed by Henry Mine, then Enoch Valley Mine. The Remedial Investigation report for Ballard was finalized in November 2014, and the Feasibility Study Report was finalized in April 2017. The EPA issued a Proposed Plan for the Ballard remedial action in April 2018 and the Record of Decision is anticipated to be finalized by 2019. P4 expects to initiate the remedial action at Ballard in 2020. The Remedial Investigation report for Henry Mine was finalized in September 2017, and the

Feasibility Study report was submitted to the EPA in October 2018. No interim or early actions have been completed at any of the P4/Monsanto Mines.

Champ Mine

Effective August 16, 2012, USFS, IDEQ, the Tribe, and Nu-West voluntarily entered into an ASAOC for performance of a RI/FS at Champ Mine. USFS has been designated as the lead agency, while the FWS and Tribe have elected to participate as support agencies. RI/FS activities at Champ Mine are in the early stages, with field investigations initiated in 2013. As such, no interim or early removal actions have been completed at Champ Mine.

Conda/Woodall Mountain Mine

In January 2008, IDEQ, EPA, BLM, and Simplot voluntarily entered into a Consent Order/Administrative Order on Consent (CO/AOC) to perform a RI/FS at the Conda/Woodall Mountain Mine. IDEQ was designated as the lead agency for this site, with EPA implementing CERCLA under the CO/AOC. The BLM, FWS, and Tribe elected to participate as support agencies, with BLM retaining its CERCLA authority on lands at the site that are subject to BLM's jurisdiction, custody, or control.

On November 1, 2010, IDEQ and EPA approved Simplot's EE/CA to conduct an early non time-critical removal action at the Pedro Creek ODA. The purpose of this early action is to stabilize the ODA from an erosion and seismic standpoint, and to reduce the release, migration, and risk of selenium and other hazardous substances from the ODA. The parties signed the AOC to conduct this early action in October 2012. Construction of the removal action was completed in 2014.

After several years of finalizing the remedial investigation, Simplot is working on the development of the Feasibility Study (FS) for the Conda Mine in 2019. The FS is being created in a phased approach which includes the development and screening of Remedial Alternatives, and the completion of a Feasibility Study Report which will include a detailed analysis of Remedial Alternatives. The draft feasibility study is anticipated to be completed in early 2020.

Diamond Gulch Mine

In 2007, IDEQ issued a Preliminary Assessment indicating that some soil and vegetation samples from the site and surrounding area showed elevated metal concentrations although it does not appear to pose an immediate threat (IDEQ, 2007). Recommendations based on DEQ's current evaluation of the data and subsequent visits to the site include the possible re-contouring and re-vegetating of those waste piles where natural vegetation has not established itself, and, if necessary, placement of clean soils and re-vegetation of these locations. However, based on current conditions at the Mine such as limited water and lack of access, the USFS and DEQ are also contemplating taking no additional action at this location.

Dry Valley Mine

Dry Valley Mine has been reclaimed. Additional remedial action for the northernmost "A" and "B" pits is being considered.

Georgetown Canyon Mine

Effective May 9, 2014, IDEQ, USFS, the Tribe, Nu-West and CF Industries, Inc. voluntarily entered into a Consent Order/ASAOC for performance of a RI/FS at Georgetown Canyon Mine. The IDEQ has been designated as the lead agency, while USFS will implement CERCLA under this Consent Order/ASAOC for the portion of the Site located on National Forest System land. The FWS and Tribe have elected to participate as support agencies. Data collection supporting the RI was conducted from 2014 to 2018; additional surface water data was collected in 2012 and 2013. The RI was submitted to the agencies in January 2019. FS activities at Georgetown Canyon Mine have not begun. As such, no interim or early removal actions have been completed at Georgetown Canyon Mine.

Lanes Creek Mine

IDEQ and IDL have exercised statutory authority for mining currently conducted on State and private land. In 2014, IDL issued an approved Mine and Reclamation Plan to Agrium/Nu-West to reopen the Lanes Creek Mine with mining commencing in 2015. It is the intent of the IDL-approved Mine and Reclamation Plan and the IDEQ-issued ground water Points of Compliance to have Agrium/Nu-West (now Itafos) mine, remediate, and reclaim the Lanes Creek Mine in one activity. This includes the remediation of the effects created by the 1978-1989 mining activity. Mining is anticipated to be completed in 2020 and full reclamation finished around 2023.

North Maybe Mine

In 2004, USFS, EPA, IDEQ and Nu-West voluntarily entered into an AOC to perform a site investigation and EE/CA at North Maybe Mine. The majority of North Maybe Mine lies on National Forest System lands; therefore, USFS was designated as the lead agency, with EPA, FWS, the Tribes, and IDEQ designated as support agencies.

In August 2008, the USFS issued an Action Memorandum approving a time-critical removal action at the East Mill Dump. The purpose of the removal action was to contain, consolidate and isolate sediments with elevated concentrations of selenium. These sediments have accumulated since 1983 when, during construction of the dump, a severe rainstorm caused the dump to fail and waste material to wash down into East Mill Creek. Construction activities associated with the removal action were completed in November 2008.

In 2007, USFS decided to address contamination at the North Maybe Mine under the CERCLA remedial process instead of the CERCLA removal process. USFS initiated negotiations with the PRPs to conduct a RI/FS, instead of the site investigation and EE/CA specified in the 2004 AOC. Negotiations between the USFS and PRPs stalled in August 2009, at which point USFS dropped the requirement for Nu-West to complete the site investigation and EE/CA agreed to under the 2004 EE/CA AOC. USFS initiated a RI/FS for the North Maybe Mine in 2010. However, Nu-West has other continuing obligations under the 2004 AOC, including the performance and maintenance of work on East Mill Creek related to the August 2008 Action Memorandum.

In June 2010, North Maybe Mine was divided into two Operable Units: the West Ridge Operable Unit and the East Mill Operable Unit. A Unilateral Administrative Order was issued by USFS for

the West Ridge Operable Unit in June 2010. This Unilateral Administrative Order requires Huntsman Advanced Materials, LLC and Wells Cargo, Inc. to conduct a RI/FS on the West Ridge Operable Unit. Relevant areas include the portion of the Mine that lies to the west of the North Maybe Mine pit and includes the West Mill Dump, Dump 5 North and South, Dump F, the El Paso Dump, Big Draw Dump, and Dumps 6 through 8 (Formation, 2011). Huntsman Advanced Materials, LLC and Wells Cargo, Inc. conducted investigation activities at the West Ridge Operable Unit in 2011 and 2012 and subsequently submitted an RI Report in August 2016.

In December 2012, an ASAOC was signed by USFS, IDEQ, the Tribes, and Nu-West to finish the RI/FS for the East Mill Operable Unit. The IDEQ, FWS and the Tribes are designated as support agencies under that 2012 ASAOC. The East Mill Operable Unit includes the Open Pit Sub-Operable Unit, East Mill Dump Sub-Operable, and Creeks Sub-Operable Unit. Nu-West conducted RI/FS activities at the East Mill Dump and Open Pit Sub-Operable Units from 2013 through 2016 and subsequently submitted an RI/FFS Report and RI/FS Report for the sub-operable units in October 2017 and February 2018, respectively.

In 2014, USFS signed a Removal Action Memorandum to provide alternative water and feed for horses pastured downstream of the East Mill dump to prevent exposure to contaminated water and forage until a permanent cleanup is implemented. This time-critical removal action was implemented in 2014 by Nu-West and is ongoing.

South Maybe Canyon Mine

South Maybe Canyon Mine is divided into two operable units: the Open Pits Operable Unit and the Maybe Creek Operable Unit. The Cross Valley Fill (CVF) is an overburden pile located within South Maybe Canyon adjacent to and east of the open pit.

In July 1998, USFS entered into a voluntary AOC with Nu-West for completion of a site investigation and EE/CA at South Maybe Canyon Mine. No other agencies were designated as support agencies in the AOC. Nu-West conducted the site investigation and EE/CA under USFS oversight through 2008. However, Nu-West and USFS reached an impasse over deficiencies in the EE/CA to address the CVF. USFS notified Nu-West in December 2009 that it would complete the EE/CA, which it did in 2011.

In January 2012, the USFS signed an Action Memorandum for approval of a removal action at South Maybe Canyon Mine CVF. Subsequently, an ASAOC to conduct the non-time-critical removal action was signed in August 2012. The purpose of the removal action is to reduce infiltration into, and isolate surface runoff from, contaminated fill material in the South Maybe Canyon Mine CVF, subsequently reducing selenium loading into Maybe Creek (USFS, 2012). The PRP began the design for the removal action in 2013. The design was approved in early 2015 and Nu-West began construction of the remedy in June 2015. The removal action was completed in 2017 and is currently in a phase of operation and maintenance.

In March 2013, USFS, IDEQ, the Tribes, and Nu-West entered into an ASAOC for performance of a RI/FS at South Maybe Canyon Mine Open Pits Operable Unit and Maybe Creek Operable Unit. Nu-West conducted RI/FS activities at the Open Pits Operable Unit from 2013 to 2016 and

subsequently submitted an RI Report in February 2018. RI/FS activities for the Maybe Creek Operable Unit have not been initiated.

Mountain Fuel Mine

Effective August 16, 2012, USFS, IDEQ, the Tribe, and Nu-West voluntarily entered into an ASAOC for performance of a RI/FS at Mountain Fuel Mine. USFS has been designated as the lead agency, while the FWS and Tribe have elected to participate as support agencies. RI/FS activities at Mountain Fuel Mine are in the early stages, with field investigations initiated in 2013. As such, no interim or early removal actions have been completed at Mountain Fuel Mine.

Rasmussen Ridge – North, South and Central Rasmussen Ridge Mines

The EPA issued two Notices of Violation to Nu-West in 2005 and 2006 for discharge of selenium-contaminated pond water to the South Fork of Sheep Creek and No Name Creek, respectively. Actions taken thus far to remedy the Notices of Violation include pumping the pond water in the South Fork of Sheep Creek to the Central Rasmussen Ridge Mine pit to eliminate the surface water pathway. The pumping system in the South Fork of Sheep Creek was expanded downstream in 2017. As part of the water management plan, haul road ditches and ponds are also maintained to divert surface water runoff to the mine pit. Surface water captured in seven haul road ponds is also pumped or directed to the mine pit. Additionally, in 2012, Nu-West constructed a 21.6 acre cap and cover system on the east slope of the overburden pile at the South Rasmussen Ridge Mine to evaluate the constructability and effectiveness of a cap and cover system as a remedial alternative.

Furthermore, in 2013 IDEQ and Nu-West entered into a consent order for the South and Central Rasmussen Ridge Mines to address effects of contaminants to ground water, including ground water that is interconnected to surface water. As part of the consent order, Nu-West developed a Plan to delineate the contaminant plume and identify and investigate source areas. A Preliminary Source Characterization Report was submitted in 2015, and a Final Source Characterization Report was submitted in early 2018. Nu-West is developing a Remedial Action Plan to evaluate alternatives for ensuring ground water meets applicable ground water quality standards. Work towards remediating the South and Central Rasmussen Ridge Mine is ongoing.

Smoky Canyon Mine

In 2003, USFS, EPA, IDEQ, and Simplot voluntarily entered into an AOC to perform a Site Investigation and Engineering Evaluation/Cost Analysis (EE/CA) at Smoky Canyon Mine. The AOC divided the mine into two areas. USFS was designated as the lead agency for Area A, occurring on Federal lands, with BIA, BLM, EPA, FWS, IDEQ, and the Tribes, as support agencies. IDEQ was designated the lead for Area B, the portion of the mine occurring on private land, with EPA, FWS, IDL, and Idaho Department of Water Resources designated as support agencies.

Data presented in the final Site Investigation report identified overburden waste in the Pole Canyon overburden disposal area (ODA) as the primary source of selenium in surface and ground water emanating from the site (Newfields, 2005). As such, in October 2006, an AOC was signed to conduct a non-time-critical removal action at the Pole Canyon ODA. The intent of the

removal action was to isolate the Pole Canyon ODA from Pole Canyon Creek and divert drainage from adjacent slopes away from the ODA. Construction activities associated with this removal action were completed in November 2008.

The participants determined that a RI/FS would better suit remediation at the Smoky Canyon Mine given the site's large geographic scale and the nature and extent of contamination. Contaminant issues were deemed more complex and widespread than originally suspected and would likely require long-term water treatment.[7] Therefore, in August 2009, the parties signed an AOC to conduct a RI/FS at Smoky Canyon Mine, which superseded the portion of the 2003 AOC associated with Area A. The 2003 AOC remains in full force and effect for Area B. The RI/FS work plan was finalized in 2011. The Remedial Investigation report was finalized in September 2014.

As a follow-up to the 2008 removal action, a second early action was initiated at the Pole Canyon ODA. The 2008 removal action focused on reducing water inflow to the ODA from Pole Canyon Creek and drainage from the adjacent hillside. It did not address infiltration into the ODA from direct precipitation and snowmelt, or risks due to the potential for ingestion of ODA surface materials or associated vegetation containing elevated contaminant concentrations. The objectives of the early action under construction in 2015 were to reduce or eliminate water infiltrating into the ODA due to direct precipitation; reduce or eliminate the ecological and human health risks associated with ingestion of vegetation on the ODA; and eliminate release of hazardous substances from the ODA through sediment transport.

In addition, a treatability study was started in 2014 to pilot test a treatment technology designed to reduce selenium concentrations emanating from Hoopes Springs. Simplot completed construction of the facility in February 2015 and expansion of the facility in November 2017; the pilot treatment study is ongoing.

South Rasmussen Mine

In 2007, EPA issued a Notice of Violations for P4/Monsanto's South Rasmussen Mine due to the discharge of pollutants from a seep at the toe of the Horseshoe Dump to the West Fork of Sheep Creek. Selenium concentrations in the discharge were up to 150 times Idaho's chronic water quality criterion. In a settlement between EPA and P4/Monsanto, the company agreed to pay a $1.4 million penalty, and to implement measures to prevent waters containing pollutants from draining into the ground water, wetlands, and the West Fork of Sheep Creek.

In 2012, IDEQ entered into a consent order with P4/Monsanto to implement P4's responsibilities under the Idaho Ground Water Quality Rule; document the recent steps taken by P4/Monsanto to address ground water quality violations originating at the Horseshoe Dump; and establish procedures to be implemented by P4/Monsanto to remedy any violations of and assure future compliance with the Idaho Ground Water Quality Rule. The consent order also required P4/Monsanto to submit a Point of Compliance Application for the South Rasmussen Mine,

[7] Typically cleanups under the EE/CA process mitigate short-term threats while cleanups under the RI/FS process are implemented for longer-term cleanup actions.

which was issued by IDEQ in 2014. P4 implemented interim actions during the period of 2009-2012 that included: installation & operation of a leachate collection system, installation of a clean water diversion system, pond construction and enhancement for water management, and the installation of two permeable reactive barriers (PRBs) for groundwater treatment. The PRB was expanded in 2016 to provide treatment for all groundwater flowing from the overburden area.

Wooley Valley Mine Complex

Additional remedial action for this mine is being considered.

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. Toxicological Profile for Selenium. U.S. Department of Health and Human Services, Public Health Service. Atlanta, GA.

Besser JM, Brumbaugh WG, Ivey CD, Ingersoll C, Moran PW. 2008. Biological and chemical characterization of metal bioavailability in sediments from Lake Roosevelt, Columbia River, Washington USA. Archives of Environmental Contamination and Toxicology, 54:557-570.

BLM. 1999. Draft Environmental Impact Statement, Dry Valley Mine –South Extension Project.

Carter, G. Kruse C.G., Hubert, W.A., and Rahel, F.J. 1997. Geomorphic Influences on the Distribution of Yellowstone Cutthroat Trout in the Absaroka Mountains, Wyoming. Transactions of the American Fisheries Society, 126:418-427.

Davis, T.Z., Stegelmeier, B.L., Panter, K.E., Cook, D., Gardner, D.R., and Hall, J.O. 2012. Toxicokinetics and Pathology of Plant-Associated Acute Selenium Toxicosis in Steers. Journal of Veterinary Diagnostic Investigation 24:319-327.

D'Eon R. and Serrouya, R. 2005. Mule Deer Seasonal Movements and Multiscale Resource Selection using Global Positioning System Radiotelemetry. Journal of Mammalogy, 86:736-744.

DeForest D.K., Brix, K.V., Elphick, J.R., Rickwood, C.J., deBruyn, A.M.H., Tear, L.M., Gilron, G., Hughes. S.A., and Adams, W.J. 2017. Lentic, Lotic, and Sulfate-dependent Waterborne Selenium Screening Guidelines for Freshwater Systems. Environmental Toxicology and Chemistry, 36:2503-2517.

Formation Environmental. 2011. Remedial Investigation and Feasibility Study Work Plan, North Maybe Mine West Ridge Operable Unit.

Formation Environmental. 2012. Revised Draft Smoky Canyon Mine Remedial Investigation/Feasibility Study 2011 Data Summary Report.

GAO. 2012. Phosphate Mining: Oversight has Strengthened, but Financial Assurances and Coordination Still Need Improvement. United States Government Accountability Office Report to Congressional Requesters. GAO-12-505.

Grunder, S. A., T. J. McArthur, S. Clark, V. K. Moore, S. 2008. Idaho Department of Fish and Game 2003 Economic Survey Report. Idaho Department of Fish and Game 08-129. Boise Idaho.

Harding, L.E., Graham, M., and Paton, D. 2005. Accumulation of Selenium and Lack of Severe Effects on Productivity of American Dippers (*Cinclus mexicanus*) and Spotted Sandpipers (*Actitis macularia*). Arch Environ Contam Toxicol, 48:414-423.

Harding, L.E. 2008. Non-linear Uptake and Hormesis Effects of Selenium in Red-winged Blackbirds (*Agelaius phoeniceus*). Science of the Total Environment, 389:350-366.

Idaho Department of Environmental Quality (IDEQ). 2002. Final Area Wide Human Health and Ecological Risk Assessments - Selenium Project Southeast Idaho Phosphate Mining Resource Area.

Idaho Department of Environmental Quality (IDEQ). 2004. Area Wide Risk Management Plan: Removal Action Goals and Objectives, and Action Levels for Addressing Releases and Impacts from Historic Phosphate Mining Operations In Southeast Idaho. February.

Idaho Department of Environmental Quality (IDEQ). 2007. Diamond Gulch Mine Preliminary Assessment Report. Submitted to Environmental Protection Agency, Region 10.

Idaho Department of Environmental Quality (IDEQ). 2011. Idaho's 2010 Integrated Report. Boise, ID: DEQ.

Idaho Department of Health and Welfare (IDHW). 2005. Draft for Public Comment: Public Health Assessment: Southeast Idaho Phosphate Mining Resource Area – Bannock, Bear Lake, Bingham, and Caribou Counties, Idaho. EPA Facility ID: IDN001002245. Prepared by: Bureau of Community and Environmental Health.

Idaho Department of Health and Welfare (IDHW). 2006. Public Health Assessment: Southeast Idaho Phosphate Mining Resource Area – Bannock, Bear Lake, Bingham, and Caribou Counties, Idaho. EPA Facility ID: IDN001002245. Prepared by: Bureau of Community and Environmental Health.

Idaho Department of Environmental Quality (IDEQ). 2019. South Dry Valley Mine Preliminary Assessment. Boise, ID: DEQ.

Idaho Department of Health and Welfare (IDHW). 2016. Eat Fish, Be Smart, Choose Wisely: A guide to safe fish consumption for fish caught in Idaho waters. 28 pp. https://healthandwelfare.idaho.gov/Portals/0/Health/EnvironmentalHealth/Fish%20Guide%20update%202016%20Copy.pdf. Accessed 10/24/18.

Idaho Bird Records Committee. 2007. Birds of Idaho Field Checklist.

Ingersoll C.G., MacDonald D.D., Wang N., Crane J.L., Field L.J., Haverland P.S., Kemble N.E., Lindskoog R.A., Severn C.G., and Smorong D.E. 2001. Predictions of sediment toxicity using consensus-based freshwater sediment quality guidelines. Arch Environ Contam Toxicol, 41:8-21.

Janz, D.M., DeForest, D.K., Brooks, M.L., Chapman, P.M., Gilron, G., Hoff, D., Hopkins, W.A., McIntyre, D.O., Mebane, C.A., Palace, V.P., Skorupa, J.P., and Wayland, M. 2010. Selenium Toxicity to Aquatic Organisms. Ecological Assessment of Selenium in the Aquatic Environment. CRC Press Boca Raton, FL., pp. 141-231.

Köhrle, J., Jakob, F., Contempre, B., and Durmont, J.E. 2005. Selenium, the Thyroid, and the Endocrine System. Endocrine Reviews, 26:944-984.

Kuck, L. 1984. Southeast Idaho Wildlife Studies, July 1978 to June 1983, Volume I. Idaho Department of Fish and Game. Job Completion Report W-160-R.

Kvale, C. 1980. Preliminary Phosphate Mining Impacts on Mule Deer, Elk, and Moose in Southeast Idaho. Proceedings of Western Association of Fish and Wildlife Agencies.

MacDonald, D.D., Ingersoll, C.G., and Berger, T.A. 2000. Development and Evaluation of Consensus Based Sediment Quality Guidelines for Freshwater Ecosystems. Archives of Environmental Contamination and Toxicology, 39:20-31.

Mebane, C.A., Mladenka, G.C., Van Every, L., Williams, M.L., Hardy, M.A., and Garbarino, J.R. 2014. Selenium in the upper Blackfoot River watershed, southeastern Idaho, 2001–12, with an appendix on selenium speciation analytical methods, by Garbarino, J.R. (ver. 1.1, August 2015). U.S. Geological Survey Scientific Investigations Report 2014-5203. 34 p. Available online at: http://dx.doi.org/10.3133/sir20145203.

Meyer, K.A., Schill, D.J., Lamansky, J.A., Campbell, M.R., and C.C. Kozfkay. 2006. Status of Yellowstone Cutthroat Trout in Idaho. Transactions of the American Fisheries Society, 135:1329-1347.

Montgomery Watson. 1999. Final – 1998 Regional Investigation Report, Southeast Idaho Phosphate Resource Area Selenium Project. Prepared for the IMA Selenium Subcommittee.

MWH. 2011. Ballard, Henry, and Enoch Valley Mines Remedial Investigation and Feasibility Study Work Plan. Final, Revision 2.

Nelson, A.A., Kauffman, M.J., Middleton, A.D., Jimenez, M.D., McWhirter, D.E., Barber, J., and Gerow, K. 2012. Elk Migration Patterns and Human Activity Influence Wolf Habitat Use in the Greater Yellowstone Ecosystem. Ecological Applications, 22:2293-2307.

Newfields. 2005. Final Site Investigation Report, Smoky Canyon Mine, Caribou County, Idaho. Prepared for J.R. Simplot Company. June.

Ohlendorf, H.M., Hoffman, D.J., Saiki, M.K., Aldrich, T.W. 1986. Embryonic Mortality and Abnormalties of Aquatic Birds: Apparent Impacts of Selenium from Irrigation Drainwater. The Science of the Total Environment 52:49-63.

Ohlendorf, H.M. and Heinz, G.H. 2011. Selenium in Birds. Pages 669-701 in W.N. Beyer and J.P. Meador (Eds), Environmental Contaminants in Biota: Interpreting Tissue Concentrations. 2nd edition. CRC Press, Boca Raton, FL. 751 pp.

P4 Production, LLC. 2013. Henry Mine Incident Summary Report. January. 14 pp.

Ralston, D.R., Brooks, T.D., Cannon, M.R., Corbette Jr., T.F., Singh, H., Winter, G.V., and Chien, M.W. 1980. Interactions of mining and water resource systems in the southeastern Idaho phosphate field. Research Technical Completion Report Project C-7651. Idaho Water Resources Research Institute. Moscow, Idaho.

Ratti, J.T., Rocklage, A. and Garton, E.O. 2002. Analysis of Selenium Levels in Bird Eggs and Assessment of the Effects of Selenium on Avian Reproduction in Southeast Idaho. Final Report to Montgomery Watson Harza.

Skorupa, J.P. 1998. "Selenium." *In* P.L. Martin and D.E. Larsen (Editors). Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment. National Irrigation Water Quality Program Information Report No. 3. Department of the Interior. Pp.139-184.

Skorupa, J., Detwiler, S. and Brassfield, R.. 2002. Reconnaissance Survey of Selenium in Water and Avian Eggs at Selected Sites Within the Phosphate Mining Region Near Soda Springs, Idaho – May to June, 1999. Southeast Idaho Phosphate Mine Site Trustee Council. 2015.

Southeast Idaho Phosphate Mine Site Trustee Council (SIPMSTC). 2015. Preassessment Screen for the Southeast Idaho Phosphate Mine Site, Idaho. June 15, 2015. 61 pp.

Teuscher, D. and Capurso, J. 2007. Management Plan for Conservation of Bonneville Cutthroat Trout in Idaho. Idaho Department of Fish and Game; USDA Forest Service. IDFG 07-48.

Thurow, R.E, Corsi, C.E., and Moore, V.K. 1988. Status, Ecology, and Management of Yellowstone Cutthroat Trout in Upper Snake River Drainage, Idaho. American Fisheries Society Symposium, 4:25-36.

Thurow R.F. and King J.G. 1994. Attributes of Yellowstone Cutthroat Trout Redds in a Tributary of the Snake River, Idaho. Transactions of the American Fisheries Society, 123:37-50.

U.S. Department of the Interior (USDOI). 1998. Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment. National Irrigation Water Quality Program Information Report No.3. USDI, Denver, CO.

U.S. Environmental Protection Agency (EPA). 1989. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance.

U.S. Environmental Protection Agency (EPA). 2001. EPA Requirements for Quality Management Plans (QA/R-2). EPA Requirements for Quality Management Plans (QA/R-2). EPA-240-B-01-002. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2002a. Guidance for Quality Assurance Project Plans (QA/G-5). EPA-240-R-02-009. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2002b. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites.* Office of Emergency and Remedial Response.

U.S. Environmental Protection Agency (EPA). 2002c. Guidance on Environmental Data Verification and Data Validation (QA/G-8). EPA-240-R-02-004. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2006. *Data Quality Assessment: Statistical Methods for Practitioners.* Office of Environmental Information, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2007. ProUCL Version 4.0, Software. Office of Research and Development.

U.S. Environmental Protection Agency (EPA). 2016. Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater. Office of Water, Office of Science and Technology, Washington D.C.

U.S. Forest Service (USFS). 1985. Riparian community type classification of Eastern Idaho-Western Wyoming. Prepared by Youngblood, Padget, and Winward, United States Forest Service.

U.S. Forest Service (USFS). 2012. Action Memorandum – Approval for a Removal Action at South Maybe Canyon Mine site, Caribou County, Idaho. File Code: 2160.

U.S. Geological Survey (USGS). 1977. Final Environmental Impact Statement, Development of Phosphate Resources in Southeastern Idaho. Volumes I, II, III, and IV. United States Department of Interior, Washington, D.C.

U.S. Geological Survey (USGS). 2004. Life Cycle of the Phosphoria Formation: from Deposition to the Post-Mining Environment, James R. Hein, Editor.

Varley, J.D., and Gresswell, R.E. 1988. Ecology, Status, and Management of the Yellowstone Cutthroat Trout. American Fisheries Society Symposium, 4:13-24.

Wang, N., Ingersoll, C., Hardesty, D., Ivey, C., Kunz, J., May, T., Dwyer, F.J., Roberts, A., Augspurger, T., Kane, C., Neves, R. and Barnhart, M.C. 2007. Contaminant Sensitivity of Freshwater Mussels: Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (*Unionidae*), Environmental Toxicology and Chemistry, 26:2036–2047.

Wiemeyer, S.N. and Hoffman, D.J. 1996. Reproduction in Eastern Screech-Owls Fed Selenium. Journal of Wildlife Management, 60:332-341.

Winter, G. 1980. Groundwater Flow Systems in the Phosphate Sequence, Caribou County, Idaho. Technical Report Project C-7651. Idaho Water Resources Research Institute. Moscow, Idaho.

Yamamoto, J.T., Santolo, G.M., and Wilson, B.W. 2009. Selenium Accumulation in Captive American Kestrels (*Falco sparverius*) Fed Selenomethionine and Naturally Incorporated Selenium. Environmental Toxicology and Chemistry, 17:2494-2497.