INTERAGENCY/INDUSTRY COORDINATION TO RESPOND TO SELENIUM CONTAMINATION AT PHOSPHATE MINES IN SOUTHEASTERN IDAHO

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ABSTRACT

Selenium contaminated vegetation and surface water related to phosphate overburden disposal was discovered in southeast Idaho in 1997. Shortly afterward, phosphate mining companies and regulatory agencies joined in response to the potentially widespread problem throughout the phosphate mining area. Five companies with a vested interest in southeastern Idaho phosphate reserves organized as a committee under the Idaho Mining Association. Under this arrangement they commissioned a regional environmental sampling program to characterize the problem in voluntary collaboration with Federal and State regulatory agencies. In 2000, the agencies in cooperation with tribal authorities agreed to coordinate their regulatory responses under a Memorandum of Understanding (MOU) that identified statutory and regulatory authorities and responsibilities; established priorities, and clarified processes for undertaking area-wide and site-specific investigations. Within the agreement, participating agencies and the Shoshone-Bannock Tribes set out frameworks for response actions and regulatory cost recovery. This group of agencies and the Shoshone-Bannock Tribes have since entered into an enforceable Area-wide Administrative Order of Consent (AOC) with the mining companies to conduct area-wide site investigations and risk assessments intended to lead to the development of remedial action objectives, remediation goals, and risk-based cleanup levels for selenium and other contaminants of concern. The U.S. Forest Service and Idaho Department of Environmental Quality, with support from other State, Federal and tribal authorities are cooperating to plan localized site investigations and engineering evaluations/cost analyses at individual mines. Data collected during the course of site-specific and area-wide efforts will eventually result in appropriate remediation of the selenium impacts at all developed phosphate mines in southeast Idaho. The authors describe the inter-agency and industry cooperative efforts in response to the selenium issue, highlighting the complications, successes, and stumbling points encountered along the way.

BACKGROUND

Phosphorous, is an important element for agricultural and chemical industrial uses worldwide. The primary source of phosphorous is phosphate ore that is known to occur in various locations around the world. The United States contains approximately 4.2 billion tons of phosphate ore, about 14 percent of the known world reserves (USGS, 2000). In 1975, the western phosphate field in Southeastern Idaho (Figure 1) was estimated to contain approximately one billion tons, about a quarter of the U.S. reserves (USGS, 1977). The phosphate reserves of Southeastern Idaho are about 80 percent located on Federal land administered by the U.S. Forest Service, Caribou-Targhee National Forest, with smaller amounts on State or Tribal leases and private land. Under authority of the 1920 Mineral Leasing Act, the Bureau of Land Management administers the 84 existing Federal phosphate mineral leases on about 46,000 acres of land and cooperates with the Forest Service, Idaho Department of Environmental Quality, and other Federal and State agencies in evaluating and

mitigating the environmental consequences of the mining.

Phosphate ore has been mined in Idaho since about 1907 with major production commencing in the 1940's. There are four active phosphate mining operations that, in a normal market, produce an aggregate of about six million tons of ore annually. Ore is shipped from the mines by rail, truck, and/or slurry pipeline to fertilizer or phosphorous manufacturing plants operated by the companies in the Soda Springs or Pocatello areas. The region contains 11 major inactive mines along with numerous, small historic orphan sites, primarily of underground design. Various types and amounts of reclamation have been completed at the major inactive mines, depending on the applicable regulations and policies in existence at the time the mining was conducted. The historic, orphaned mines are generally not reclaimed.

Phosphate ore in Southeastern Idaho occurs within the upper and lower parts of the Meade Peak member of the Phosphoria Formation. Interbedded shale and mudstone approximately 170 feet thick have been extensively folded and faulted throughout the region (Figure 2). A typical phosphate mine in the area is developed on dipping ore beds that occur parallel to topographic ridges. Ore is removed by open pit mining methods down-dip to the economic extent feasible and then along the strike of the outcrop to the margins of the lease, or to where the ore beds have been removed by erosion or displaced by faulting. This results in long, relatively narrow open pits, similar to many eastern coal strip mines. Because of the sequential extension of the open pits along strike, much of the overburden from subsequent mine pits is opportunistically backfilled into previous pits although in the initial mine panel development significant quantities of overburden have, and continue to be placed outside of pit back fills in external overburden dumps.

The overburden for the upper ore zone is typically sandy siltstones and limestones of the Triassic Dinwoody Formation, chert of the Rex Chert Member of the Phosphoria Formation, and shales and mudstones of the upper Meade Peak Member. Overburden produced from the lower ore zone includes shales and mudstones of the "Middle Waste Shale" portion of the Meade Peak Member and poorly cemented arenitic limestones of upper members of the Wells Formation. Overburden is moved with trucks from the open pits to the sites of the overburden dumps and then end dumped from various heights in lifts. Historically, this material was placed in a run-of-mine condition with little or no segregation of the different waste rock lithologies. Shale and siltstone from the waste units weather variably into rocky soil-like material that was utilized in the past to support reclamation vegetation with extensive fertilization. Until the early 1990's topsoil was not typically salvaged and replaced during reclamation. However, this has become the norm for the modern mining operations.

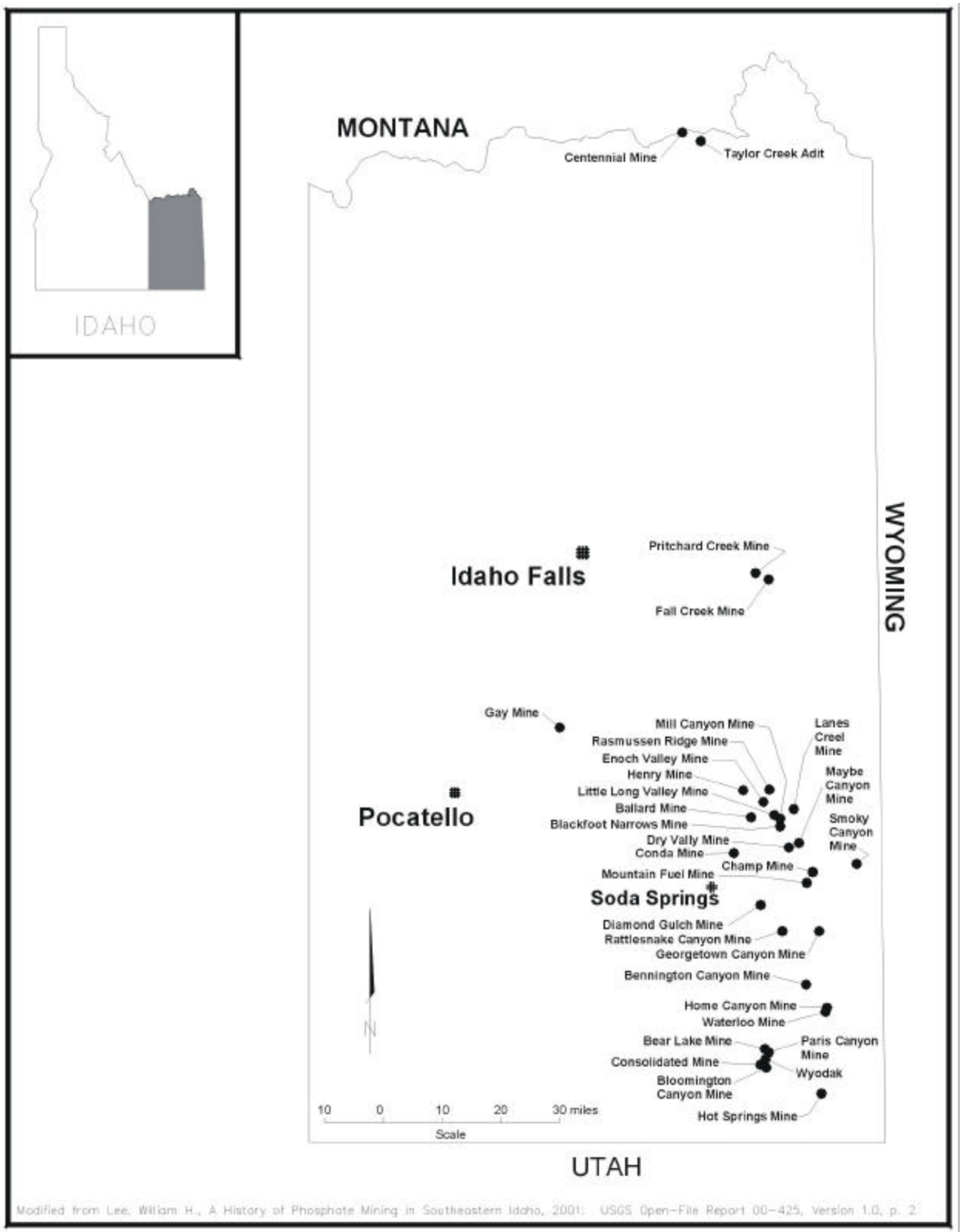

Figure 1. Generalized location map showing phosphate mines in southeastern Idaho

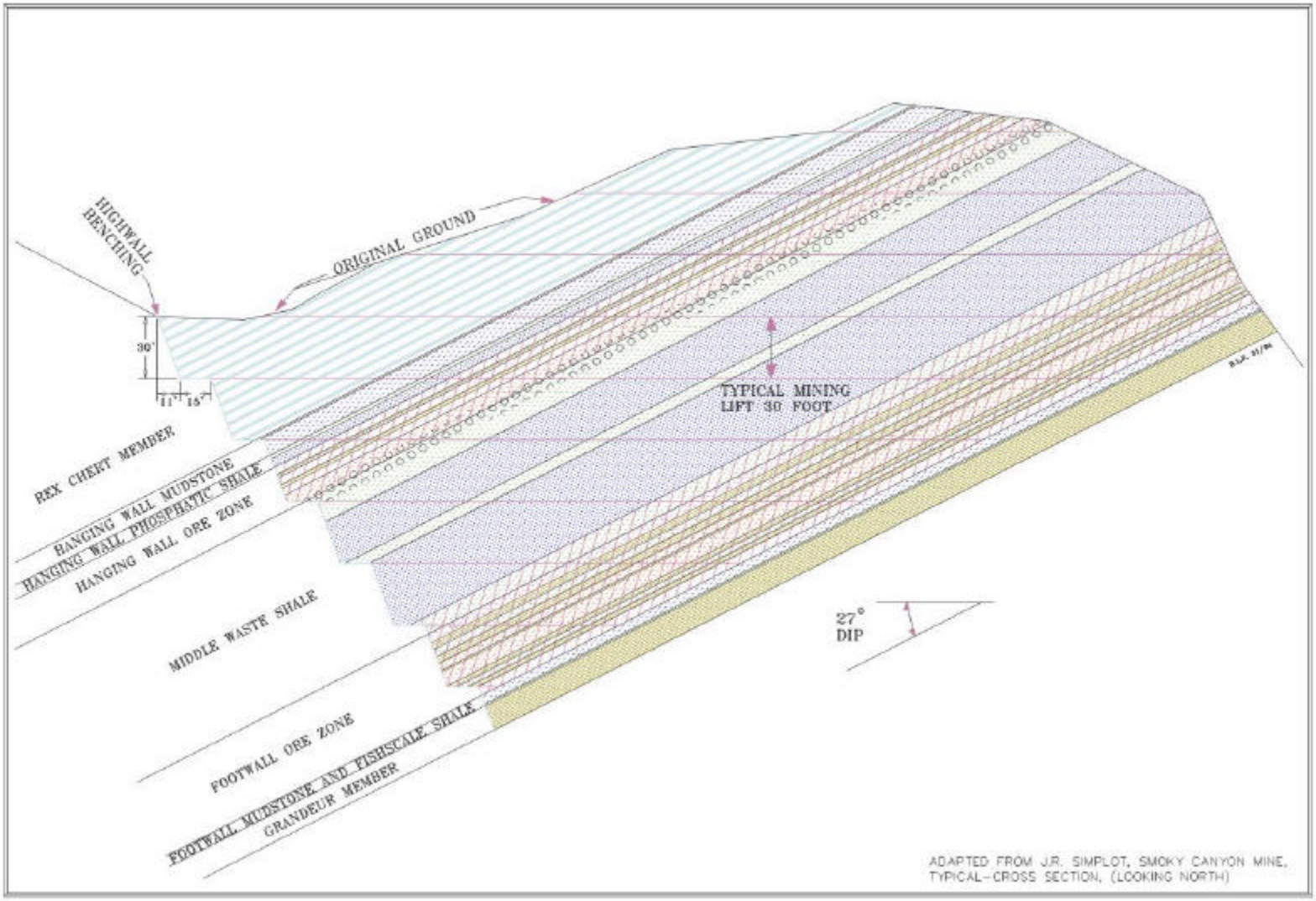

Figure 2. Typical Cross Section of the Phospheria Formation, Simplot Smoky Canyon Mine Panels B&C

Many overburden dumps constructed prior to about 1990 were reclaimed by regrading slopes to 3h:1v (horizontal: vertical) and drilling or hydroseeding a mix of grasses and forbs directly onto the regraded overburden surface. The relatively moist mountain climate of southeast Idaho is conducive to establishment of vegetation cover on most reclaimed mines in the region.

Mountainous topography in the area led to construction of overburden dumps on hillsides, some of which are close to stream channels. In some cases, overburden was placed in head-of-hollow or cross-hollow fills with rock drains in the former stream channels to carry infiltrating meteoric water and stream flow under the overburden fills. Construction of overburden fills in valleys was a preferred overburden handling technique for a number of years because of convenience, an unobtrusive visual profile, and to reduced the surface area of external overburden fills when compared to placement of overburden on steep mountain slopes.

Runoff from mine disturbances has been controlled through the use of runoff diversion, collection, and settling features common to all types of mining. Precipitation has typically come in direct contact with weathered overburden materials because topsoil was not utilized in reclamation, and older waste dumps were often constructed to rapidly infiltrate meteoric water. Runoff from storm events and snowmelt is commonly collected in settling ponds or silt traps to remove eroded sediment before discharge to local streams. Past environmental impact analyses documented the potential for impacts to surface streams. Impacts were most often attributed to suspended sediment along with lesser amounts of dissolved parameters such as nitrate, metals, and other contaminants (USGS, 1977).

DISCOVERY OF SELENIUM PROBLEM

Selenium has been known to be present in elevated concentrations in Meade Peak Member phosphate rock and mudstone for some time. In 1977, a programmatic EIS developed to analyze universal impacts of phosphate mining in Southeastern Idaho reported that phosphate rock had average selenium concentrations of 30 mg/kg (ppm), with maximum concentrations of 800 mg/kg, while mudstones were documented with average concentrations of 14 mg/kg and maximum concentrations of 1,500 mg/kg (USGS, 1977). Selenium was significantly elevated when compared to an average of 0.23 mg/kg for selenium concentrations in soils in the western United States (Shacklette and Boerngen, 1984). However, this EIS and other environmental impact studies conducted in the area prior to 1996 did not specifically identify selenium found in overburden as being a contaminant of potential concern (COPC).

Selenium in Meade Peak member overburden is present as relatively insoluble selenide (Se-II) and native elemental selenium (Se) that, after weathering and oxidation, can produce soluble forms of selenite (SeIV) and selenate (SeVI). Soluble oxidation products can easily be mobilized from the overburden materials in runoff or infiltration water (Desborough et al., 1999). Selenium in trace quantities is an important nutrient for human health (ATSDR, 1996). Small quantities of selenium are present in many human and livestock food supplements but selenium can also be toxic to humans and animals at higher doses. A number of environmental studies have been conducted in other parts of the United States where selenium concentrations in surface waters have been affected, typically by irrigation drainage (Seiler et. al. 1999, Luoma and Presser, 2000). Mobile forms of selenium bioaccumulate in some plants and animals chronically exposed to the contaminant (Herring et al,

1999). A particularly problematic pathway of selenium exposure can be present where livestock or wildlife feed exclusively on vegetation where selenium has bioaccumulated from growth medium or water. Animals exposed to high doses of selenium can themselves accumulate and biomagnify toxic concentrations of the contaminant and display symptoms of chronic selenium poisoning (selenosis).

In December1996, six horses grazing on private land downstream from the former South Maybe Canyon phosphate mine became ill and were diagnosed with chronic selenosis. Five of these animals had to be destroyed when it was determined they would not recover their health. Again in the summer of 1997, two horses pastured on the former Conda Phosphate Mine were diagnosed with selenosis and both animals had to be destroyed. In mid-summer 1997, 176 sheep were found dead in the Conda Mine area. The cause of death was not confirmed but selenium poisoning was not ruled out. Since then, other occurrences of multiple sheep deaths have been reported at the Conda Mine and Wooley Valley Phosphate Mine. Forensic examination of samples taken from the dead animals in each case showed elevated selenium concentrations in tissue and rumen although definitive conclusions as to the actual cause of the deaths were not made. Myocardial necrosis, a symptom of toxic selenosis, was found in the Wooley Valley sheep.

Selenosis in the horses pastured in Dry Valley prompted agency and public concern that selenium releases from phosphate mining was apparently an environmental and potential public health concern. A Preliminary Assessment of the South Maybe Mine in 1997 led the Forest Service to exercise their delegated authority to initiate action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The current leaseholder was identified as the Potentially Responsible Party (PRP) for that site. In September 1997, the U.S. Forest Service entered into an Administrative Order on Consent (AOC) for the South Maybe Mine with the leaseholder to conduct a Site Investigation (SI) and Engineering Evaluation/Cost Analysis (EE/CA) under CERCLA.

EARLY INDUSTRY AND AGENCY RESPONSES

Five phosphate mining companies in Southeastern Idaho quickly accepted that the selenium contamination problem was a significant concern and could be systemic throughout the phosphate mining region. Agency personnel along with the phosphate mining industry generally recognized that the geology, mineralogy, and physical environmental conditions at all the phosphate mines in Southeastern Idaho were similar enough that known problems at a few mines could easily be indicative of potential conditions at the other phosphate mines in the region. However, site differences in elevation, ecology, and climate indicated that conclusions from a few sites may not be universally extrapolated across the phosphate producing region.

In January 1997, agency and industry representatives were invited, along with citizens in Southeast Idaho, to attend a meeting in Soda Springs where information about the situation was presented. The five mining companies present decided to form an ad hoc committee of the Idaho Mining Association (IMA) in early spring 1997; this “Selenium Subcommittee” consisted of FMC (now Astaris), J.R. Simplot Company, Nu-West Industries (Agrium), Rhodia LLC, and P4 Production LLC (a joint venture between Monsanto Inc. and Solutia Inc.). Members of the subcommittee joined voluntarily with representatives from the land management, environmental, and resource management agencies, as the “Selenium Working Group”, to provide oversight of the

investigative work. Selenium Subcommittee members through the IMA agreed to fund studies intended to identify, on a regional basis, whether selenium was originating from phosphate mines, selenium sources, and the extent of selenium impacts. Industry subcommittee members retained technical experts from the consulting industry who subsequently subcontracted specialists from academia to conduct the necessary studies. Montgomery Watson was hired by the IMA subcommittee as the environmental consultant; the University of Idaho, and University of California-Davis joined them in a contractual arrangement.

The Selenium Working group operated under the auspices that they would direct data collection strategies, identify specific studies, collaterally interpret data, and cooperate with the phosphate mining industry to develop mitigation or management practices to prevent selenium releases from current and future phosphate mining operations. Participating agencies initially included:

- U. S. Forest Service (USFS)
- U. S. Bureau of Land Management (BLM)
- Idaho Department of Environmental Quality (IDEQ)
- Idaho Department of Lands (IDL)
- Idaho Department of Fish and Game (IDFG)

Later in the process several other agencies and sovereign parties joined in the process but remained outside the working group. They included:

- U.S. Fish and Wildlife Service (USFWS)
- U.S. Environmental Protection Agency (EPA)
- U.S. Bureau of Indian Affairs (BIA)
- Shoshone-Bannock Tribes

Additionally, representatives of the public, interest groups, academia, veterinary and agricultural sciences, and the press participated in the open meetings of the Selenium Working Group. Meetings were held regularly to coordinate efforts of the participants in the regional investigations and do the other work of the Selenium Working Group. As this group evolved, sometimes including more than 50 participants, decision making became difficult and at times controversial. In an attempt to improve effectiveness, the "Selenium Steering Committee", was formed with a single representative from each organization within the Selenium Working Group.

As data from regional investigations in 1997 were received, it became evident that elevated selenium concentrations were being observed throughout the phosphate producing area.

Members of the IMA subcommittee and their consultant produced a number of documents related to regional investigations performed throughout a 2,500 square mile area in Southeastern Idaho including:

- Fall 1997 Interim Surface Water Survey Report, Southeast Idaho Phosphate Resource Area Selenium Project, February, 1998;
- 1998 Regional Investigation Sampling and Analysis Plan, Southeast Idaho Phosphate

Resource Area Selenium Project, April, 1998;

- $ 1999-2000 Regional Investigation Sampling and Analysis Plan, Southeast Idaho Phosphate Resource Area Selenium Project, August, 1999;
- $ Final1998 Regional Investigation Report, Southeast Idaho Phosphate Resource Area Selenium Project, December, 1999;
- $ 1999 Interim Investigation Data Report, Southeast Idaho Phosphate Resource Area Selenium Project, October, 2000; and
- $ 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999 Draft, April, 2001.

In addition to these data reports, using field data from the 1998 regional investigations, the consultants to the Selenium Subcommittee prepared a Preliminary Human Health Risk Assessment and a Preliminary Ecological Risk Assessment. Regulatory agencies involved in the Selenium Working Group commented on the risk assessments and essentially rejected them for premature conclusions based on the lack of sufficient data. Comments submitted by the agencies were not sufficiently addressed or incorporated in the assessment. Support of the risk assessments by the regulatory agencies was withdrawn and an agency disclaimer written.

Two reports were produced by the Selenium Subcommittee describing management practices that had been or could be employed at the phosphate mines for control of selenium impacts; they were:

- $ Existing Best Management Practices at Operating Mines, Southeast Idaho Phosphate Resource Area Selenium Project, March, 2000; and
- $ Draft Best Management Practice Guidance Manual for Active and Future Mines, Southeast Idaho Phosphate Resource Area Selenium Project, April 2000.

The first of these reports summarized management practices that were already being employed at the mines to control sediment. Practices detailed here had been previously endorsed by the State of Idaho as practices suitable to control erosion and sedimentation impacts.

Final publication of the second document was never accomplished. It was intended to address the release of contaminants from the mine sites in multiple media. However, the scope and detail were not sufficient to provide a broad range of mitigations to address the problem. Most of the methods discussed again focused on control of erosion and sedimentation without addressing water treatment. Compared to the extensive discussion of management practices for surface runoff control in these documents, the regulatory agency reviewers were dissatisfied with the relative lack of objective discussion on the use of more expensive management practices such as: capping the tops or lining the bottoms of overburden fills with impermeable materials, and collection and chemical treatment of seleniferous water.

In addition to what the Selenium Subcommittee was doing, other organizations were conducting separate studies, including:

- $ With funding provided by J.R. Simplot Co., the University of Idaho conducted graduate project studies to identify or refine environmental and selenium treatments at the Smoky

Canyon Mine (Simplot, 2002).

- **$** Astaris agreed to conduct independent field studies at their Dry Valley Mine of selenium accumulation in vegetation growth medium and vegetation in response to mitigation employed at their mine.
- **$** Three of the mining companies conducted multi-media environmental baseline studies at their properties, focusing on the selenium impacts, to support upcoming Environmental Impact Statements (EISs).
- **$** The USFS Rocky Mountain Research Station is conducting research to identify vegetation species adapted to reclamation purposes that would occlude selenium. Studies are underway that will evaluate potential amendments that could permanently capture selenium within waste products. Mustard species, specifically Canola, are being tested for potential as a phytoremediation tool that would not escape cultivation on waste dumps. Correlations between soil salvaged from the mine sites and bioaccumulation in reclamation vegetation are included in their studies.
- **$** The IDEQ began Total Maximum Daily Load (TMDL) studies on known impacted watersheds in the region.

The USGS Western Mineral Resources Team, Western U.S. Phosphate Project, began a 5-year study in 1997 that included investigations of the geology, mineralogy, history, stratigraphy, chemistry and environmental characteristics of many phosphate mining locations in Southeastern Idaho. This work has been a collaborative effort between USGS scientists from multiple offices and others from a diverse range of interests including state, federal, tribal, academic, mining, and general public. When all the reports are completed in 2002, there will have been over 50 separate publications, most of them USGS Open-File Reports (USGS, 2002).

Altogether, the studies conducted by the IMA, State and Federal agencies, academia, and individual mining companies in Southeastern Idaho generated a tremendous amount of information in only 3 - 4 years on the source, pathways, and impacts of selenium contamination related to phosphate mining. This was a major accomplishment of industry and agency cooperation. Although the regulatory agencies were appreciative of the phosphate mining industry's voluntary efforts on the regional and other investigations, they questioned the role of the mining industry in interpreting the data and objectively considering mitigation measures for existing and future potential selenium impacts on public lands. Conscious of the scope and implications of the situation, the agencies decided that the completely voluntary efforts to date on the part of the mining companies would have to be replaced with a more traditional, agency-controlled approach using State and Federal authorities.

MEMORANDUM OF UNDERSTANDING

In July 2000, the Federal regulatory agencies participating or overseeing the actions of the Selenium Working Group (USFS, BLM, EPA, USFWS, BIA), the IDEQ, and the Shoshone-Bannock Tribes entered into a formal agreement between them titled, "Memorandum of Understanding concerning Contamination from Phosphate Mining Operations in Southeastern Idaho" (MOU). The stated purpose of this agreement provided a cooperative atmosphere for the regulatory parties to

work together on matters related to the environmental contamination at phosphate mines. Commitments were made to follow specific processes to resolve conflicts between them, minimize duplication of efforts, and communicate a single set of instructions to the mining companies.

Parties to the MOU agreed that an area-wide contamination investigation should be conducted by IDEQ under criteria and a scope of work established in the MOU with a commitment for cost recovery and enforcement within the scope of an "Administrative Order on Consent" (AOC) with the companies principally responsible for the leases in southeastern Idaho. Outlined in the AOC was an agreement that subsequent, site-specific investigations and remedial actions, conducted under CERCLA and other regulatory authorities, would not duplicate efforts conducted under the area-wide investigations. Site-specific investigations would be managed by specific, and agreed upon lead agencies, with identified support agencies. Lead agencies would enter into site-specific, enforceable agreements with the affected companies for each individual mine site. Parties to the AOC also agreed on the general scope of work for the site-specific CERCLA activities.

In signing this MOU, the agencies asserted their regulatory authority under CERCLA to take charge of the regional contamination impact investigations, now called the "Area-wide Investigations" and eventually conduct whatever site-specific studies were necessary to thoroughly investigate all the 15 major operating and inactive phosphate mines in Southeastern Idaho for the release or threatened release of hazardous substances. Site Investigations and Engineering Evaluation/Cost Analysis undertaken will eventually lead to another agreement requiring the remediation of the existing contamination impacts at each of these sites by the responsible companies. Adoption of the MOU changed the former voluntary effort of the Selenium Working Group, that was primarily controlled by the companies who made up the Selenium Subcommittee, to a rigorously regulated process under CERCLA that clearly placed the regulatory agencies in charge of the effort. At first glance, one might think the mining companies would object to this change in management, but this has not necessarily been the case. Involved mining companies supported this change because it offered the promise of more efficient project management and decision-making, with the added benefit of the agencies being able to chart a clear course to some final end for each individual site. Additionally, without a mechanism offering proof that the companies would relinquish their leases in a condition suitable for the management of other sustainable resources, permitting future extractive phosphate operations on public lands would have become impossible.

When the MOU was fully executed on July 15, 2000, the IDEQ took over the former regional investigations calling the new effort the "Area-wide Investigations", and began planning to do the work. What the IDEQ and the other agencies needed was the financial support of the mining companies, and clearly enforceable authority over the process. Costs incurred in oversight of the process by IDEQ, EPA, F&WS, and the Shoshone-Bannock Tribes are recovered from the phosphate industry participants in the AOC. Cost recovery, negotiated participation, and provided enforcement necessary for the agencies to protect the public interest. Additionally, the AOC was necessary to ensure continued financial support for the investigation and oversight by IDEQ and some of the support agencies.

AREA-WIDE CONSENT ORDER AND ADMINISTRATIVE ORDER ON CONSENT

In concert with the interagency cooperative agreement and CERCLA process described in the

MOU, the parties to the MOU entered into an enforceable Consent Order and Administrative Order on Consent (CO/AOC) for the Area-wide Investigations with the mining companies making up the Selenium Subcommittee. The stated purpose of the Area-wide CO/AOC was to set out the scope of work for the Area-wide Investigation, identify procedures to be used, and ensure cost recovery for the scope of work from the mining companies signing the order. The regulatory authority for the Federal agencies signing the order is CERCLA and the work to be conducted under the order was specified to comply with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). IDEQ's authority to participate in the investigation and cleanup of hazardous substances are: the Idaho Environmental Protection and Health Act ("EPHA"), Idaho Code § 39-101to 39-130, and the Hazardous Waste Management Act of 1983 ("HWMA"), Idaho Code § 39-4401 to 39-4432, and other laws including CERCLA and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 et seq.

The statement of work under the order included: 1) establishing area-wide remedial action objectives, remediation goals, and risk-based cleanup levels for selenium and other contaminants of concern that will be protective of human health and the environment; 2) develop a monitoring plan that will assess the effectiveness of future remedial activities within the Resource Area; 3) develop Best Available Technologies and Remediation Techniques for use, as appropriate, at sites in the Resource Area; and 4) provide information to support future agency-approved site investigations and remedial actions, and other land use activities on selenium-impacted lands with the Resource Area. The work to be done under the order included a general, area-wide risk assessment, and planning for general remedial action objectives intended to be considered for future site-specific activities. With the signing of the Area-wide CO/AOC in September, 2001 IDEQ was ready to begin work on the Area-wide Investigations.

AREA-WIDE INVESTIGATIONS

IDEQ adopted the Selenium Working Group organizational structure to initiate the Area-wide Investigations. The former Working Group Steering Committee was changed to the "Selenium Area Wide Advisory Committee" (SeAWAC), and the larger Working Group meetings were shifted to a quarterly schedule to distribute information and provide progress reports in a public forum. An Interagency Technical Group, made up of representatives of the parties to the MOU with representatives from Idaho Department of Lands and the Idaho Fish and Game was also developed to provide for regular coordination and planning of the area-wide activities. IDEQ successfully hired an experienced environmental professional with CERCLA project experience to manage the area-wide activities. IDEQ also retained the services of an environmental consultant, Tetra Tech EM Inc., to assist it with the area-wide work.

The Area Wide Scope of Work was developed to utilize the existing information from the IMA regional investigations and continue the work envisioned in the MOU by the signatory agencies to that agreement. After obtaining input from the Interagency Technical Group and the Area Wide Advisory Committee, the Area Wide Scope of Work was defined to include:

- **$** Assess all existing data and prepare a preliminary risk assessment,
- **$** Determine data needs to support an area-wide human health and ecological risk assessment,

- $ Develop sampling and analyses plans and studies to fill identified data gaps,
- $ Conduct area-wide investigations as required,
- $ Complete Area-Wide Population based Ecological and Human Health Risk Assessments,
- $ Establish remediation goals, remedial action objectives, and risk based cleanup levels,
- $ Develop a regional water quality and aquatic monitoring plan,
- $ Develop best available technology and remedial techniques,
- $ Conduct public involvement and participation activities for the area-wide investigation, and
- $ Other activities to support area-wide goals.

Each phase of the Area Wide Scope of Work was planned in advance and input was sought from the Interagency Technical Group and the Area Wide Advisory Committee. Deliverable products for each phase of work were documented and reviewed by the Technical Group and Area Wide Advisory Committee. IDEQ was diligent in seeking public input at all major steps in the area-wide process. Several public meetings were held. Notices were published in local newspapers and on IDEQ's internet site to solicit interest from the affected community. Major study plans were published on the IDEQ website for 30-day public comment periods. Most comments are provided by agency representatives and the Idaho Mining Association.

SITE-SPECIFIC INVESTIGATIONS

Site-specific investigations mentioned in the MOU will be conducted at 15 sites by potentially responsible parties using technical contractors approved by the lead agency on each site. With one exception, the Forest Service will be the lead on all mine sites that are located within the boundaries of the Caribou-Targhee National Forest; the IDEQ will lead where the surface is privately owned and intermingled with BLM or State surface ownership, and the BIA will lead where the surface ownership is tribal. Other parties to the MOU will be "Support Agencies" ensuring that lead agencies protect their interests as appropriate for each site. Lead agencies will provide an On-Scene Coordinator (OSC) or Remedial Project Manager (RPM) as appropriate for each site; these individuals will have the duties described in the NCP and will coordinate with a site-specific Project Manager also provided by the lead agency.

The scope of work for each site-specific CERCLA project will include the following major tasks:

- $ Develop a Project Work Plan,
- $ Prepare and implement a Community Relations/Public Involvement Plan,
- $ Oversight of the Site Investigation Work Plan,
- $ Oversight of the Sampling and Analysis Plan,
- $ Oversight of the Quality Assurance Project Plan,
- $ Oversight of the Health and Safety Plan,
- $ Oversight and approval of the Site Investigation,
- $ Oversight of the Risk Assessment,
- $ Oversight of the Engineering Evaluation/Cost Analysis, and remedial alternative selection
- $ Monitoring Oversight of Selected Alternatives

$ Analysis of various technical and progress reports typically prepared in a CERCLA project.

The lead agency and the mining company will enter into an enforceable CO/AOC that will refer to a site-specific Project Work Plan and schedule. Responsible parties will coordinate with the lead agency to develop a Scope of Work to be included in the CO/AOC. Detailed work plans will be developed to specifically outline the plans necessary to conduct a NCP Site Investigation. Site investigations will be evolved to fill data gaps about the release mechanisms and pathways by which contaminants are released from operations. Data collection will also be designed to evaluate potential remedial treatments and their effectiveness to reduce releases to concentrations compliant with Applicable or Relevant and Appropriate Regulations gathered by the lead agency.

When alternatives are developed to address site-specific releases, they will be presented to the public according to the instructions listed in the Community Relations/Public Involvement Plan prepared by the lead agency. Subsequent to the public involvement process, the lead agency will publish their decision in a "Record of Decision". Alternative selection will consider the merits of the treatment and its cost effectiveness.

Once the decision is made to proceed with an alternative, negotiations with the responsible party for remediation will result. Negotiations will be undertaken to provide guidelines for the removal of the contaminant, reclamation of the site, and monitoring the performance of implemented treatments.

FUTURE ACTIVITIES

To date, two of the 15 major phosphate mining sites, the South Maybe Canyon and Smoky Canyon mines, have successfully completed AOCs to conduct site investigations and EE/CAs. AOCs for the other sites are scheduled for negotiation beginning in late summer 2002 and are expected to be completed by the end of 2004. Each of the site investigations for these major sites are expected to take from two to three years to complete after which the removal actions themselves will take place. Appropriate removal actions will likely be somewhat different for each site, adjusting for site-specific conditions. At this point, one can only guess at the time frames required to complete all the removal actions but it is safe to say that it will take years to do so. Long-term removal actions and certainly monitoring activities will likely extend decades into the future.

The approach to the orphaned phosphate mine sites will be different than the 15 major sites. Orphan sites are abandoned sites where no viable responsible parties are apparent. Most of these sites were underground operations though some were open pits. Data collected from these sites in 2002 will be evaluated and a Preliminary Assessment prepared for each. Conclusions in the Preliminary Assessments will be used to decide how to proceed. Some sites may not need any further investigation however others may need detailed site investigations. At that time, further efforts may be taken to identify responsible parties or a determination will be made to expend public funds to further detail the extent of any releases and the risks posed to human health and the environment.

CONCLUSIONS

A great deal of information has been generated in an attempt to understand the selenium issue

in Southeastern Idaho and, because the situation is still unclear, more information will be produced . It is hard to keep up on all the new information coming out and definitive determinations on the human health and ecological impacts have yet to be made. Keeping in mind that factual conclusions are still to be made on much of the data, some points of general consensus can be made as follows:

- **$** The general sources and potential releases of selenium from phosphate mining sites in Southeastern Idaho are systemic to some degree at all such mine sites throughout the region.
- **$** While other contaminants of potential concern co-exist with the selenium, they are not as much of a concern as the selenium itself.
- **$** Bioaccumulation of selenium in vegetation growing on seleniferous overburden is the main pathway for exposure of elevated concentrations to foraging animals. Certain plant species are more susceptible to accumulating high concentrations of selenium than others.
- **$** Runoff from seleniferous terrain is the main pathway for release of the contaminant to surface waters.
- **$** Infiltration of precipitation into seleniferous overburden can potentially cause groundwater contamination but a more problematic release pathway for this leachate is through seeps and springs that may occur at the outer edges of overburden fills. These discharges can subsequently result in pathways of selenium to surface waters, vegetation, and animals.
- **$** Impacts appear to be relatively confined to the mine sites or immediately downstream and these impacts may be able to be reduced or eliminated with the proper site-specific mitigation/remediation actions.
- **$** Results to date do not indicate any known immediate or imminent threat to public health.
- **$** Local toxicity threats to wildlife and livestock appear to be the main ecological impacts.
- **$** Some mine engineering designs exacerbate selenium concentrations in vegetation and surface water, while others work to abate contaminant releases.

From 1996 to now, the administrative/regulatory/political process has been very interesting. An obvious good point is that the government and industry representatives are still talking to each other and trying to cooperate as practically as possible, within the constraints of the major financial and legal concerns. A large portion of the credit for this needs to go to the IMA Selenium Subcommittee who proactively accepted responsibility for beginning the expensive work of studying this problem early on when it would have been easy to wait and see what happened from a legal and regulatory approach. Industry cooperation early in the investigative process resulted in a major effort over a 3-year period study covering over 2500 square miles. Products of that effort provided valuable data necessary to permit us to agree on the points of general consensus listed above.

Early industry cooperation was good for public relations and the regulatory agencies because the phosphate industry was able to rapidly provide financial support where government funding would have taken time. Early action in 1997 demonstrated that the companies and their government partners were anxious to address the problem. Delays resulting from endless debate would have been counterproductive and led to public distrust of both the agencies and the phosphate mining industry. Government intentions from the beginning were not to issue citations or to damage the industry but to solve the problem rapidly. Rapid resolution to bring contaminant releases into compliance were considered necessary to protect a critical national resource.

There were obstacles, distrust, and at times adamant disagreements, however, many of those obstacles were set aside to keep the search for the solution moving forward. Most companies mining phosphate today moved forward in their attempts to mitigate contaminated leachates produced from mine wastes. While detailed communications regarding their actions were sometimes weak, agency representatives accepted these efforts as well intentioned. Because some of these mitigations were poorly documented, it now makes it difficult for the agencies to know if a permanent mitigation was developed or if there is a temporary suppression of impacts that may reoccur in the future.

Forty years of what may be interpreted as friendly regulation of the phosphate industry in Southeastern Idaho has led to the impression that an adversarial relationship now exists between the phosphate industry and the agency regulators. However, contrary to this perception, the regulatory agencies are simply following prescribed protocols. As regulators, protection of the public trust has multiple meanings. Environmental protection is legally mandated in many cases but it is also in the interest of the local population.

Releases of contaminants from or onto public lands requires an appropriate response mandated by law. Several factors influenced both agency and industry reactions early in this process. Initial industry control of the early investigative process provided control of the pace that studies and remediation would occur. Voluntary lead with the initial investigations also allowed the industry to control the rate that money was spent. Under regulatory guidance and agency direction industry control was lost but the benefit is that the more structured approach should lead to defensible decisions on site remediation. It's true that site investigations in strict compliance with CERCLA may be more expensive but, when compared to the potential costs associated with unsuccessful remedial activities, these costs are small.

Protection of the public trust is also necessary in the mandated process required by law to implement major actions by the Federal government or on Federally administered lands. Without public trust in both the industry and regulatory managers responsible, the ability to permit continued and future phosphate mining in Southeastern Idaho would become increasing difficult and more costly to both the government and industry. Therefore, agency control and objective, well conceived decisions on the site investigations and remedial activities related to the selenium issue are best for all involved.

Continued success of the phosphate mining industry is dependent on the ability of the agencies and the industry to cooperate within a regulatory framework that provides for maintenance of the public trust. Phosphate production is important not only to the local economy but to the ability of the nation to produce products that sustain a high quality of life. Without this cooperation within a proven regulatory framework, our own laws increase the possibility that opponents of land disturbing activities can successfully delay or prevent extractive industries from operating on public lands.

A tremendous amount of work remains in the effort to continue current phosphate production in southeast Idaho and permit necessary expansions while conducting site investigations and remedial activities at existing mine sites. Agency/Industry relations may continue to be strained at times, but as long as their communications and cooperation continue, an important industry can continue to operate in Southeastern Idaho.

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