USDA United States Department of Agriculture | Forest Service | Intermountain Region | 324 25th Street Ogden, UT 84401 801-625-5605

Date: January 4, 2012

File Code: 2160

MEMORANDUM

SUBJECT: Approval for a Removal Action at South Maybe Canyon Mine Site, Caribou County, Idaho

FROM: Sherri Clark, Deputy Director, Engineering
CERCLA Phosphate Program Manager

TO: Harv Forsgren, Regional Forester

THROUGH: Brent Larson, Forest Supervisor
Keith Simila, Director, Engineering

EPA Site ID # IDN001002957

I. Purpose

The purpose of this Action Memorandum is to request and document approval of the selected CERCLA[1] removal action described herein for the South Maybe Canyon Mine Site (Site) located on the Caribou-Targhee National Forest, Soda Springs Ranger District, Idaho. The Forest Service anticipates negotiating with Nu-West Mining, Inc. / Nu-West Industries, Inc. (Nu-West), the potentially responsible parties for the Site, for Nu-West to implement the removal action under an Administrative Settlement Agreement / Order on Consent (ASAOC).

II. Site Conditions and Background

A. Site Description

1. Removal Site Evaluation

The Site, which includes the Cross-Valley Fill (CVF) waste rock dump, is located on National Forest System lands administered by the Caribou-Targhee National Forest. Phosphate mineral reserves underlying the South Maybe Canyon Mine are covered by Federal Phosphate Mineral Lease I-04 (Lease I-04), administered

[1] Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601 *et seq.*

by the Bureau of Land Management (BLM). Lease I-04 was issued in 1950 and amended in 1953, but no extractive mining operations under the lease occurred at South Maybe Canyon until 1976. Beker Industries Corporation (Beker) mined the Site from 1976 to 1978, as the lessee under Lease I-04. The Conda Partnership, consisting of Beker and Nu-West Mining, Inc. (formerly Western Cooperative Fertilizer Company) mined the Site under Lease I-04 from 1979 through 1984. Beker and the Conda Partnership mined phosphate ore using open-pit truck and shovel techniques, shipped ore to Soda Springs, ID for processing, and disposed of rock in the CVF. Nu-West Mining, Inc. (Nu-West), a subsidiary of Nu-West Industries, Inc., is the current lessee for Lease I-04.

The leaseholders constructed the CVF over Maybe Creek to store permanently waste rock generated from mining operations at the Site. The CVF waste rock dump is about 1.0 miles long, 0.3 miles wide at its widest point, and 425 feet deep at its maximum depth. During construction, miners at the Site segregated waste rock into two general categories, chert and shale. The miners constructed an approximately 50-foot deep / mile long French drain over Maybe Creek as the base of the CVF with coarse and durable chert. The drain was designed to accommodate a water flow of 200 cubic feet per second (CFS) under the CVF.

Miners also dumped chert along the western aspect of South Maybe Canyon, creating a blanket of durable chert to serve as a drain for the runoff from the western aspect of South Maybe Canyon and from the final dump surface. While the chert blanket feature was designed to be shale-free, in one incident the miners deposited approximately 30,000 cubic yards of waste shale in the blanket. On completion of a substantial portion of the drain, miners began placing waste shale in the fill between the pit and the drain, moving eastward until the drain was covered. As the CVF grew, miners selectively dumped chert or "Run-of-Mine" (ROM) shale and waste rock in the appropriately designated areas to complete construction of the core drain and blanket and to dispose of waste in the fill. Approximately 29 million cubic yards of chert and shale are contained in the CVF.

The contaminants of concern (COCs) for the South Maybe Canyon Mine CVF include selenium, cadmium, chromium, nickel, and zinc. The COCs at the Site are associated primarily with the waste shale; the chert has relatively low levels of COCs. Selenium is the most widespread and concentrated COC at the Site. In 1996, six horses pastured about 1.5 miles downstream from the CVF developed selenosis from chronic exposure to contaminated water in Maybe Creek and pasture plants exposed to creek water. Subsequently, the owner euthanized five of the horses because it was unlikely that the horses would fully recover.

Surface water measurements taken upstream of the CVF indicate COC concentrations below detection limits. However, selenium is present at concentrations that exceed regulatory standards in surface water downstream of the CVF, including Maybe Creek and Dry Valley Creek, and in springs along the

Maybe Creek reach immediately downstream of the CVF. The CVF is the only known source of selenium and other COCs in the upper Maybe Creek drainage. However, lower in the canyon, COCs are present in waste rock from the North Maybe Mine Dump 6 failure, from shale piled near the historic portal to the underground workings, and in the sediment ponds at the Forest boundary.

Precipitation that falls on the top of the CVF infiltrates the surface and percolates through the waste shale, dissolving selenium salts and transporting contamination from the CVF into Maybe Creek. Ground water also emerges from the Dinwoody Formation beneath and downstream of the CVF and from the alluvium beneath Maybe Creek. Selenium concentrations in surface water below the CVF consistently increase in late April or early May, peak in late May, and then decrease throughout summer and fall as the annual snowmelt runoff decreases. Spring and early summer flow in Maybe Creek often reaches Dry Valley Creek. It is during this period of high runoff that most of the annual contaminant load reaches the Blackfoot River and presents an exposure to fish in lower Dry Valley Creek and the Blackfoot River.

Characterization data has been collected at the Site from 1999 to the present, including samples of surface water, ground water, soils, sediment, and vegetation. The data collected through 2008 are the basis for determining the need for action and are summarized in this Action Memorandum, with emphasis on the selenium results. A removal action addressing selenium will likely mitigate threats posed by other Site-related COCs.

Nu-West conducted a Site Investigation (SI) under Forest Service oversight from 1999 to 2009. The Forest Service anticipates initiating a Remedial Investigation / Feasibility Study (RI/FS) in the future to develop final response alternatives for the Site. The RI/FS will fully evaluate the characterization data, including information pertaining to contaminants other than selenium, to determine the nature and extent of contamination and any associated threat to public health, welfare, or the environment. The RI/FS will also evaluate alternatives for remedial actions to prevent, mitigate or otherwise respond to releases of contaminants from the Site. The Forest Service may select additional cleanup actions to address surface water, ground water, sediment, and / or vegetation contamination based on monitoring post construction activities associated with this action, and on information generated during the RI/FS, in a final Record of Decision.

2. Physical Setting

Distance to Nearest Populations, Land Ownership and Surrounding Land Use

The South Maybe Canyon Mine and related CVF waste dump are located on National Forest System lands administered by the Caribou-Targhee National Forest. The closest community is Soda Springs, ID located approximately 26 miles to the southwest of the Site. The City of Soda Springs has a population of approximately 3,400 (See Figures 2.1 and 2.2).

Private property belonging to Nu-West Industries is located to the west adjacent to the National Forest boundary in Dry Valley. Additionally, the State of Idaho owns nearby lands to the west of the National Forest and three miles to the northwest along Dry Valley Creek.

No residents live on the National Forest or in Dry Valley west of the South Maybe Mine. Nu-West's Dry Valley Mine operated in Dry Valley from 1992 to 2010. The nearest ranch is located approximately 6 miles downstream near the confluence of Dry Valley Creek and the Blackfoot River.

Site Features and Topography

South Maybe Canyon lies within the Southeastern Idaho and Western Wyoming Overthrust belt and is typical of the Middle Rocky Mountain physiographic province in southeastern Idaho. North/south-trending ranges and valleys, similar to those found in the Appalachian province of the eastern U.S., were created by the eastward compression of sedimentary strata deposited during the late Paleozoic and early Mesozoic times. South Maybe Canyon is a steep-sided canyon oriented roughly north/south. Maybe Creek flows north, parallel to Dry Ridge, until it reaches Maybe Canyon. At the canyon junction with North Maybe Creek, Maybe Creek turns west to flow through Maybe Canyon towards Dry Valley. Maybe Creek is perennial, is approximately 4.8 miles long, and forms an alluvial fan at the mouth of the canyon where much of the stream flow is lost to groundwater. Alluvium is present along Maybe Creek and colluvium along the flanks of the north-south reach of Maybe Canyon.

The creek discharges from Maybe Canyon onto the alluvial fan and enters Dry Valley as an intermittent stream. During normal to above normal precipitation years, Maybe Creek forms a confluence with Dry Valley Creek, a tributary to the Blackfoot River. The gradient of Maybe Creek is about 6 percent over most of its course in Maybe Canyon. The gradient increases to 16 percent and greater in the headwaters of the canyon above the CVF. There are two small ponds within the Maybe Creek channel at the mouth of Maybe Canyon; Maybe Creek flows through the ponds.

The present channel of Maybe Creek in Dry Valley is broad and poorly defined. The creek traverses a wide area characterized by only a few feet of relief. Several low-relief surface channels are evident on the fan. The course and channels of Maybe Creek were substantially altered when the adjacent access road and railroad were modified in the early 1990s in connection with development of the Dry Valley Mine located across Dry Valley from Maybe Canyon.

Numerous small springs emerge along Maybe Creek immediately downstream of the CVF and upstream of the confluence with North Fork Maybe Creek. These springs discharge from the lower Dinwoody Formation or alluvial aquifer.

Vegetation in Maybe Canyon includes riparian vegetation along Maybe Creek and in the wetlands. There is also mixed spruce, fir, and aspen forest present with upland grass species and forbs found with mountain brush species on the arid open slopes. Precipitation in the area around the mine generally varies from 17 to 30 inches per year, depending on location and elevation.

Geology and Hydrogeology

Rocks in the upper Wells Formation west of Mine Ridge are poorly cemented calcareous sandstone with minor limestone interbeds; however, most of the deeper older rocks of the formation are fractured limestone with some interbedded sandstones. These rocks form the folded core of Mine Ridge. Throughout this region of southeast Idaho, the Wells Formation contains the regional aquifer[2]. Rock formations in the sandy upper Wells Formation are easily eroded while the deeper limestone forms steep slopes, exposed outcrops, and colluvial material.

At the Site, the Phosphoria Formation is approximately 370-feet-thick. Economically, the Meade Peak Member of the Phosphoria Formation is the most important source of phosphate ore and is approximately 270 feet thick. Overlying the Meade Peak Member, the Rex Chert Member is 80 to 100 feet thick and forms the hanging wall in the open pits. Siliceous rocks of the Rex Chert Member resist weathering and are useful as coarse and durable construction material. The miners removed phosphate ore from the upper and lower ore seams within the Meade Peak Member. The "Center Waste" shale (an interbedded black carbonaceous shale, mudstone and siltstone) divides the ore seams and contains most of the hazardous substances discharged from the CVF. (See Figure 2.3)

Groundwater flows down Maybe Canyon through alluvial and bedrock aquifers beneath the CVF. Bedrock aquifers are present within the Dinwoody and Wells Formations. Shallow alluvial/colluvial aquifers are present within Maybe Canyon and Dry Valley.

Rock formations of the Wells Formation serve as an aquifer in the region. Data collected from exploration and monitoring wells completed in the Wells

[2] Ralston. 1980.

Formation in the area indicate that hydraulic conductivity ranges from 0.08 to 9.94 feet per day (ft/d) and transmissivity ranges from 4 to 3,600 square feet per day (ft^2/d).[3] Ralston concluded that, "Streamflow was always lost to some degree if not entirely when the stream crossed the upper member of the Wells Formation." Additionally, Ralston concluded, "A major groundwater flow system exists in the lower member of the Wells Formation (Ralston 1980)."

Generally, two shallow alluvial groundwater systems are present in the vicinity of the Site, one associated with Maybe Creek and the other in the more complex alluvial sequences of Dry Valley. Unconsolidated sediments associated with Maybe Creek consist primarily of clay and silt derived from shale members of the Dinwoody Formation and chert and limestone fragments from the Rex Chert Member and Dinwoody Formation. Groundwater elevations in Maybe Canyon rise in the spring (April to May) and fall slowly throughout the remainder of the year. Based on information obtained during the installation of the monitoring wells in the canyon, the thickness of colluvial material ranges from 24 to 47 feet. Hydraulic conductivities are low to moderate and range from 3.9 to 28.0 ft/day. There are no culinary or production wells in the shallow aquifer in Maybe Canyon.

Climate

The climate is generally cool and dry, with prevailing winds and weather patterns moving from west to east. Based on the data from the SNOTEL site on Slug Creek Divide, the Site receives annual precipitation amounts ranging from a low of 19.8 inches (2001) to 49.8 inches (1982). The water year average from 1981 to 2011 is 31.4 inches of precipitation, falling mostly as snow at elevations of 7200 feet and higher. Snow cover typically begins to accumulate on the ground in November and persists through April. Snow accumulation is greatest along the north- and east-facing slopes. Winter temperatures range from -18 degrees to 40 degrees Fahrenheit.

Summer temperatures are mild, generally ranging from 40 to 80 degrees F. Stream flow in local streams is controlled by snowmelt, precipitation, and ground water discharge. Peak flows generally occur in April through June, during spring runoff, and decline to low-flow conditions by mid to late summer. Late summer storms of short duration but high intensity occur annually; these are often local events that can deliver significant volumes of water and create surface erosion when they occur.

Vulnerable or Sensitive Populations, Habitats, and Natural Resources

Maybe Creek is subject to Idaho Department of Environmental Quality (IDEQ) water quality criteria for designated cold-water biota use. The Blackfoot River is

[3] Greystone 2003. Draft Environmental Impact Statement, North Rasmussen Ridge Mine, Agrium Conda Phosphate Operations, Caribou County, Idaho. Greystone Environmental Consultants, Inc.

designated for cold water aquatic life, salmonid spawning, recreation, and domestic and agricultural water supply. The Blackfoot River provides habitat for the Yellowstone Cutthroat Trout. The main stem of the Blackfoot River, Dry Valley Creek and Maybe Canyon Creek are water-quality impaired (listed under Section 303(d) of the Clean Water Act) and do not fully support these streams' beneficial uses due to elevated temperature, low levels of dissolved oxygen, and elevated levels of selenium.

The US Fish and Wildlife Service has designated southeast Idaho as linkage area for Canada lynx (*Lynx canadensis*) since there are patches of potentially suitable habitat present in mixed conifer forests in southeast Idaho.

3. Site Characteristics

The predominant land uses in the vicinity of the Site are mining, livestock grazing, and recreation. The lands in Dry Valley have been mined for phosphate and are otherwise used primarily for cattle grazing. Before mining and on some of the reclaimed land, these sites support wildlife habitat and cattle and sheep grazing. Horses were once pastured downstream of the CVF on private pasture irrigated by Maybe Creek but have not been pastured there once they contracted selenosis; cattle seasonally graze nearby private pastures today. Current land use on and around the CVF also includes outdoor recreation (hunting and ATV riding).

This is the first CERCLA cleanup action taken at the Site; the lessee has taken action to stabilize, maintain, and repair erosion and storm water management features on the CVF under the mine reclamation plan.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The COCs for the South Maybe Canyon Mine CVF include selenium, cadmium, chromium, nickel, and zinc – all of which are hazardous substances as defined by CERCLA 42 U.S.C. section 9601(14).

Site investigation work identified waste rock containing Meade Peak Member shales as the primary source of selenium released from the CVF. Of the hazardous substances identified, selenium has the widest distribution and greatest exceedence of screening level benchmarks and thus is an adequate surrogate to identify the nature and extent of contamination. Screening level benchmarks were either calculated from default exposure assumptions and toxicity information or derived from promulgated standards. Screening levels indicate the potential for unacceptable risk to human and ecological receptors.

For surface and ground water, the benchmarks are the promulgated water quality criteria. For vegetation, the benchmarks are the screening levels in the Area-Wide Risk Management Plan (AWRMP). In general, data from the CVF indicate that

selenium and other COCs significantly exceed their associated screening level benchmarks, with selenium in surface water exceeding these benchmarks by orders of magnitude, as discussed below.

Surface Water Downstream of the CVF

Selenium concentrations in Maybe Creek are highest near the toe of the dump and decrease downstream; selenium concentrations peak each spring during run-off from snow melt and early seasonal storms. Maximum surface water selenium concentrations at SW-2 (Figure 2.5) increased during the 10 years of monitoring from 0.71 mg/L total selenium in 1997 to 3.14 mg/L total selenium in 2008. Water from the ponds at the mouth of Maybe Creek ranged between 0.653 and 1.350 mg/L in 2006. Upstream of the ponds at SW-4 concentrations were 1.5 mg/L in 2007, and 2.44 mg/L in 2008. All of the selenium concentrations discussed in this paragraph are at least 100 times the Idaho chronic cold-water criterion of 0.005 mg/L. Additionally, selenium concentrations exceed the Idaho acute cold water criterion of 0.020 mg/L. Similar to Maybe Creek, selenium concentrations in nearby springs peak in late spring, and then decrease throughout the remainder of the year. In 2005, selenium concentrations ranged from 0.234 to 1.340 mg/L in spring SP-3, from 0.078 to 1.530 mg/L in SP-7, and from 0.026 to 0.270 mg/L in spring SP-9. All of these concentrations exceed the cold water criterion, some by more than a factor of 200.

Ground Water Down-gradient from the CVF

Selenium is detectable in shallow alluvial groundwater monitoring wells in Maybe Canyon and Dry Valley. In general, selenium concentrations are highest in the spring and decrease during the summer. Selenium concentrations generally increase as groundwater elevations increase and decrease as groundwater elevations decrease.

Groundwater from six wells in Maybe Canyon was sampled monthly and analyzed for dissolved selenium to evaluate seasonal changes in selenium concentrations. Concentrations were highest at well MC-1, located just downstream of the CVF. Selenium concentrations in well MC-1 are similar to concentrations in surface water at monitoring station SW-2. In 2006, selenium concentrations ranged from 1.14 to 2.56 mg/L at well MC-1, and from 0.28 to 0.714 mg/L in well MC-6 further downgradient. Concentrations of selenium measured in groundwater in 2009 follow similar trends.

Vegetation on the CVF and Downstream

Vegetation samples collected from the CVF have selenium concentrations ranging from 2.46 to 13.5 mg/kg in grasses, from 2.95 to 76.1 mg/kg in forbs, and 6.14 to 11.0 mg/kg in shrubs. The screening level for selenium in vegetation is 5.0 mg/kg based upon the Area-Wide Risk Management Plan (AWRMP).

Selenium in the water and plants in the horse pasture 1.5 miles downstream from the CVF caused selenosis in horses in 1996. The source of that selenium is the CVF.

5. National Priorities List status

The South Maybe Canyon Mine is not on the U.S. Environmental Protection Agency's National Priorities List (NPL).

B. Other Actions to Date

1. Previous actions

There have been no previous CERCLA removal or remedial actions to date, although the lessee has conducted storm water management maintenance activities on the CVF in 2008 and 2011. These activities were conducted in accordance with BLM's Mine and Reclamation Plan and the mine's Storm Water Pollution Prevention Plan.

2. Current Actions

This action memorandum selects a limited removal action to reduce infiltration to, and isolate surface runoff from, contaminated fill material in the CVF, as the means to reduce selenium loading to Maybe Creek. The Engineering Evaluation / Cost Analysis (EE/CA) supporting the Removal Action did not evaluate possible actions to address other impacts at the Site. The Forest Service anticipates that, following implementation of the selected Removal Action, the Forest Service will conduct a CERCLA Remedial Investigation and Feasibility Study (RI/FS) to fully evaluate Site contamination.

C. Authorities' Roles

In 1998, Nu-West and the Forest Service entered into a CERCLA Administrative Order on Consent to complete an SI and an EE/CA. Nu-West submitted an initial report in 1999, followed by nine annual supplements. This report and the supplements documented site conditions and the results of several pilot treatment studies. The Forest Service is the appropriate response agency to lead this action since the source of contamination is on National Forest System land and the Forest Service has been delegated authority under CERCLA to address contamination from hazardous substances. The Forest Service has coordinated the investigation with Idaho Department of Environmental Quality and other federal agencies. The Forest Service shared the draft EE/CA with IDEQ and the other federal agencies prior to release for public comment.

D. Tribal response

The Forest Service shared the EE/CA with the Shoshone-Bannock Tribes (Tribes) prior to release for public comment as part of the trust responsibilities that the Forest Service maintains. On December 9, 2010, Forest Service staff met with the Tribal environmental staff to discuss the EE/CA. The Tribal environmental staff indicated support for the recommended action, which is now the selected removal action. The Fort Hall Business Council did not request a formal government-to-government consultation.

III. Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

Based on the following NCP[4] factors, a removal action at the CVF is appropriate to address threats to public health or welfare or the environment:

Actual or potential exposure to nearby human populations, animals or the food chain from hazardous substances, pollutants, or contaminants (42 C.F.R. 300.415(b)(2)(i))

Receiving streams at the Site are designated by IDEQ for cold water biota use. Surface water concentrations of selenium exceed Idaho Water Quality Criteria by as much as three orders of magnitude for chronic exposures for cold water aquatic life, and by as much as two orders of magnitude for acute exposures for cold water aquatic life. The chronic criterion is an estimate of the highest concentration of selenium in surface water to which an aquatic community can be exposed indefinitely without resulting in an adverse effect. The acute criterion is an estimate of the highest concentration of selenium in surface water to which an aquatic community can be exposed briefly without resulting in an adverse effect.

Concentrations of selenium in site sediments and vegetation exceed the screening level benchmarks, indicating a potential for unacceptable risks to human health and ecological receptors. Exposure of livestock to selenium-contaminated forage has been a demonstrated concern at the South Maybe Canyon Mine Site and similar sites in the area. In addition to the six horses, discussed earlier in this Action Memorandum, that contracted selenosis after ingesting contaminated forage and surface water, there have been other livestock poisoning deaths in the area, which were or were likely caused by selenium. In 2001, approximately 170 sheep died while grazing on one of the overburden disposal areas at the Conda Mine. In 2009, approximately 18 cattle died from toxic exposures to selenium at the nearby Lanes Creek mine. Lanes Creek Mine is on private land; the Conda Mine is located on private and BLM land. Livestock were exposed to selenium contamination at these mines through contaminated forage.

[4] National Oil and Hazardous Substances Pollution Contingency Plan. 1990. Section 300.415 (a)(2)

Selenium concentrations in shallow ground water exceed the Idaho ground water quality standard (IDAPA 58.01.11) and the Safe Drinking Water Act Maximum Contaminant Levels. While there are currently no culinary or production wells in the shallow aquifer, there is potential for such use in the future.

Chronic ingestion of high levels of selenium results in human health effects, as well. Symptoms of selenosis can include a garlic odor on the breath, deformation and loss of nails, gastrointestinal disorders, hair loss, fatigue, irritability, and neurological damage. Campers could be exposed to elevated levels of selenium in surface water and sediments.

Actual or potential contamination of drinking water supplies or sensitive ecosystems (42 C.F.R. 300.415(b)(2)(ii))

Maybe Creek exits the toe of the CVF with elevated concentrations of selenium, as previously discussed. At times this water, still with elevated selenium concentrations, reaches the Blackfoot River. The Blackfoot River is a Clean Water Act section 303(d)-listed stream for selenium. Selenium contaminant concentrations in the Blackfoot River exceed levels that are known to cause adverse effects in fish. Fish and waterfowl are sensitive receptors to selenium, and are at risk from both aqueous and dietary exposures to selenium. Selenium is toxic to fish and waterfowl (selenium is a teratogen) as evidenced in malformations in the fry, embryos and chicks. Greater morbidity can appear in the fry and chicks of nesting and resident populations of migratory birds.

High levels of hazardous substances, pollutants or contaminants in soils largely at or near the surface that may migrate (40 C.F.R. 300.415(b)(2)(iv))

Center waste shales are continually exposed to the elements and produce selenium salts that are present on the surface of the CVF. During snow melt or summer rain events, the selenium salts may dissolve and be carried off the surface of the CVF and into Maybe Creek.

Weather conditions that may cause hazardous substances, pollutants or contaminants to migrate or be released (40 C.F.R. 300.415(b)(2)(v))

Seasonal weather conditions contribute to the release and migration of hazardous substances from the CVF in several ways. Snow on top of the CVF and on the upstream and downstream slopes of the CVF melts in the spring and then infiltrates into the CVF. Rain during the spring and summer also infiltrates the CVF. The infiltration results in leaching and mobilization of the selenium in the CVF, where it flows into the French drain and exits the CVF into Maybe Creek. Spring and summer storm events can cause erosion and rilling, leading to transport of the seleniferous waste shales down the face of the dump and into Maybe Creek. The highest concentrations of selenium are detected during late spring when infiltration and runoff are highest. Intense spring and summer storm events create the potential for slope failure.

IV. Endangerment Determination

Actual or threatened releases of hazardous substances from the South Maybe Canyon Mine CVF, if not addressed by implementing the selected Removal Action, may present an imminent and substantial endangerment to public health, welfare, or the environment, as outlined in Section III, above.

V. Proposed Actions and Estimated Costs

The following removal action objectives (RAOs) are based on the NCP factors discussed in Section III, above.

- Minimize infiltration on the surface of the CVF to reduce the load (concentration times volume) of selenium and other hazardous substances into Maybe Creek;
- Prevent exposure of human and ecological receptors to hazardous substances in vegetation on the surface of the CVF; and
- Capture and isolate precipitation runoff from the CVF surface to reduce flow from within the fill. Smaller emergent flows will be easier to manage if further treatment is determined to be necessary.

A. Alternatives Considered

With these RAOs in mind, four alternatives were developed to address the CVF. In summary, these four alternatives are:

Alt.	CVF Top Deck	CVF Downstream Slope	Infiltration Control	Institutional Controls
1	Grading to approximately 3.5% - 5% slope to the east	No Action	Increases runoff from the top deck and diverts runoff into chert blanket	Grazing Restrictions/ Vegetation Control
2	Grading and capping approximately 68 acres	No Action	Minimizes infiltration on the top deck and diverts runoff into chert blanket	Grazing Restrictions
3	Grading and capping approximately 68 acres	Grading, terracing, and capping approximately 24 acres	Minimizes infiltration on the top deck and slope and diverts runoff into chert blanket	Grazing Restrictions
4	Grading and capping approximately 75 acres	Grading, terracing, and capping approximately 25 acres	Minimizes infiltration on the top deck and slope and diverts runoff around the CVF	Grazing Restrictions

The EE/CA discussed each alternative's performance relative to that of the other alternatives with respect to the RAOs and the criteria described in Section 7 in the EE/CA (effectiveness, implementability and cost).

The first RAO is to minimize infiltration on the surface of the CVF thereby reducing leaching of selenium and other hazardous substances into the CVF and Maybe Creek.

The water balance analysis described in the EE/CA indicates a large percentage (i.e., 70 to 80 percent) of flows at the toe of the CVF originate from precipitation on and recharge through the CVF. Since the majority of flows downstream of the CVF in Maybe Creek originate from precipitation falling on the CVF surface, source controls that minimize surface infiltration and runoff are essential to meet this RAO.

Alternative 1 would not substantially reduce infiltration on the surface of the CVF and selenium loads to Maybe Creek because it does not substantially change the current condition. There is no physical barrier to prevent precipitation from infiltrating into the CVF. Grading the CVF top deck may temporarily increase infiltration until vegetation re-establishes on the graded surface. Selenium loading to Maybe Creek would likely remain the same and possibly increase in the short-term as shale in the CVF surface is exposed to weathering conditions. Therefore, this alternative does not meet the effectiveness criteria, which include the ability to meet the RAOs, compliance with ARARs, and overall protection of human health and the environment.

Alternative 2 reduces infiltration into the fill by capping the 68-acre top deck. Runoff to the blanket is promoted from the top deck, but all of the water diverted from the top deck would still discharge at SW-2 and contact waste rock materials along the flow path. Selenium loads to Maybe Creek would be reduced because of the top deck cover; however, materials in the toe of the fill would remain exposed to the weather and leaching. Therefore, this alternative does not meet the effectiveness criteria, which include the ability to meet the RAOs, compliance with ARARs, and overall protection of human health and the environment.

Alternative 3 would minimize surface infiltration with caps on the top deck and downstream slope of the fill by approximately 95%. Alternative 3 better controls surface infiltration because of the downstream slope cap; however, re-introduction of runoff into the chert blanket could substantially reduce overall net effectiveness of this option.

Alternative 4 would provide the greatest reduction in overall surface infiltration into the CVF. Approximately 95% of the precipitation and runoff that currently contacts contaminant bearing waste rock in the fill would be diverted and isolated from the CVF, thereby providing the greatest net reduction in selenium loading to Maybe Creek. Alternative 4 is expected to reduce the overall hydraulic loading (i.e., input of water) to and from the CVF by approximately 70 to 80 percent (there is still the introduction of water into the CVF from the buried springs). Water balance information indicates that diverting and isolating precipitation and run-on Alternative 4 would reduce peak hydraulic loads to approximately 0.5 cfs at the toe of the CVF. Alternative 4 is expected to reduce peak selenium loads at SW-2 from 70 lbs/day in May 2008 to less than 5 lbs/day. Springtime peak flows would be reduced to base flow levels with implementation of Alternative 4.

The second RAO is to minimize exposure of human and ecological receptors to hazardous substances in vegetation on the CVF surface.

Alternative 1 would not meet this RAO because there is no physical barrier to prevent future vegetation from taking up the selenium from the waste shale. Vegetation established on the downstream slope will continue to take up selenium from the seleniferous waste shale. Alternative 1 is not substantially different than the current site condition.

Alternative 2 would partially meet this RAO by capping the surface of the top deck of the CVF with a design to prevent root contact with the underlying shale, but the downstream slope would not be capped. Vegetation established on the downstream slope will continue to take up selenium from the seleniferous waste shale.

Alternatives 3 and 4 would meet this RAO by capping the surface and downstream slope of the CVF, and thus breaking the connection between seleniferous material and plants which can absorb selenium and make it available to grazing animals. Alternatives 3 and 4 would effectively meet the second RAO.

Idaho Water Quality Standards are key ARARs for the Site. While none of the alternatives will meet this ARAR, Alternative 4 will provide the best progress toward doing so, as discussed below. Alternative 1 would not result in improved water quality or compliance with water quality standards because it does not change the current infiltration conditions. Alternatives 2 and 3 would reduce loading of hazardous substances to surface water, which would result in some reduction of contaminant concentrations downstream, but would not result in compliance with all water quality standards. Alternative 4 would provide the greatest reduction in loading of hazardous substances to the CVF and Maybe Creek, resulting in the greatest contribution toward compliance with ARARs. Alternative 4 isolates surface water that falls as precipitation on the CVF and the surrounding upslope areas (i.e, the sides of the valley above the CVF), and diverts it from other water sources that contact the CVF (i.e, the upwelling groundwater beneath the fill and water sources in the Maybe Creek drainage upgradient of the CVF). Capture and diversion of the precipitation is expected to reduce the amount of water that contacts the CVF by 70 to 80 percent. This will reduce the selenium load to the receiving streams, such that compliance with water quality criteria will be achieved at a downstream location. Substantial flow reductions in discharge from the toe of the fill at SW-2 would carry a smaller dissolved load of contaminants from the fill. While resulting contaminant concentrations in this discharge may increase, the smaller water volume and contaminant stream would be more effectively managed if further improvement in water quality is determined to be necessary.

The consequent decrease in the total load of selenium discharging from the CVF should result in downstream locations of Maybe Creek coming into compliance with federal AWQC and Idaho Water Quality Standards sooner than Alternatives 2 and 3. Alternative 4 would also provide the greatest reduction in the volume of water that may require treatment in the future.

Alternatives 1, 2, 3, and 4 require different levels of effort but all are implementable. Grading the CVF and, for Alternatives 2, 3, and 4, constructing the cap can be implemented using conventional earth-moving equipment and proven engineering technologies. Winter conditions may limit the construction season to 5 to 6 months. The required materials are available either locally or from commercial sources.

Alternative 4, offers the additional engineering challenge of capturing runoff, diverting it into channels, and controlling flow velocities and energy developed as the diverted runoff water drops several hundred feet in elevation along steep terrain. However, it is still implementable.

Alternative 4 would provide the greatest level of source control at the Site and be consistent with any potential future remedial action at the Site.

The costs for the four alternatives range from $1,900,000 to $17,200,000. Alternative 4 is the most expensive and Alternative 1 is the least expensive.

Alternative 1, while implementable and the least expensive, would not effectively improve water quality or meet any of the RAOs. Alternative 2 is implementable, but still

lacks the effectiveness to substantially improve water quality or achieve the RAOs. Some improvements in water quality and isolation of vegetation on the top deck would be achieved at a cost of approximately $11,600,000. Alternative 3, like 2, is implementable and its effectiveness improves with the cap extension over the downstream slope of the CVF. However, this effectiveness is compromised by re-introducing run-off from the top deck and run-on from the slopes above the CVF into the chert blanket to discharge at SW-2. Alternative 3 costs approximately $15,800,000.

Alternative 4 would be the most reliable and effective source control option relative to cost. Alternative 4 is approximately $1,400,000 more costly than Alternative 3 at $17,200,000. However, Alternative 4 isolates water from the seleniferous waste shale, delivers clean surface water downstream of the toe of the CVF, and provides the greatest reduction in the volume of water that may require treatment in the future.

After evaluating the four alternatives against the short- and long-term aspects of three broad-based criteria and associated sub-criteria, as well as public comments, the Selected Removal Action is Alternative 4.

B. Proposed Removal Action

Alternative 4, grading and capping the top deck and downstream slope and diverting runoff around the CVF is the selected Removal Action alternative. Alternative 4 best addresses:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
- Actual or potential contamination of drinking water supplies or sensitive ecosystems;
- High levels of hazardous substances or pollutants or contaminants in soils largely or nearly at the surface, that may migrate; and,
- Weather conditions that may cause hazardous substances, pollutants or contaminants to migrate or be released.

As described in the section above, Alternative 4 represents the best balance among the criteria of effectiveness, implementability, and cost. Additionally, this alternative has the best chance to meet water quality standards of all of the alternatives without water treatment. If water treatment is necessary, Alternative 4 will reduce the volume of contaminated water exiting the CVF which will contribute to the feasibility of water treatment and reduce the cost of treatment.

The cap design for the CVF top deck includes a 1-foot-thick cushion layer that will be placed on the graded fill, overlain with a geosynthetic clay layer (GCL) and a 60-mil High Density Polyethlylene (HDPE) low-permeability geomembrane, a drain layer, and covered with a 2-foot-thick layer of soil cover and vegetation.

The cap design for the CVF downstream slope includes the current slope regraded and flattened to an overall 3.5 horizontal:1 vertical slope with in-slope terraces. Intermediate slopes, between the terraces will be covered with a 1-foot-thick cushion layer placed on the graded fill, overlain with a 60-mil HDPE low-permeability geomembrane and drain layer covered with a 2-foot-thick vegetated soil cover.

Terraces would reduce erosion potential and enhance long-term stability. A low permeability geomembrane would control infiltration while a soil cover would support vegetation. Terraces excavated into the CVF slope would have a geomembrane-lined channel along the inner slope with the geomembrane liner extended onto the terrace surface. Riprap would be placed over the geomembrane to protect the liner on the surface.

Vegetation planted on the CVF would consist of native plants adapted to the elevation and aspect, and contribute to the protection of cap layers. Captured runoff would be routed along the CVF slope margins in a concrete channel with energy dissipation provided at the bottom of the CVF. Clean runoff will be routed into Maybe Creek well past the discharge at SW-2.

This alternative can be implemented using available technologies, materials, and services. This alternative will effectively meet the RAOs and reduce loading of hazardous substances to surface water.

C. Contribution to Remedial Performance

This alternative has the best chance to meet water quality standards of all of the alternatives without water treatment because it isolates water from the seleniferous waste shale, delivers clean surface water downstream of the toe of the CVF, and provides the greatest reduction in the volume of water that may require treatment in the future. If water treatment is determined to be necessary, Alternative 4 will substantially reduce the cost and be more feasible because of the much reduced quantity of contaminated water at SW-2.

This Removal Action for source control at the Site would be consistent with any potential future remedial action, such as water treatment, at the Site.

D. Engineering Evaluation / Cost Analysis

An EE/CA for this removal action was completed by the Forest Service and is included in the South Maybe Canyon Mine Administrative Record. As discussed above in Section V (Alternatives Considered) of this memorandum, Section 8 of the EE/CA compared the removal alternatives based on the criteria outlined in the Guidance for Conducting Non-

Time Critical Removal Actions under CERCLA[5]. The Forest Service identified Alternative 4 as the preferred alternative. The Forest Service initiated a comment period on February 11, 2011 and concluded it on March 17, 2011. One individual and four organizations submitted written comments on the EE/CA. Responses to the public comments received are provided in the responsiveness summary attached to this Action Memorandum. Nu-West indicated support for Alternative 3; however, the Forest Service believes that Alternative 3 is less effective than the selected removal action because precipitation run-off from the top deck of the CVF and surrounding slopes is introduced into the CVF and exits the toe of the dump.

E. ARARS

The NCP requires that removal actions attain applicable or relevant and appropriate requirements under federal or state environmental or facility siting laws, to the extent practicable. In determining whether compliance is practicable, an agency may consider the scope of the removal action (40 CFR 300.415(j)). Applicable or relevant and appropriate requirements for this action are listed in Appendix C of the EE/CA.

Key ARARs include the Federal Ambient Water Quality Criteria (AWQC) (40 CFR 131), the Idaho Water Quality Standards (IDAPA §58.01.02), and Rule for Control of Fugitive Dust (IDAPA §58.01.01.650 - .651). The federal AWQC and the Idaho Water Quality Standard for total dissolved selenium are both 0.005 mg/l for protection of aquatic organisms for chronic effects. The federal AWQC for cadmium is 0.00025 mg/l for protection of aquatic organisms for chronic effects. The Idaho Water Quality Standard for cadmium is 0.006 mg/l. The federal AWQC and the Idaho Water Quality Standard for zinc is 0.120 mg/l for protection of aquatic organisms for chronic effects.

The Idaho Rule for Control of Fugitive Dust is an ARAR since the removal action will move significant amounts of soil. Best Management Practices (BMPs) will be employed during construction to meet this ARAR.

F. Project Schedule

This response action is anticipated to begin in 2012 and the project is estimated to take 1 to 2 years to construct.

G. Estimated Costs

The estimated cost of the selected alternative is $17.2 million. Details on the cost estimate for the preferred alternative are provided in Appendix B-2 of the EE/CA.

[5] U.S. Environmental Protection Agency. Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA. EPA540-R-93-057. Washington, D.C. August 1993.

VI. Expected Change in the Situation Should Action Be Delayed or Not Taken

If the response action should be delayed or not taken:

- Infiltration of precipitation into the CVF will continue and hazardous substances will continue to migrate from the CVF to Maybe Creek through surface or ground water.
- Precipitation flows into the CVF and exiting the toe will not be reduced; consequently reducing the feasibility of any potential water treatment that relies on smaller emergent flows from the CVF.
- Hazardous substances will remain as a potential human health or ecological threat based on direct contact to the hazardous substances on the surface of the CVF or through ingestion of vegetation containing high levels of selenium.

VI. Outstanding Policy Issues

None

VII. Enforcement

The Forest Service will seek Nu-West's performance of the selected Removal Action under an enforceable mechanism such as an Administrative Settlement Agreement and Order on Consent.

Decision

This decision document presents the Removal Action, which is described in Section V.B., above, for the South Maybe Canyon Mine Cross-Valley Fill, located on the Caribou-Targhee National Forest, Idaho, consistent with CERCLA, as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site. Conditions at the Site are consistent with criteria listed in 40 CFR 300.415(b)(2) for a removal action. I recommend your approval for the Removal Action described in this Action Memorandum.

Recommended:

1/4/2012

Brent Larson
Forest Supervisor

Date

1/6/2012

Keith Simila
Director, Engineering

Date

Approval:

Approved X Disapproved _____

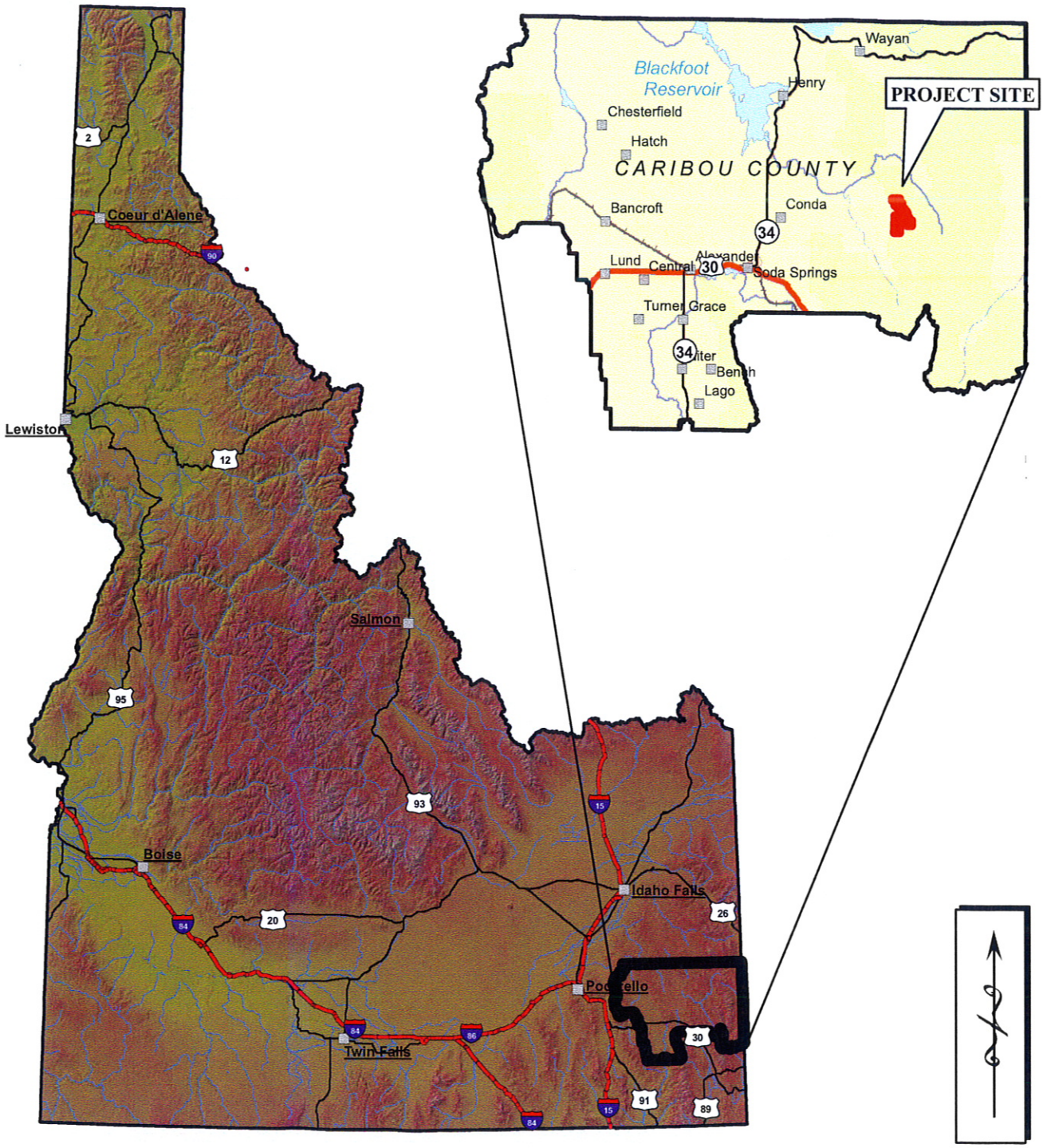
Harv Forsgren 1/6/2012

Harv Forsgren
Regional Forester
USDA Forest Service, Intermountain Region

Date

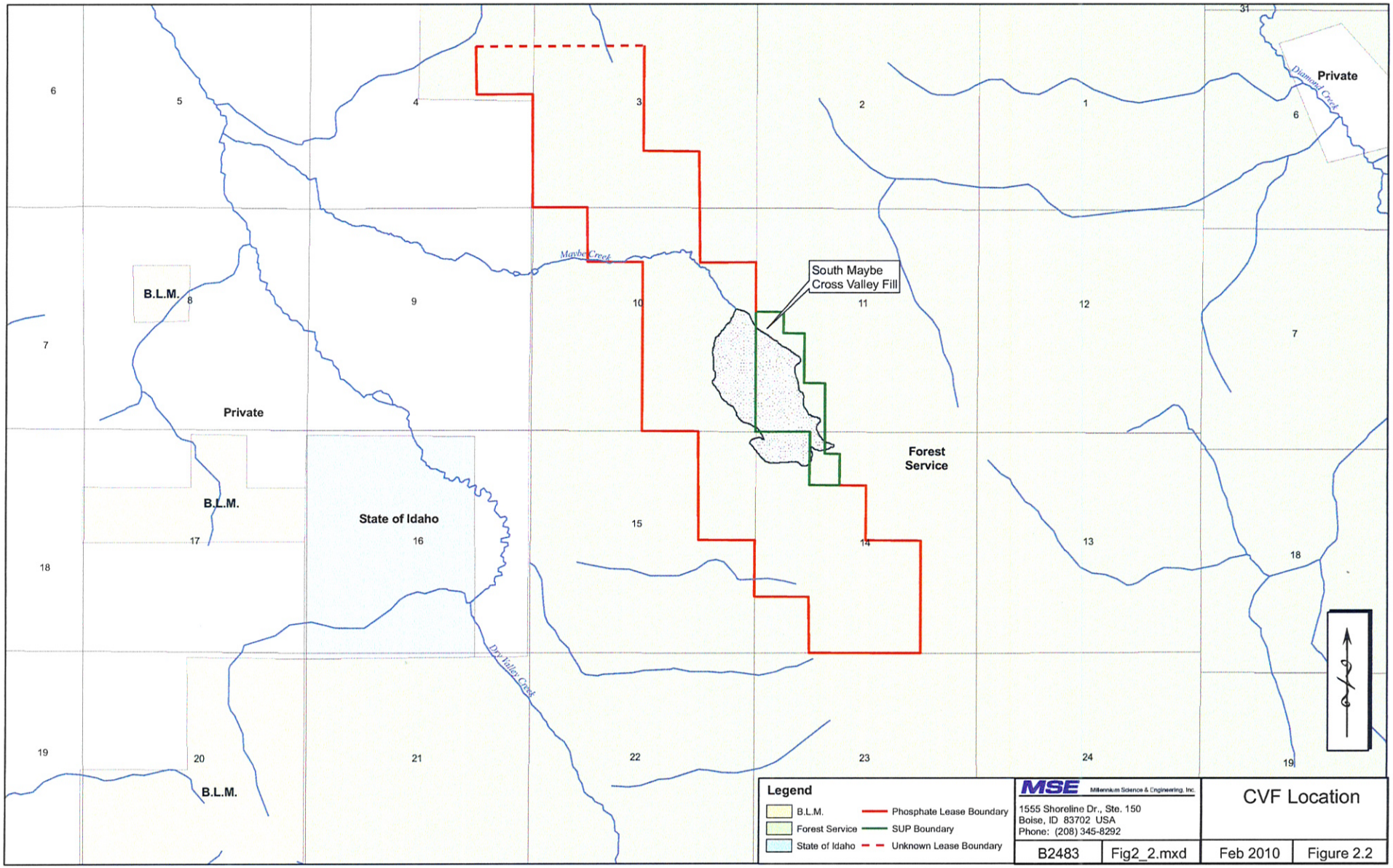
Appendix 1

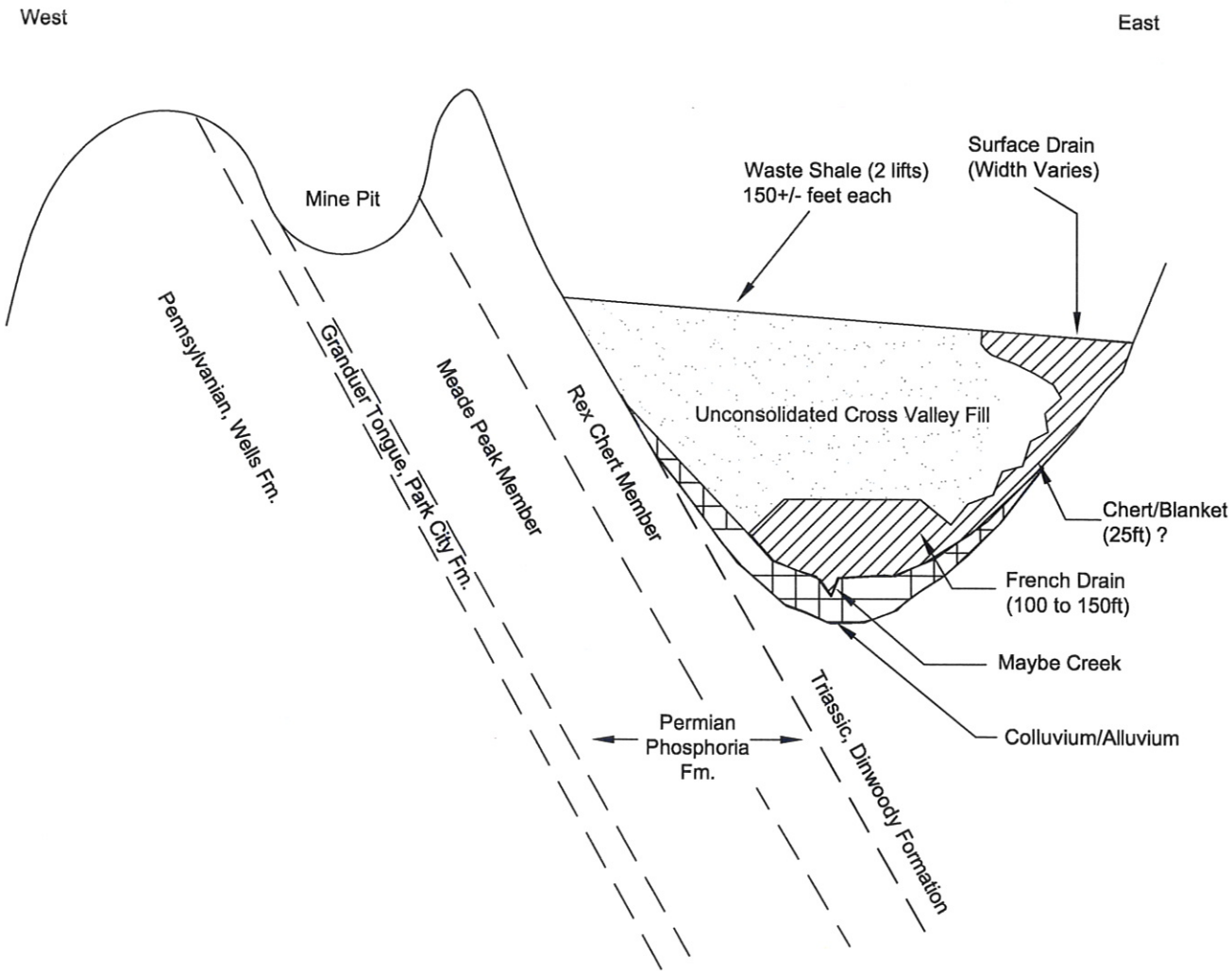
Figures



MSE Millennium Science & Engineering, Inc.		Site Location	
1555 Shoreline Dr., Ste. 150 Boise, ID 83702 USA Phone: (208) 345-8292		South Maybe Canyon Mine Caribou County, Idaho	
B2483	Fig2_1.mxd	Feb 2010	Figure 2.1

:C:\projects\maybe_canyon\south_maybe\EECA\Fig_2_1.mxd

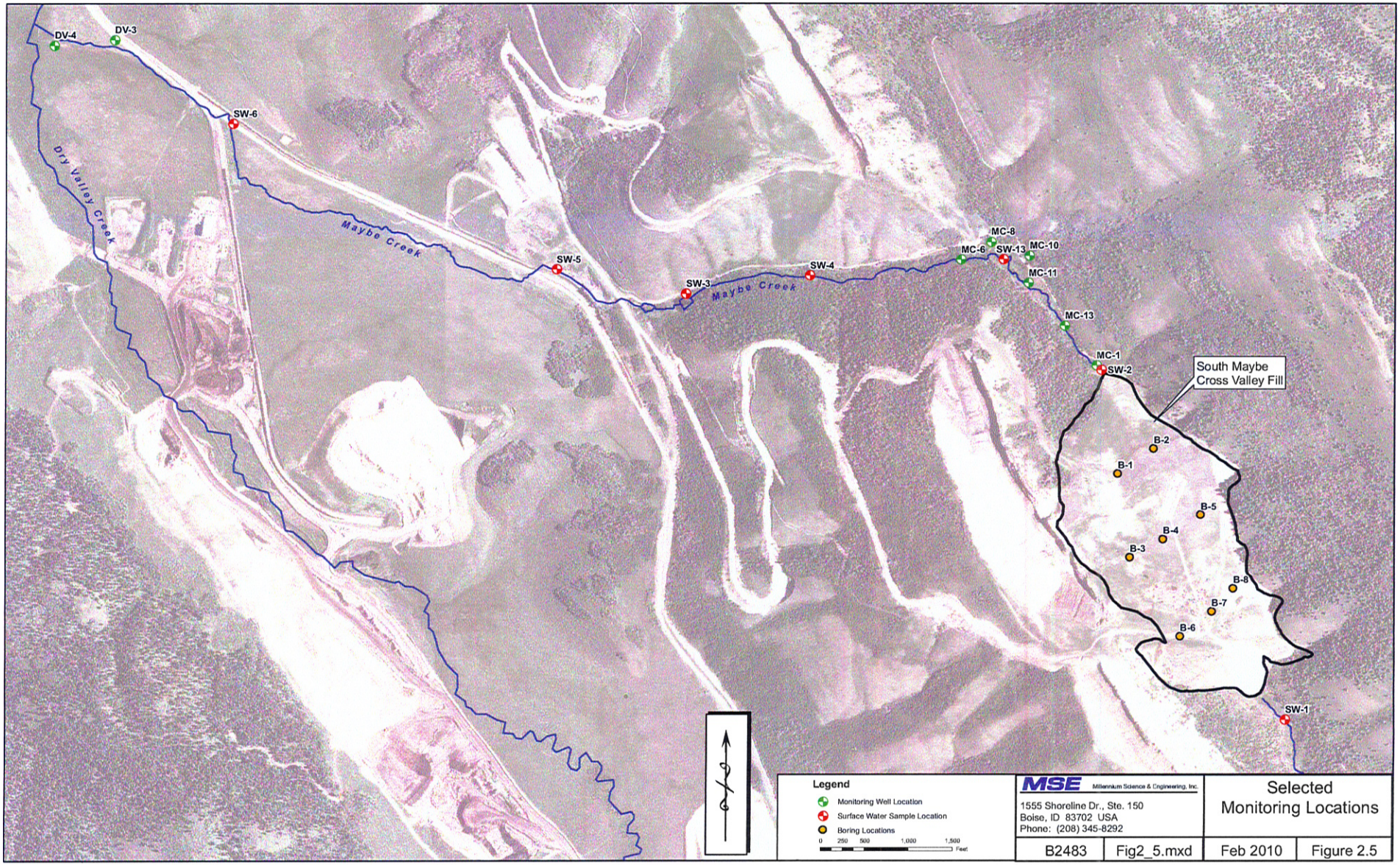

Private
Diamond Creek
Maybe Creek
South Maybe
Cross Valley Fill
B.L.M.
Private
Forest
Service
B.L.M.
State of Idaho
Dry Valley Creek
B.L.M.
Legend
B.L.M.
Forest Service
State of Idaho
Phosphate Lease Boundary
SUP Boundary
Unknown Lease Boundary
MSE Mitigation Science & Engineering, Inc.
1555 Shoreline Dr., Ste. 150
Boise, ID 83702 USA
Phone: (208) 345-8292
CVF Location
B2483
Fig2_2.mxd
Feb 2010
Figure 2.2



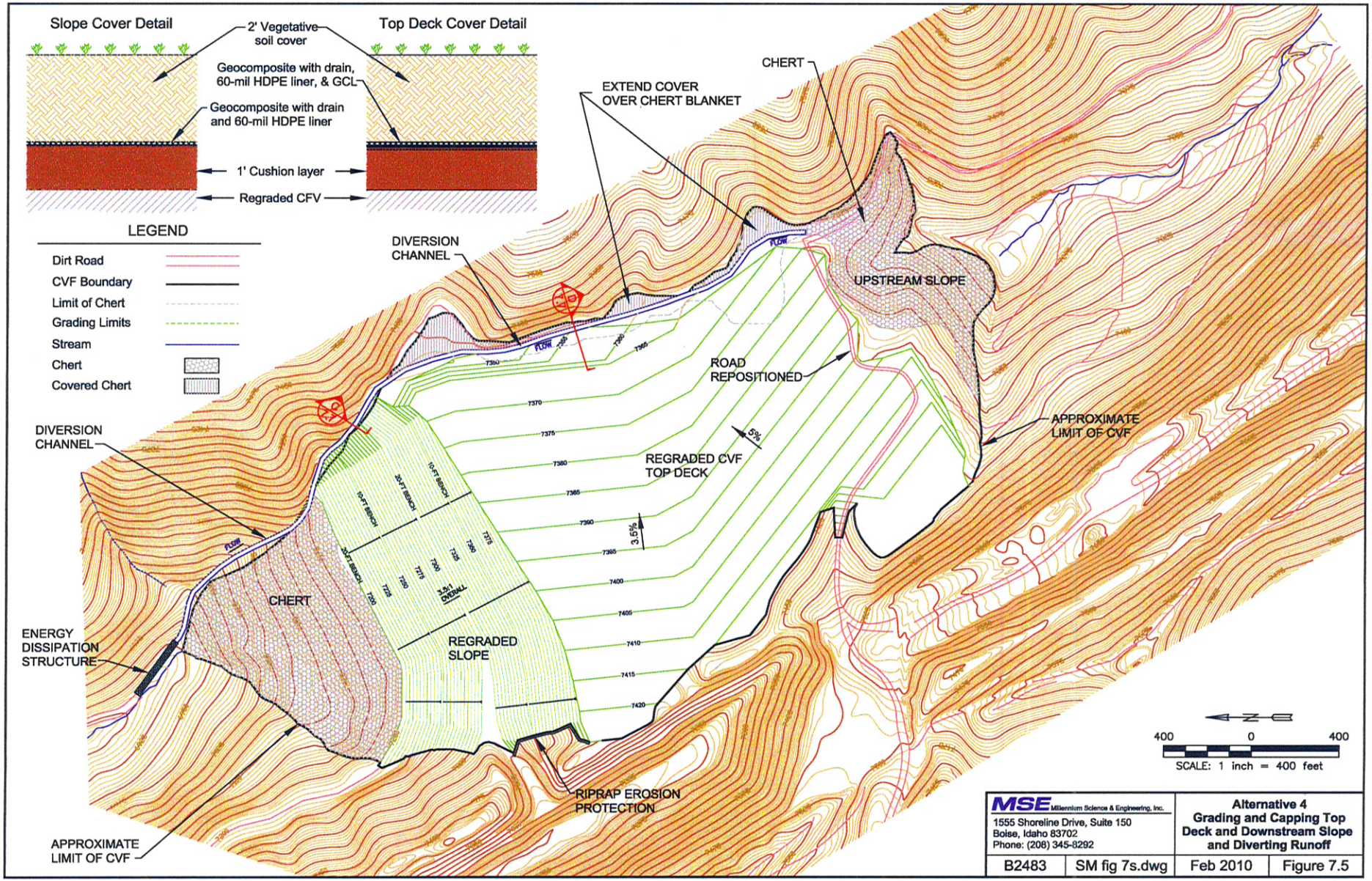
N

MSE Millennium Science and Engineering, Inc. 1555 Shoreline Drive, Suite 150 Boise, Idaho 83702 Phone: (208) 345-8292		**Generalized Cross Section of Maybe Canyon Mine and CVF**	
B2483	Fig2.3.dwg	Feb 2010	Figure 2.3

:MyDocuments/1Projects/GIS_Work/Richard/B2483.B9_F2 3_Dec09



C:/projects/maybe_canyon/south_maybe/EECA/Fig2_5.mxd


Slope Cover Detail
2' Vegetative soil cover
Geocomposite with drain, 60-mil HDPE liner, & GCL
Geocomposite with drain and 60-mil HDPE liner
1' Cushion layer
Regraded CFV
Top Deck Cover Detail
LEGEND
Dirt Road
CVF Boundary
Limit of Chert
Grading Limits
Stream
Chert
Covered Chert
DIVERSION CHANNEL
EXTEND COVER OVER CHERT BLANKET
CHERT
UPSTREAM SLOPE
ROAD REPOSITIONED
APPROXIMATE LIMIT OF CVF
REGRADED CVF TOP DECK
5%
3.5%
DIVERSION CHANNEL
CHERT
ENERGY DISSIPATION STRUCTURE
REGRADED SLOPE
RIPRAP EROSION PROTECTION
APPROXIMATE LIMIT OF CVF
N
400 0 400
SCALE: 1 inch = 400 feet
MSE Millennium Science & Engineering, Inc.
1555 Shoreline Drive, Suite 150
Boise, Idaho 83702
Phone: (208) 345-8292
Alternative 4
Grading and Capping Top Deck and Downstream Slope and Diverting Runoff
B2483
SM fig 7s.dwg
Feb 2010
Figure 7.5